






A5. Marketing Material





Confederation of Indian Industry
 125 Years: 1895-2020

Roadmap for Digital Enterprise through Digital Factory

2020/07/30



About JICA

JICA : Japan International Cooperation Agency governmental agency

JICA coordinates Official Development Assistance (ODA) for the government of Japan. It is chartered with assisting economic and social growth in developing countries, and the promotion of international cooperation.

JICA & CII Experts

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Lecturer's Biography

Hiroshi Jogasaki E-mail: Hiroshi-Jogasaki@wbaa.co.jp JICA Expert
 Director Senior Consultant, World Business Associates, Inc.
 Certified Business Consultant by METI, Japan April, 2008
 Ph.D. in Systems Information Science March, 2017


Doctoral Program, Future University Hakodate March, 2017
 Department of Electrical Engineering, Faculty of Science and Engineering, Waseda University March, 1987



Feb, 2020 In charge of "Digital KAZEN" course lecturer sponsored by the Ministry of Foreign Affairs JAPAN in the 6 cities at Major States of Russia.
 Nov, 2019, 28 IT companies visiting and meeting with Japanese companies from Russia hosted by the Ministry of Foreign Affairs Japan. In charge of the chief lecturer of the training to Japan for the company.

June, 2019 JICA Engaged in the business of training pilot for Indian manufacturing executives. (Continuing)
 April, 2019 Project Manager for METI Grant Application Support to 17 Small and medium-sized manufacturing companies in Japan.
 June, 2018 In charge of "Project Management" course lecturer sponsored by the Ministry of Foreign Affairs JAPAN in the 6 cities at Major States of Russia.


Information Technology related corporate experience more than 30 years. Most recently, From 2008 to 2011 at IBM Japan customer success team for automotive manufacturing companies's headquarters and affiliates throughout Japan, especially for IT infrastructure pre-sales. From 2011 to 2013 at Tata Consultancy Services Japan, he was in charge of the construction of a global infrastructure for a general trading company and a pre-sales of a help desk construction support project. From Nov. 2013 to Sep 2016, at Harvey Nash, HQ in United Kingdom, worked as a Head of the Japanese business of Vietnam offshoring business. From Oct. 2016 Current position.

Co-author: "Loyalty Marketing" and many others Doctoral thesis: Emotion-focused method for smart device sensing



Message to Senior Managers from Eiji Toyoda



"Senior management is simply a flag bearer when a business decision is made. It is of no use unless others follow the flag."

– Eiji Toyoda
(Former Chairman of Toyota)

Senior management should have a flag with follower.

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Chapters

1. Digital revolution of automotive industry in the world
CASE (Connectivity, Autonomous, Shared & services, Electric)
2. Data Science Revolution with using AI & IoT
What is AI & IoT Technologies for automotive industry?
3. Concept of Digital Factory & Roadmap
What is Digital Factory and how to make it happen?
4. How you motivate employee?
KAIZEN Leadership and SDGs oriented approach for motivating employee for Digital Enterprise.
5. Executive Summary
6. Q & A time

↓
Main Part

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1. Digital revolution of automotive industry in the world

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Fact of Automotive Industry

According to the researchers,
Among 7 Billion people, there is 800 Million vehicles in the world 2015.
But riding only 15 days in a year and other days vehicles are staying in the Parking place

“The Automobile Revolution: Towards a New Electro-Mobility Paradigm”

↓

Optimize the total utilization of the vehicles

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Digital transformation to drive change in a variety of industries

CASE Connected Shared Services Electric

As vehicles become cheaper, it's going to be difficult to secure revenue

Taxis and rentals will not be needed

Automobile life insurance will not be needed

Logistics costs go down significantly

The traffic jam is cleared. Reduce environmental impact

Share & Services

vehicles are no longer selling. Sales decline

buses, railways, etc. Roles change

The real estate business are affected

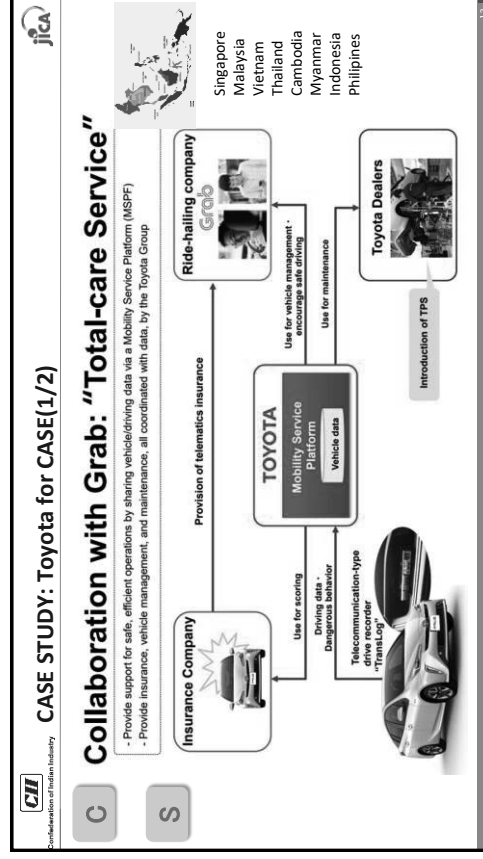
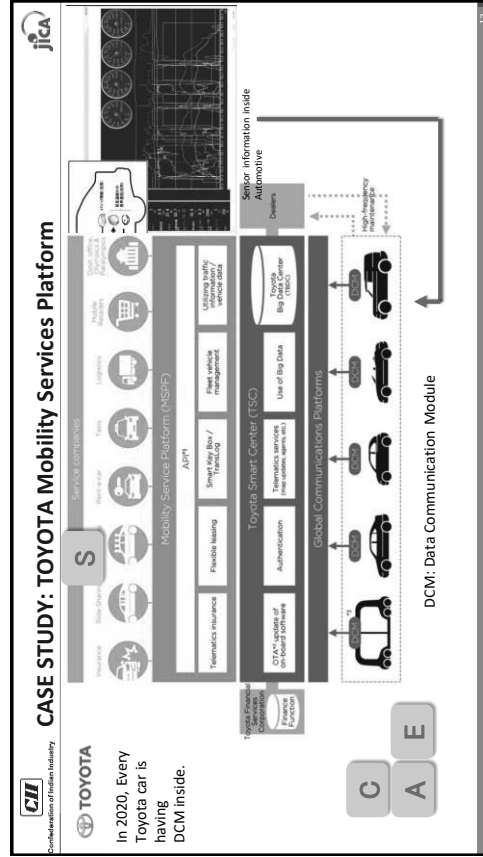
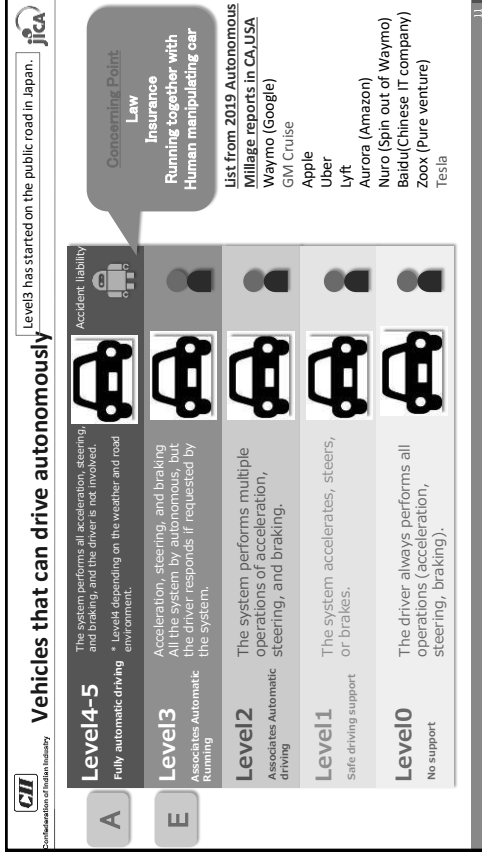
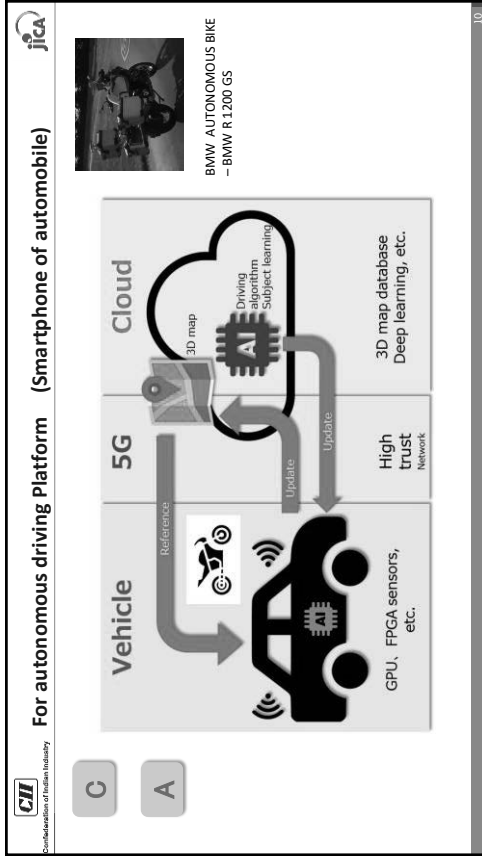
Gas station will not be needed

Connected

Autonomous Electric

Honda GO BIKE RENTAL 2020/03~

Chinese Electric Scooters in Vietnam



CASE STUDY: Toyota for Autonomous and Electric(1/2)

MaaS-dedicated Vehicle Lineup

Develop multi-task vehicles that reflect the characteristics of MaaS (improving capacity efficiency, ease of getting in/out, cleaning, and maintenance)

	e-Palette	MaaS Sienna	MaaS BEV
Purpose	Multi-task short distance transportation (people/cargo)	Medium-to-long distance ride-sharing	Short-to-medium distance ride-sharing
Launch	2021 Tokyo Olympic Games	2021	-
Power	BEV	HEV	BEV
Size	Large	Medium	Small

MaaS: Mobility as a Service, BEV: Battery Electric Vehicle, HEV: Hybrid Electric Vehicle

CASE STUDY: Toyota for Autonomous and Electric(2/2)

Autonomous Driving MaaS Vehicles

- Convert Level 2-3 mass-produced vehicles into Level 4 MaaS-dedicated vehicles through ADKs (Autonomous Driving Kit)
- Improve safety through dual-monitoring of the surrounding environment by the ADK software and the Guardian system on the vehicle
- Promote standardization of VCI (Vehicle Control Interface) and generalization of the vehicle control unit, including the Guardian system

CASE STUDY: Yamaha Autonomous Manipulating ROBOT(2015~2017)

Impressive driving experience by visualizing information

MOTOBOT is driving without modifying the vehicle body.

Human style robots gives insights to R&D to improve the experience on the two wheeler.

CASE STUDY: Toyota for Autonomous and Electric(1/2)


Using Toyota's Real-World Technology Assets as Strengths


Mass-produce advanced vehicles equipped with AI at sufficient quality and appropriate cost, and conduct maintenance on those vehicles at appropriate intervals to popularize them as safe mobility services in society

CII Confederation of Indian Industry | **jica** | **CASE STUDY : Yamaha started new company with Autonomous Car Startup**

Logistics inside the factory | **R&D** | **Engineering**

Yamaha's new Company (eve autonomy) is joint venture company together with Open Source based Autonomous Car solution start-up "Tier IV".

A  **eve autonomy**



AUTOWARE ECOSYSTEM

- 1. User applications
- 1. Algorithms
- 1. Framework / SDK
- 1. OS / RTOS
- 2. Maps
- 1. Simulation
- 1. Compute
- 1. Sensors
- 1. Vehicle

Autoware 2.0 → **Autoware 1.0** → **Autoware 0.10**

ROS 1, ROS 2, Linux, Linux

Drivers and Supporting Software

1. 100-based Hardware
2. 100-based Software
3. 100-based OS

Open Innovations is key for the success for Digital Factory solutions.

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The automotive industry is under going a profound transformation with the arrival of new type of vehicles, services, and uses that break away from the traditional model of vehicles.

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2. Data Science Revolution with using AI & IOT

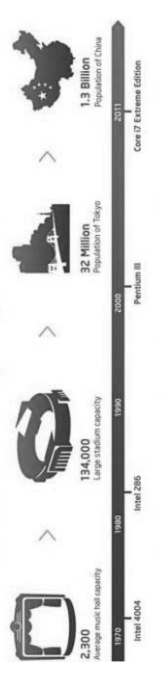
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(インテル創業者の一人であるゴードン・ムーアが、1965年に自らの論文で発表した「半導体の集積率は18か月で倍になる」という半導体業界の法則です。)

Visualizing Progress

If transistors in a microprocessor were represented by people, the following timeline gives an idea of the pace of Moore's Law.



Year	Transistor Count / Population	Approximate Area
1971	Average truck bed capacity (Intel 4004)	Small square
1986	Intel 286	Small square
1999	Large stadium capacity (Intel Pentium III)	Medium square
2005	Population of Tokyo	Large square
2011	1.3 Billion (Core i7 Extreme Edition)	Very large square

Now imagine that those 1.3 billion people could fit onstage in the original music hall. That's the scale of Moore's Law.

Semiconductor improvement is so significant. It is changing the world.

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History of Computer and Automotive

1940's
ENIAC (Electronic Numerical Integrator and Computer)

1960's
IBM System/360

1980's
IBM PC/AT

1940's
CADILLAC Fleetwood 60 special

1960's
Ford Thunderbird

1980's
Cadillac Fleetwood Sixty Special

Computers are downsizing every 20 years. And reducing cost dramatically.

History of Computer and Automotive

2000's (2007)
Apple i-phone

2000's (2007)
Camaro

Everybody have more power than ENIAC in your hand.

Buttons & controls can't change

Significant Change from Hardware Keyboard to Software Keyboard

Looking back IT history IT Trends

At Cambrian age, every animal started to having eye and started explosion. AI's eye can recognize better than Human from 2017.

1960~ (1964-IBM System/360)
Mainframe appearance and Operational efficiency and productivity improvements in Centralized processing

1980~ (1981-IBM Personal Computer 5150)
PC appearance and distributed processing of the user of Digital devices
Applicable business area and the expansion of client servers

1990~ (1993-Commercial use of the Internet, 1995-Windows95-Internet Explorer)
With the advent of the Internet Expand and expand connections collaboration between business across companies and local communities, And Achieving adjustments

2000~ Cloud (Salesforce.com)

2007~ IoT AI life Robot
Mobile (Apple, iPhone)
Social (Facebook, Twitter)

IT Cambrian explosion
Technology Ambient and Penetration into daily life

IBM(2000 --> 2019)

IBM has established at 1911

1993 Lewis Cassner CEO of Transition
2003 Samuel J Parsamian CEO
2012 Jeannie Komiecki First Women CEO
2020 Arvind Krishna First Technical background CEO

2000 Revenue 888\$

The structure of sales (summary) in the business of

Hardware 42.8%
Global Services 37.5%
Software 14.3%
Finance and others 5.5%

From HW business to Service business

2019 Revenue 798\$

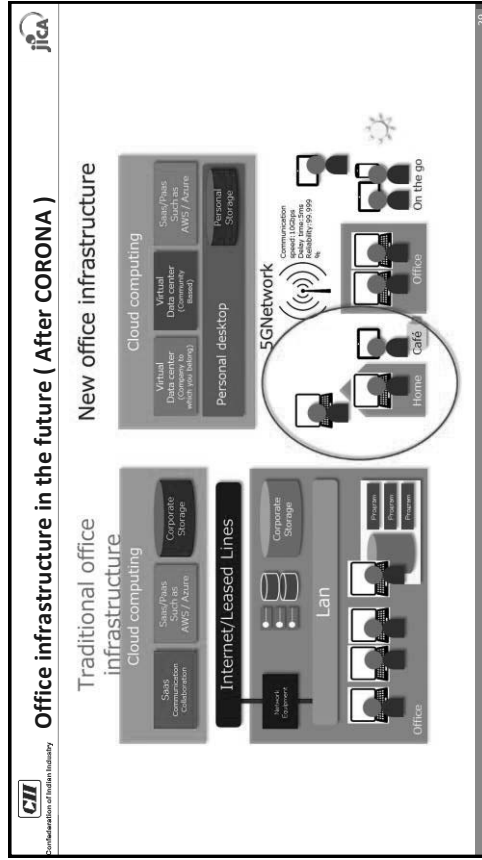
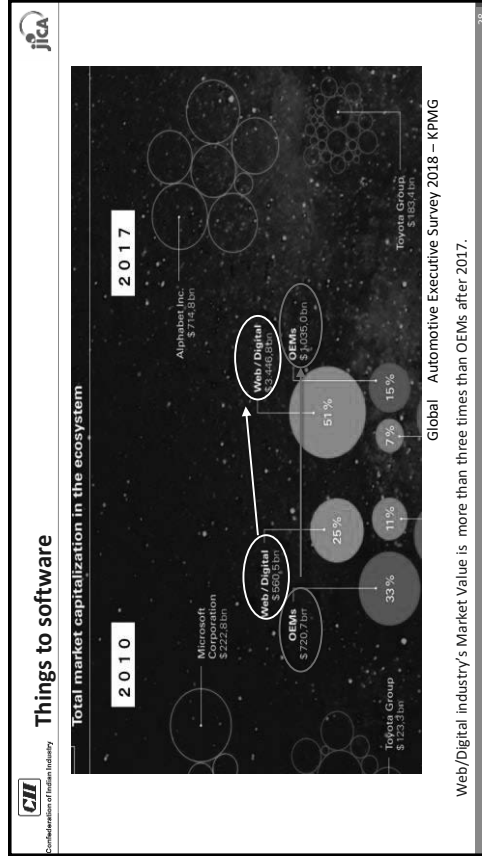
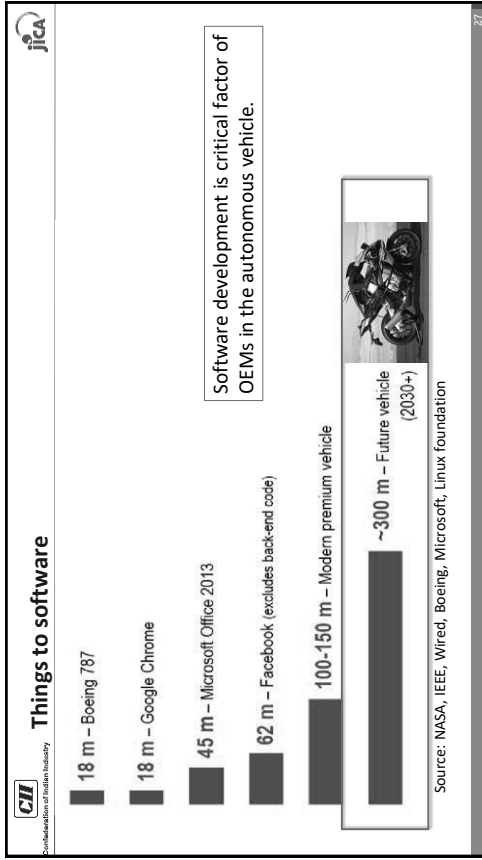
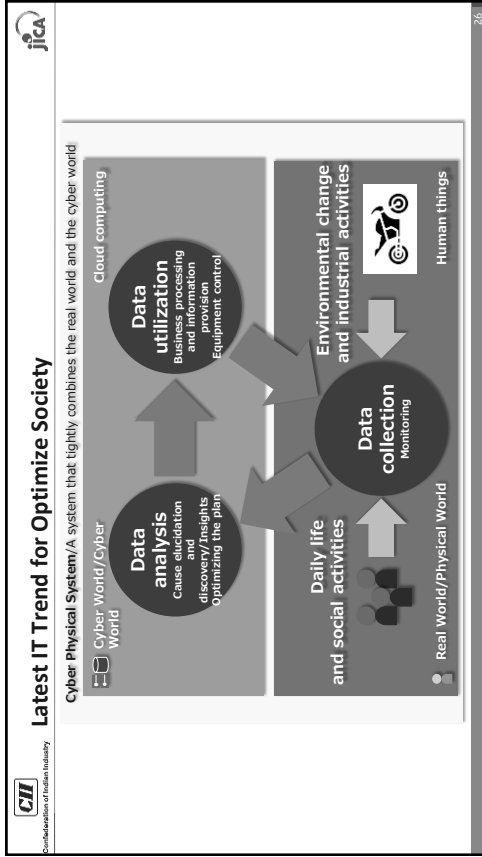
The structure of sales (summary) in the business of

Global Technology Services 38%
Cloud & Cognitive Solutions 30%
Global Business Services 24%
System hardware 8%

IBM acquires OpenSource company Redhat with 348\$ in 2018

Microsoft bypasses IBM revenue for now.

From HW Company to Services Company



Wide usage of the technology of IoT/AI enables cost reduction to enter this field .

The scene where is utilized IoT / AI

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Why is deep learning so much attention?

Because it has proven precision on Visual Recognition at ILSVRC2012(Large Scale Visual Recognition Challenge).

Rule
make rules for interpretation based on human experience or knowledge

Machine learning
By analyzing the data, Find out automatically the rules and Patterns in it

Traditional machine learning
Point of interest when finding a pattern (Feature Value)
Human beings teach the quantity of features and Machine find patterns, organize patterns in the data

Deep learning (based on Neural Network)
Point of interest when finding a pattern (Feature Value)
Even if humans don't teach, they find patterns automatically. Classify and organize the world

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Machine Learning and Reasoning (1/3)

Machine Learning
A large number of Learning data
The characteristics of each cat and dog are investigated. Create the most precise data combination pattern (inference model)

Reasoning (automated)
Because it best matches the inference model of this is an inference that it is a cat.

Reasoning Inference
Both Inference and Is it the most consistent?
Consistent — 其 U2;

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Machine learning and reasoning (2/3)

Human
Machine learning: Start in observation and decision. Approach

Machine
Machine learning: Data analysis. Decide

Learning
For each "Feature Value" (The value of the feature of the cat and dog), This value and the "Sub-System" (Ear, Eyes, Mouth) represent the characteristics of a cat and dog.

Cat's Inference model
Best represents the characteristics of a cat. Combination pattern of Feature Value

Dog's Inference model
Best represents the characteristics of a dog. Combination pattern of Feature Value

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Machine Learning and Reasoning (3/3)

Unknown data

Feature Value
Ear
Eyes
Mouth

Reasoning
Feature extraction
Calculate each value

Inference Model
Cat

Inference Model
Dog

Reasoning results
That's why this image is a cat.

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Data is Oil, AI model is Engine

Data

AI model

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What is for automotive factory by AI technologies? (1/2)

MUSASHI
Bevel gear supplier
realize dramatic cost down
3M\$ Cost Down / 2379M\$ Revenue

NVIDIA Jetson NANO

- For example, in the production line of the assembly manufacturing industry, AI is seeming to fit an visual inspection. What was initially expected to AI was to be perfectly distinguished OK products and NG products. And if you know it's impossible, this time you're going to say, "If 100% accuracy is not guaranteed, it cannot be used on the production line."
- However, such confusion seems to have settled down considerably, too. By doing POC (Proof of Concept) and element development, the essence of AI has come to be recognized.
- "In the first place, even a human inspector cannot distinguish 100% with precision."
- "Even if it is not possible to automate appearance inspection suddenly, reduction of the number of inspector is meaningful"
- "Even if AI continue to work for a long time, AI won't get tired, and AI won't lose his concentration. "AI is useful for pokayoke, etc., " face-to-face reality, There is a growing need for utilization such as at shop floor"

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What is for automotive factory by AI technologies? (2/2)

For example, such as the "color unevenness" judgment at the paint shop is difficult job for AI. AI needs to perform a subtle distinction that considerable build-in and tuning will be required to achieve more than a certain level of accuracy.

On the other hand, it is relatively easy to determine that the parts in the box are out of stock or that the connector is off.

"First of all, from the easy part of such an effort, among various manufacturing approaches AI can start implementing and achieve results such as labor shortage measures and productivity improvement in a short period of time."

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Where are you going?

Business value

Innovation

AI, Robot, IoT, Social, Open, Big Data, Cloud, Mobile, Wearable

Create a new combination

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3. What is Digital Factory and how to make it happen?

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Smart Manufacturing Platform defined by METI (Ministry of Economy, trade and investment in Japan)

IoT / Big DATA / AI

Product Life Cycle Management (PLM) | Service Life Cycle Management

Model Based Management | Engineering Data Management | Supply Chain Management | CAD | M2M | CRM

Maintenance Parts stock point optimization | Predictive Maintenance Service | Loss management of Client Service history

Enterprise | Factory | Shop floor

Product Planning | Product Design | Production | Sales | After Market | Brand Value

Create Product Value | Create Service Value

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Overview of how IT Solutions address Digital Factory Needs

Expectation vs Maturity

Plant Automation Solutions (2005-2010): Integrate Best Operations, Integrate ERP Process Planning, Execution, ERP-MES, PPS: Product Engineering Solution, Edge Controller for Real-time Events (ECRE), RFID, Cloud

Business Process Automation (2010-2015): Track and Trace assets, Global Visibility of Operations, Analytics Process Triggers, Situation Awareness in Key Decision Making, IoT Platforms with Analytics

Value Added Services (2015-2020): Global compliance and security, Condition based maintenance, Integrated Solutions, Scalability, Transparency, Enterprise Master Data Management

Time: 2005, 2010, 2015, 2020

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Digital Planning tool for the Automotive Assembly Line

Example : "DELMIA Final Assembly Planning" Dassault Systems

Improve planning quality
Deliver manufacturing planning efficiency



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Digital Product cost Planning and Management

Example : "Teamcenter" by Siemens

Product Lifecycle management
BOM management
Change Management & Workflow
Documentation Management & Publishing
etc



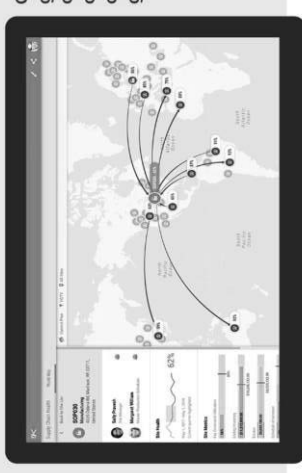
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Kinaxis Supply chain optimization software

Get an at-a-glance view of the health of your supply chain with geo-mapping.



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Digital Tracking the global Supply Chain

Challenges: Under the COVID-19, Lack of Visibility and High Fixed and Variable Costs Impacts Profitability for the company

Solution: Insist on Deep Visibility and Accurate Cost Controls Throughout the Global Supply Chain





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CASE STUDY : Harley-Davidson York Factory

PAIN POINTS
 Harley Davidson's new younger buyers wanted a different type of motorcycle. It needed to get agile, to be able to respond to the changes fast, and to be more efficient and productive. It needed to lower the hours per unit to build motorcycle.

SOLUTIONS
 In 2010, Harley-Davidson began a massive restructuring of its manufacturing plant and deployed an **IoT system** that collects data from manufacturing equipment to look for early sign of mechanical problems. Hundreds of machines were connected with IoT sensors to help plant managers track such metrics as **temperature and vibrations** to keep machinery operation at peak efficiency and alert managers to problems that could slow production. The data from the machines powers analytics systems that can predict problems long before they are likely to occur.

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Recent story about Harley-Davidson

BUSINESS VALUE


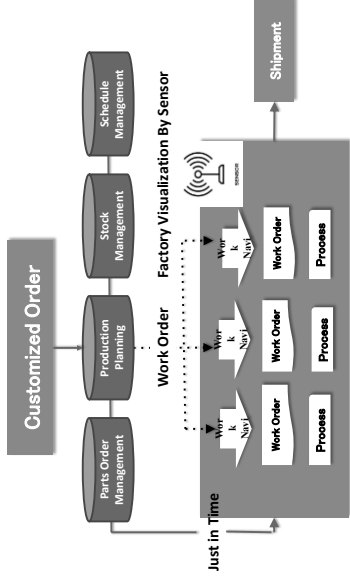
- Ten to 25 times improvement in build-to-order(BTO) cycle times (18 months reduced to two weeks)
- Seven to 12 percent increase in IoT automation-driven equipment utilization.
- A profitability increase between 3 to 4 percent in one factory.

In 2016, **Harley-Davidson leveraged IoT to change its York** (Pennsylvania, USA) **manufacturing facility and deployed smart sensors and edge analytics. They could reduce the time it takes to produce a motorbike from a 21-day cycle to six hours.** Now, one motorcycle comes off the assembly line every 89 seconds. – while simultaneously reducing operating costs by \$200 million.

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Mass-customization based Factory in Harley Davidson in York Factory


The flowchart illustrates the process flow from a **Customized Order** to **Shipment**. It starts with **Parts Order Management**, **Production Planning**, **Stock Management**, and **Schedule Management**. These lead to **Work Order** and **Process** stages, which are then visualized by a **Factory Visualization By Sensor**. The process is supported by **Just in Time** delivery and **Work Order** management. A **Work Order** is shown as a sequence of **Work Order** and **Process** blocks. A **Work Order** is also shown as a sequence of **Work Order** and **Process** blocks. A **Work Order** is also shown as a sequence of **Work Order** and **Process** blocks. A **Work Order** is also shown as a sequence of **Work Order** and **Process** blocks.

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Overviews of the Factory

<https://www.youtube.com/watch?v=3UoF488tE4>



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Main LCD Board for Visualization



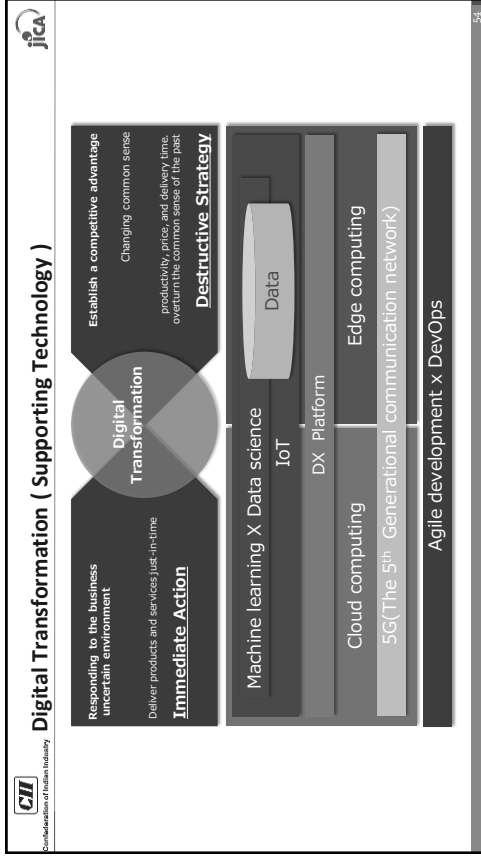
LCD Displays for Digital Andon in Assembly Line



Robot Painting

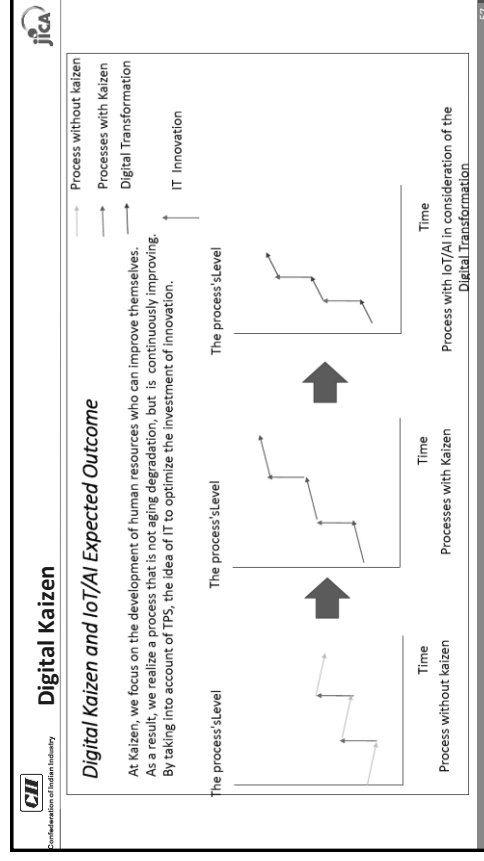


Pilot Project Proposal in Hero MotoCorp Neemrana plant,
 Adopted New Approach : Digital Transformation and Andon System



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- ### What is good for Company
- **【Environment】** Get Agility for competitiveness
 - Improve the speed of the response against the market demand.
 - **【Operation】** Improve the speed of KAIZEN
 - Improve productivity
 - Improve the First-time-Right
 - Improve the reducing the stock from the factory
 - **【Outcome】** Get agility for the company sustainability
 - Profitability
 - Supply Capacity
 - Revenue
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- ### What is good for Employees
- **【Environment】** Clear objectives
 - Accurate object driven daily activities
 - **【Operation】** Organized Operation
 - Shorten the working time
 - Focusing on more value adding job
 - Shifting from non-intelligent work to intelligent work
 - **【Outcome】** Employer's happiness
 - Data driven culture
 - Efficient working style
 - Good return on money
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1. lot Visualization

- 1.1. Equipment uptime
- 1.2. Operating conditions of the equipment (Time, temperature, humidity etc)
- 1.3. Detection of abnormalities (sound, vibration, light etc)

2. Kaizen:

- 2.1. Discovery and standardization of waste (Leveling, layout)
- 2.2. Optimization of production conditions (Yield improvement, variation reduction)
- 2.3. Prediction of failure

3. Management improvement: Cost Reduction

- 3.1. Reduce lead time and increase productivity
- 3.2. Quality improvement and productivity improvement
- 3.3. Preventive maintenance and productivity improvement

Digital Kaizen and IoT/AI Expected Outcome

The process's Level

Kaizen cycle shortening

Time

Digital Kaizen

Traditional

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What has been realized In Kaizen?

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Toyota production system (TPS) Relationship between methodologies

Parent goal

Goal

JIT Production

Shorter lead time

Problems are manifested, improved, self-work and waste elimination

Kanban system

Heijunka* Levelled Production (small lot)
Multi-functional engineering, standardization

5S, Flow of layout, single setup

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(CASE Study) Helmet assembly process "Heijunka"

Product Number: 123-456 Product Name: Sakura
 Monthly Target Production 18,400 → Per day required: 920
 Number of days of operation of the factory per month 20 Days
 Scheduled working hours: 480 Minutes (7HRs40minutes)

(1) Equipment layout diagram

(2) Processing order and processing time

Processed contents	Processing 1	Processing 2	Processing 3	Processing 4	Inspection
Manual line (seconds)	2	22	15	14	32
Auto feed line (seconds)			25		

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Production capacity table by process

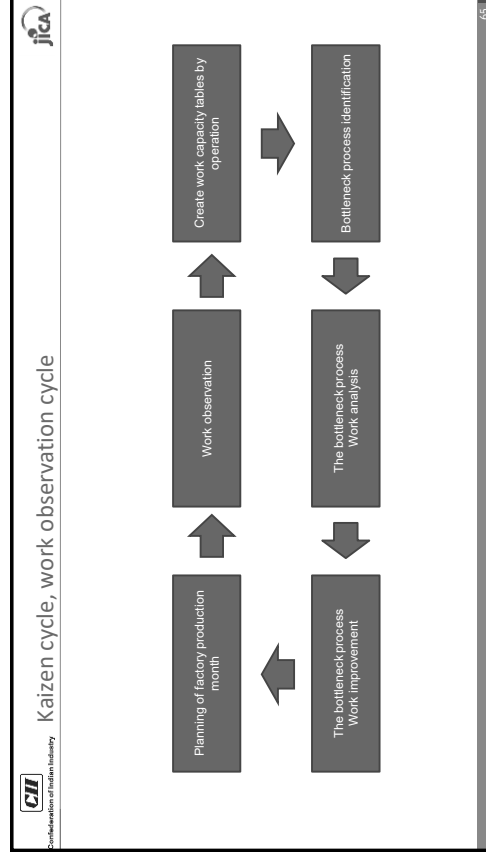
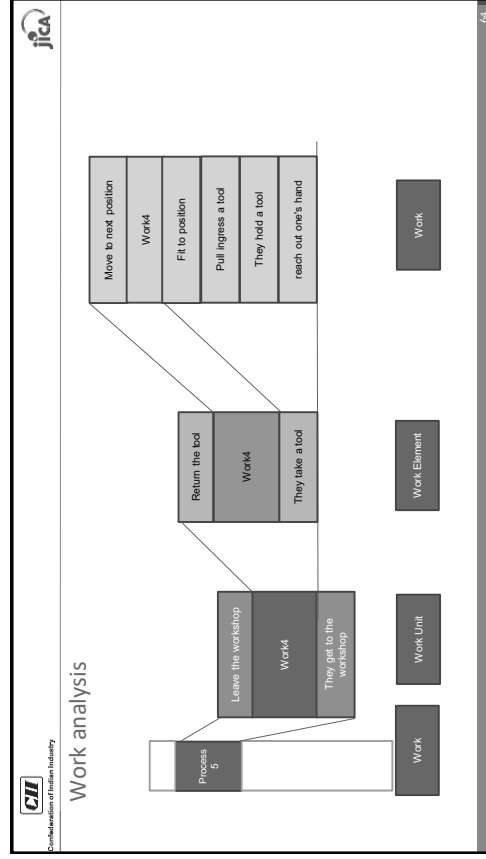
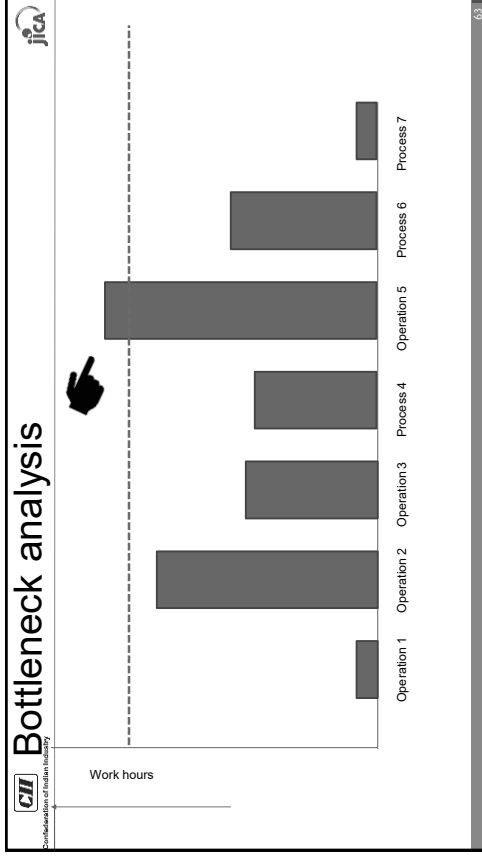
Process order	Process name	Work hours (Seconds)	Completion time (seconds)	Note
Process1	They take the material	2		
Process2	Operation 1	22	32	On a conveyor
Process3	Operation 2	15	32	On a conveyor
Process4	Operation 3	14	32	On a conveyor
Process5	Operation 4	32	32	On a conveyor
Process6	Inspection	16	32	On a conveyor
Process7	Put the finished product	2		
Total			104	

$$\text{Production capacity} = \frac{\text{Work time hours}}{\text{completion time per one product}} = \frac{46 \times 60}{32} = 862.5$$

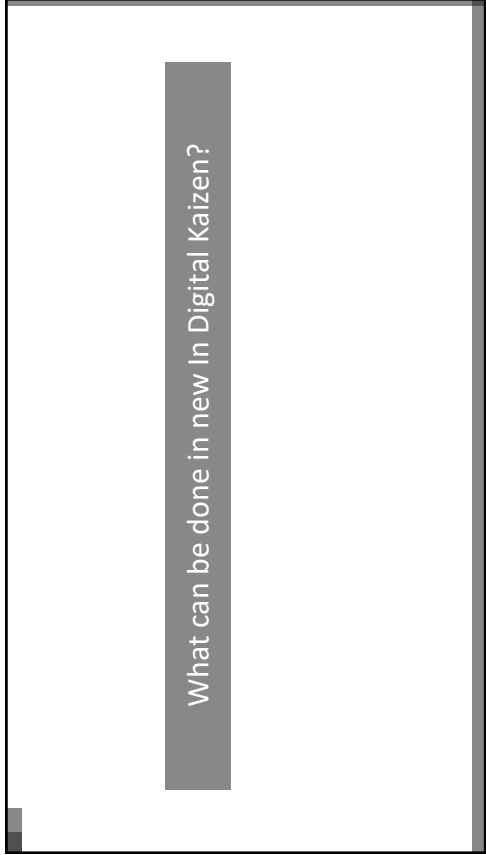
$$\text{TAKT TIME} = \frac{\text{Working hours}}{\text{Per day required number}} = \frac{480 \times 60}{200} = 144 \text{ (Seconds)}$$

less than 920
 Shortage of pieces : 58
 Need to investigate the work contents

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What can be done in new In Digital Kaizen?



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(CASE STUDY) Helmet assembly process "Hejunka"

Product Name: 123-456 Product Name: Sakura
 Monthly Target Production: 18,400 → Per day required: 920
 Number of days of operation of the factory per month: 20 Days
 Scheduled working hours: 460 Minutes (7HRs 40minutes)

(1) Equipment layout diagram

(2) Processing order and processing time

Material	Work1	Work2	Work3	Work4	Measuring instrument	Finished Product
Processed contents	Processing 1	Processing 2	Processing 3	Processing 4	Inspection	
Manual time (seconds)	22	15	14	32	16	2
Auto feed time (seconds)			25			

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Manual or automatic measurement by sensor input

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Manual or automatic measurement by sensor input

Button sensor:
 The start time is recorded when pressed once,
 The end time is recorded when pressed twice.

Motion sensor:
 Measure the strength of the acceleration

Light Sensor:
 Measure the Light intensity

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Production capacity table by process

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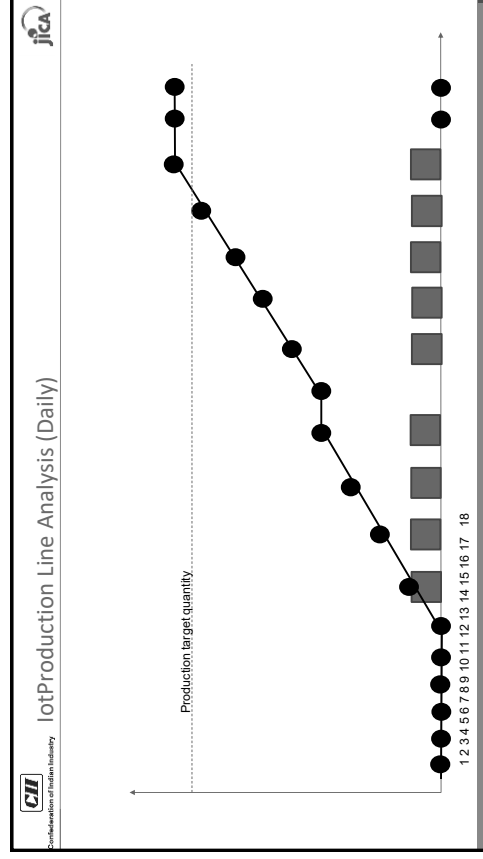
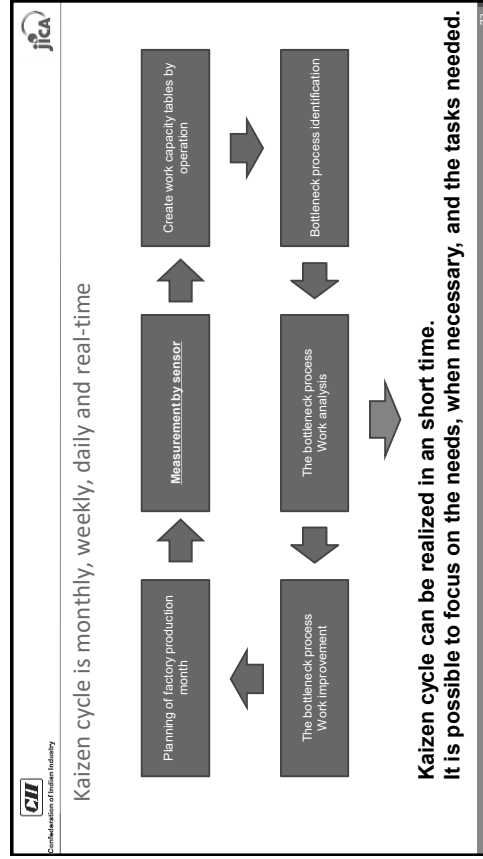
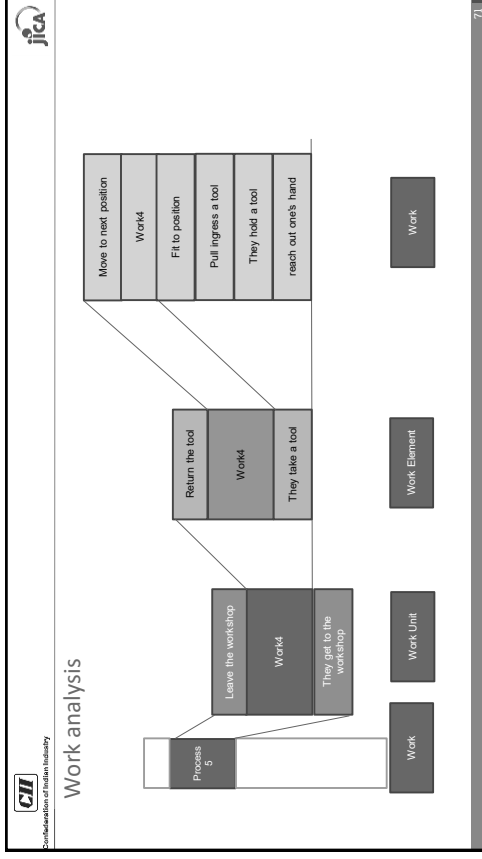
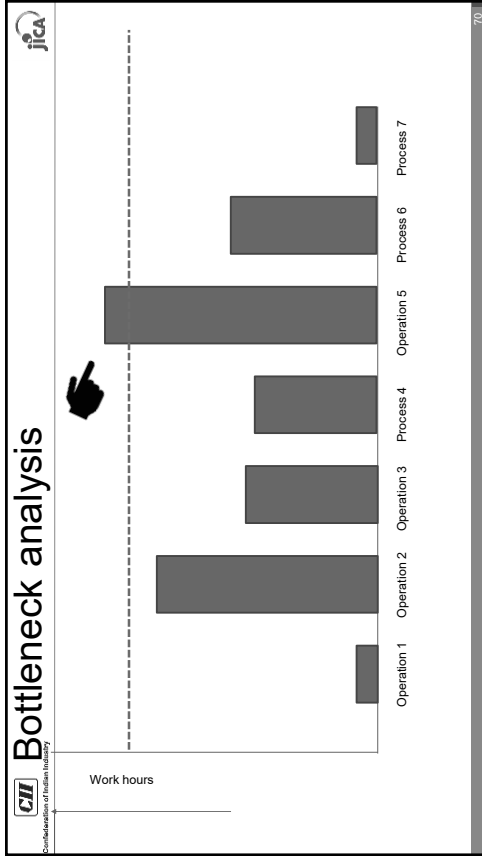
Production capacity table by process

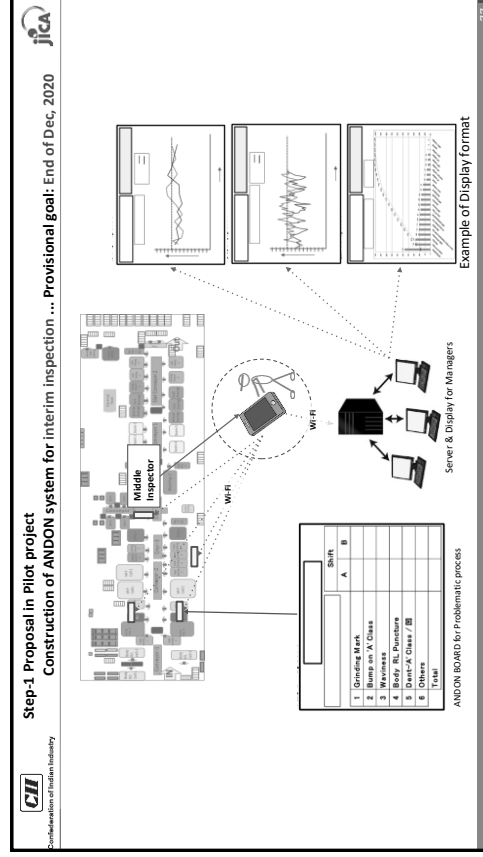
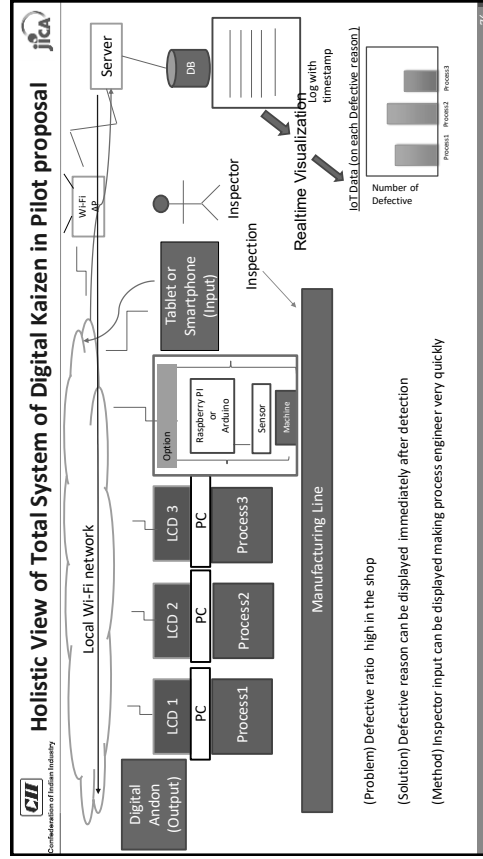
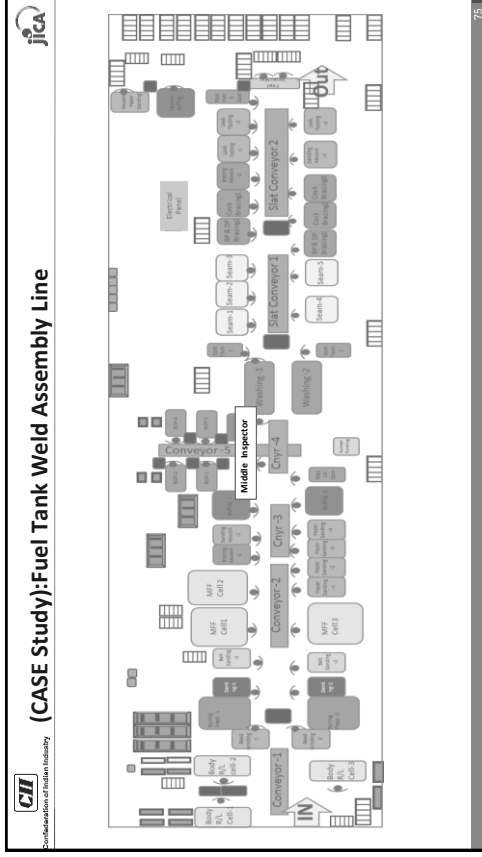
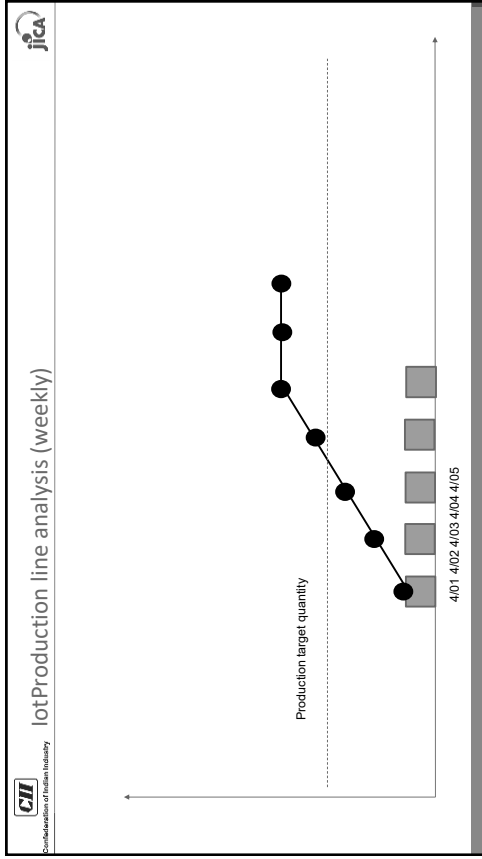
Process order	Process name	Work hour (Seconds)	Completion time (seconds)	Note
Process1	They take the material	2		
Process2	Operation 1	22	32	On a conveyor
Process3	Operation 2	15	32	On a conveyor
Process4	Operation 3	14	32	On a conveyor
Process5	Operation 4	32	32	On a conveyor
Process6	Inspection	16	32	On a conveyor
Process7	Put the finished product	2	104	
Total				

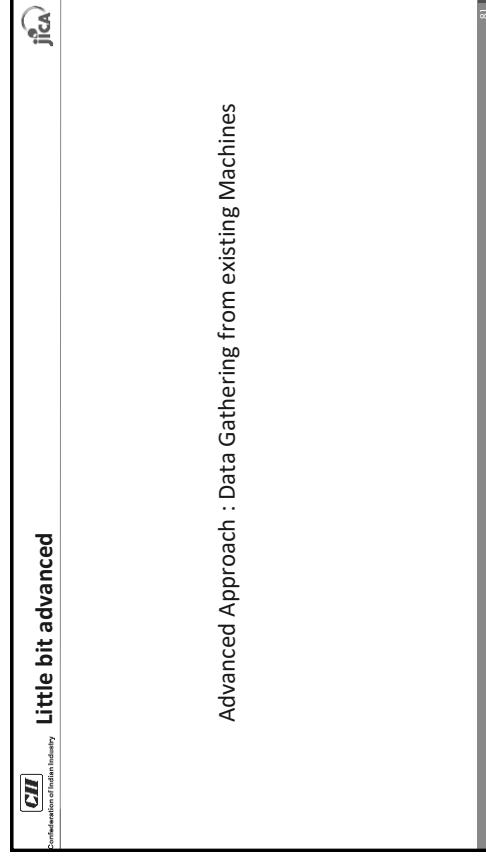
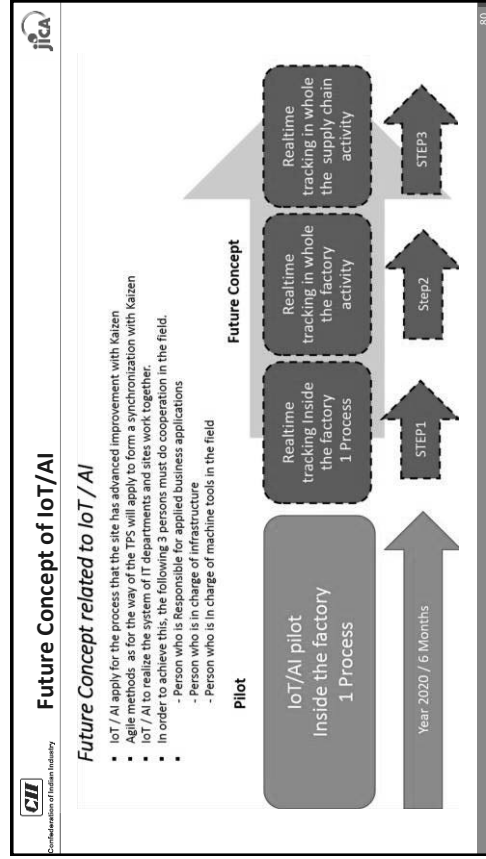
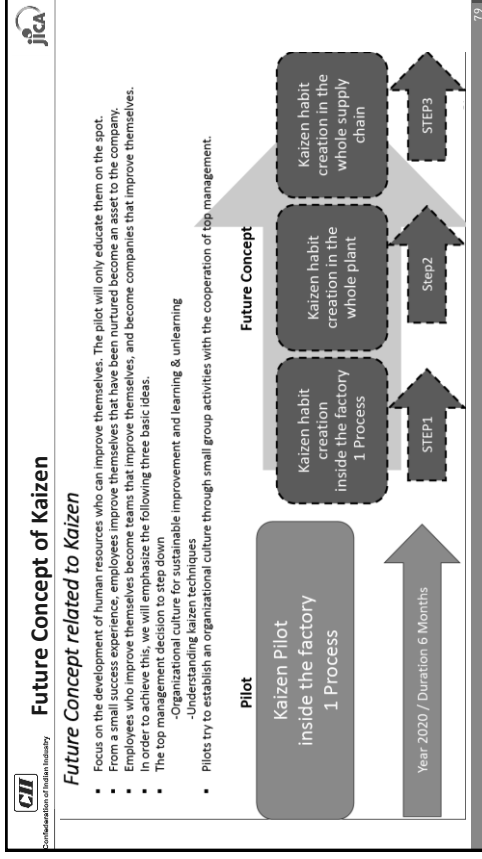
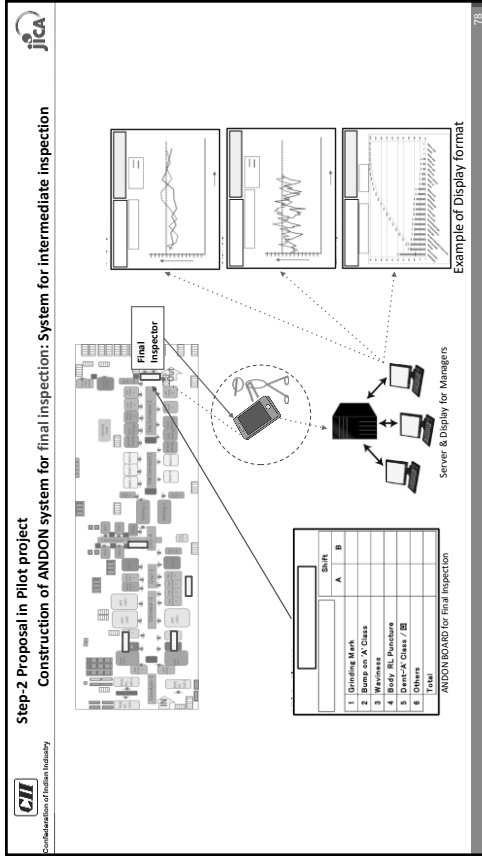
Production capacity = $\frac{\text{Working hours}}{\text{completion time per one product}} = \frac{460 \times 60}{32} = 862.5$
 less than 920
 Shortage of pieces : 58

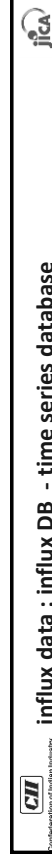
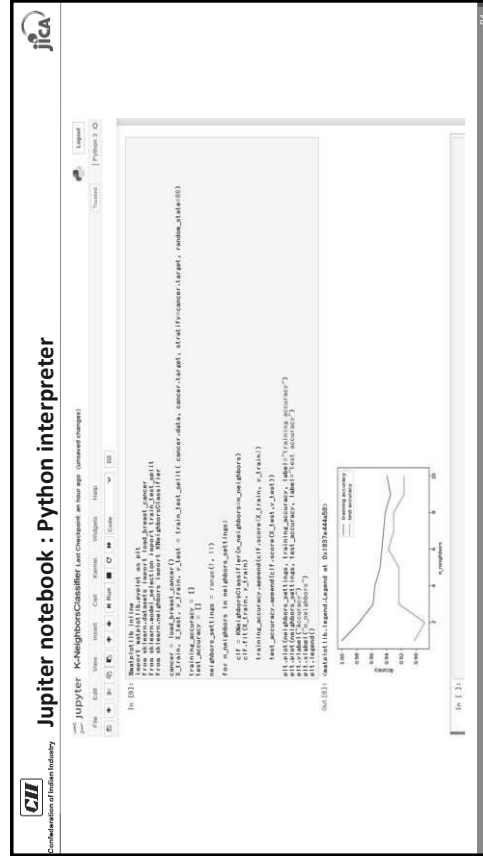
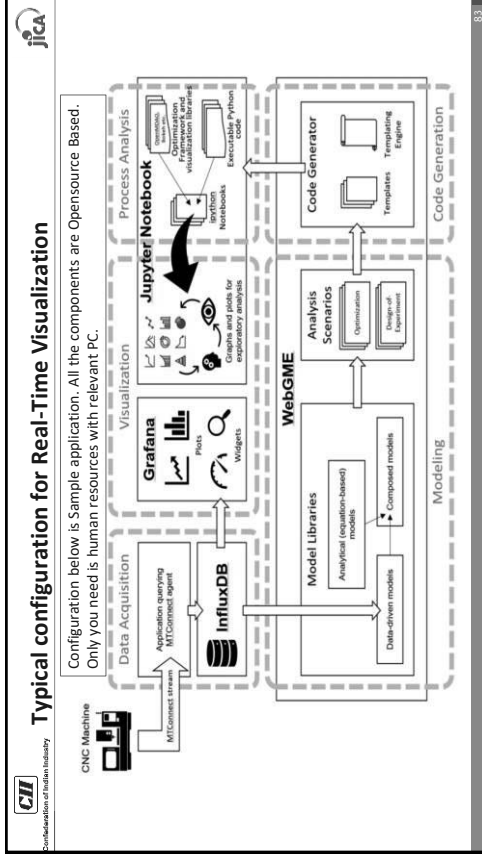
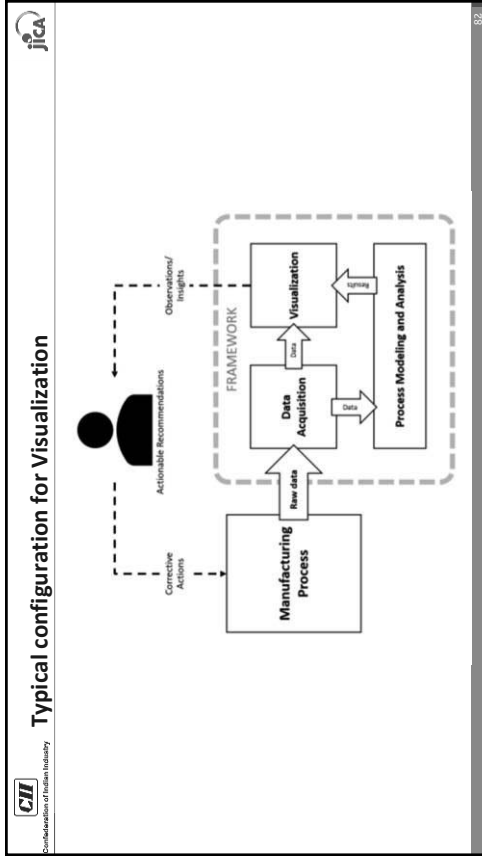
TAKT TIME = $\frac{\text{Working hours}}{\text{Per day target number}} = \frac{460 \times 60}{920} = 30$ (Seconds)
 Need to investigate the work contents

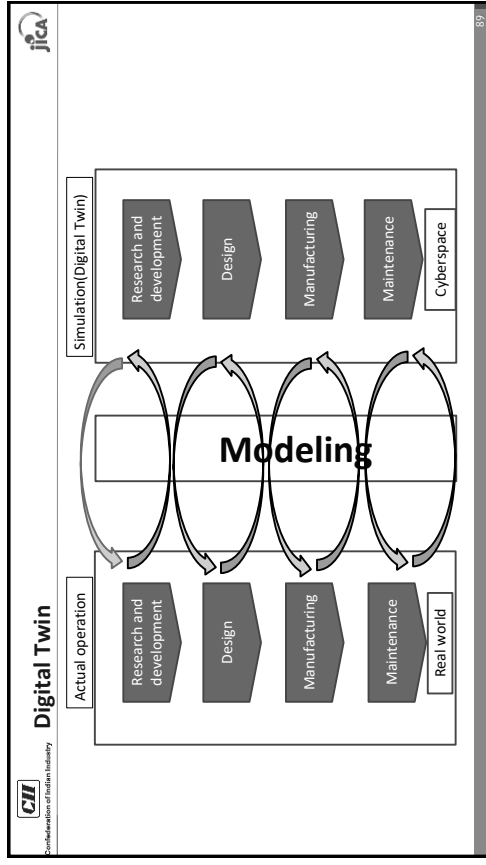
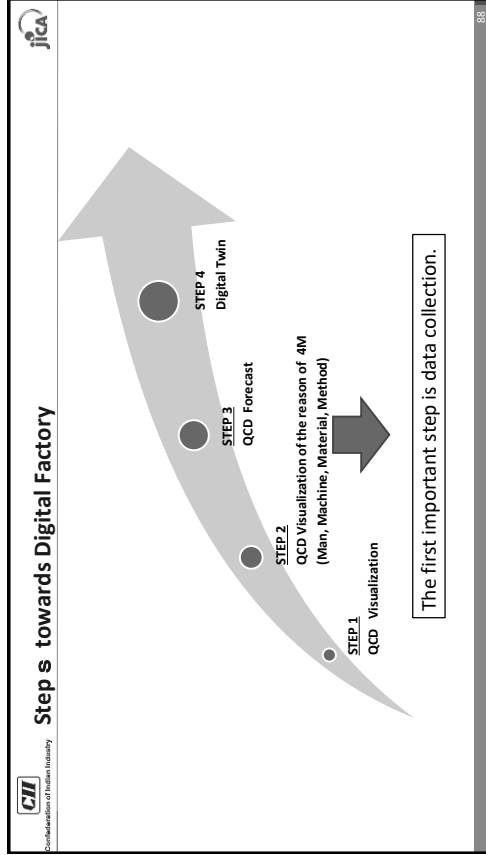
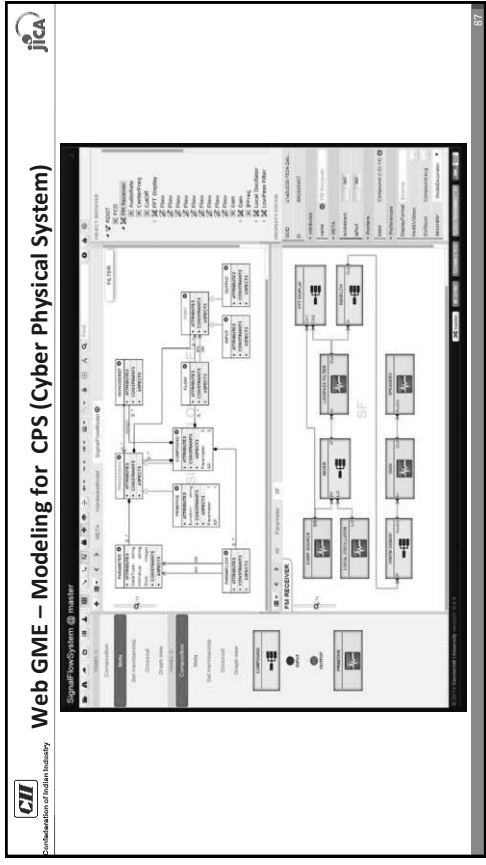
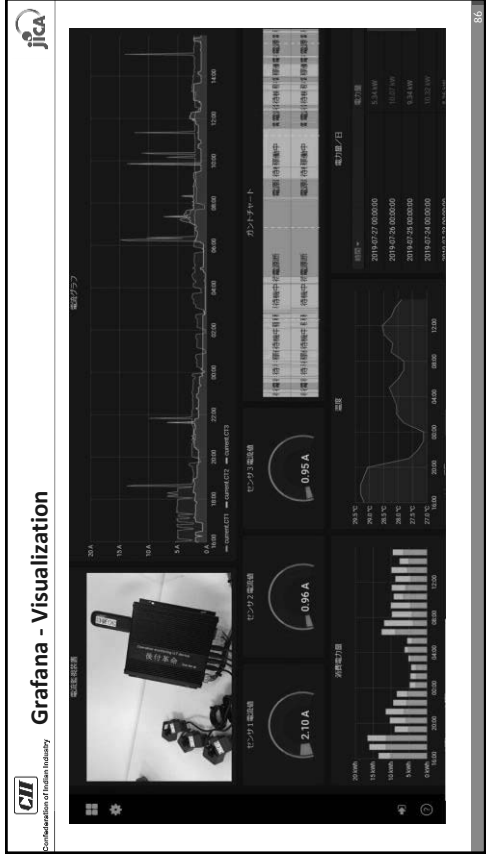
69

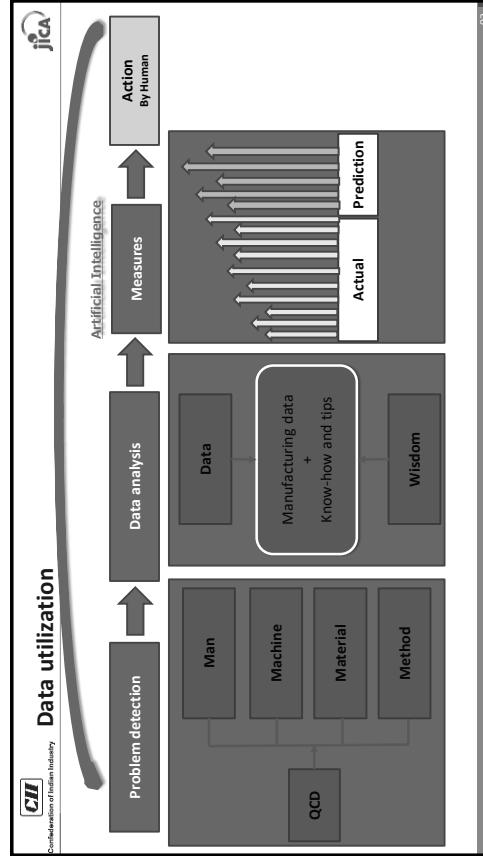
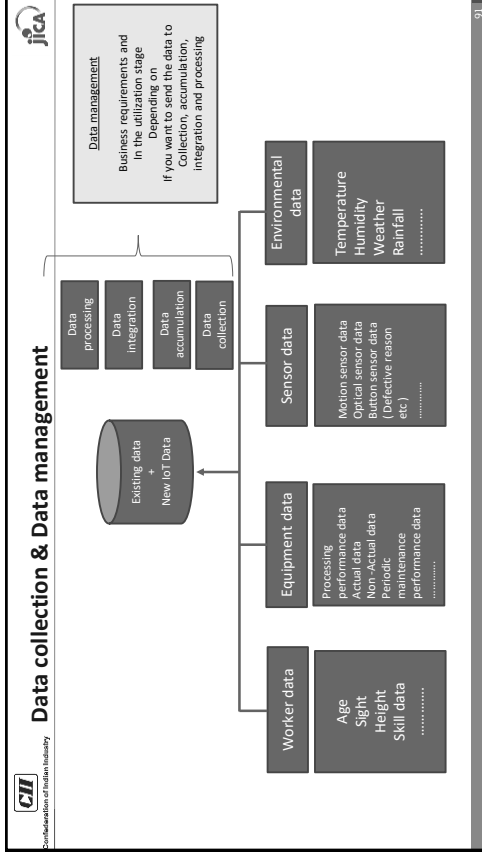
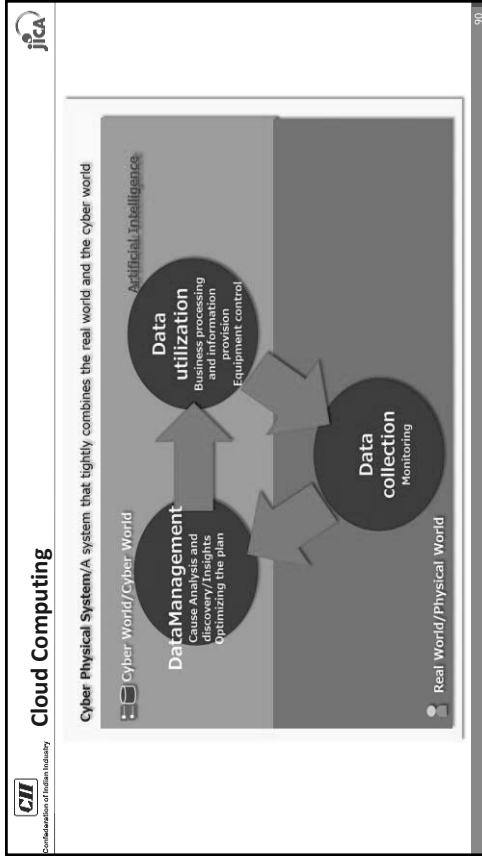












Human Resource Development

1. CEO Level Executive Education Program
2. Senior Manager Level Executive Education Program
3. Self-learning Online-Course Sample for ML/DL for Middle Management and Engineers

IoT Visualization & Web APPs for Digital Andon 8-10 Weeks

CIJ **jica**

We have introduced with in the Pilot project.

Lecture : Demo Web app for Digital Andon

S. No.	Lecture Inputs	System Output
1	Ruby :your code	Hello
2	Def. & Gems	Gems Installation
3	Selenium web driver	Browser Automation
4	Rail New	Hello Rail
5	DB – Data Bases	Data storing
6	MVC: Model View & Controller	Modification
7	Online data collection	Software development
8	Digital Andon	Real time data visualization

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CIJ **jica**

Real Time Demo for Audience (1/2)

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CIJ **jica**

Real Time Demo for Audience (2/2)

New Machine Register

MC046	MC047	MC051L	MC051R	MC056	MC057L
MC057R	MC058L	MC058R	MC059L	MC059R	MC033
MC034	MC035	MC036	MC037	MC038	MC007
MC013	MC014	MC015	MC022	MC023	MC001
MC041	MC026	MC027	MC050	MC042	MC005
MC006	MC008	MC009	MC040	GR002	GR004
GR008	GR009	HN001	HN002	HN004	HN005
LP001	MP	MC046	MC047	MC051L	MC051R
MC056	MC057L	MC057R	MC058L	MC058R	MC059L
MC059R	MC033	MC034	MC035	MC036	MC037
MC038	MC007	MC013	MC014	MC015	MC022
MC023	MC001	MC041	MC026	MC027	MC050
MC042	MC005	MC006	MC008	MC009	MC040

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CIJ **jica**

4. How you motivate employee?

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CIH Confederation of Indian Industry **jica**

Motivate employee using long term strategies with
TPS(Toyota Production System) and
SDG(Sustainable Development Goals)

102

CIH Confederation of Indian Industry **jica**

Why long-term strategies impacts motivation?

Long-Term commitment to Continuous improvement & SDGs activities gives opportunity to maintain Human motivating cycle such as below:

1. Set goals to create meaning
2. Celebrate milestones big and small
3. Provide meaningful feedback
4. Empower through solving and learning
5. Follow through on promises
6. Experiment and learn

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CIH Confederation of Indian Industry **jica**

What is SDGs?

- Action plan adopted by all the 193 countries, United Nations Member States in 2015
- 17 Goals and 169 Targets to be achieved until 2030

The REASON for targeting Digital Enterprise is that addressing Global Social issues are crucial for sustainable entity.

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CIH Confederation of Indian Industry **jica**

How to implement to the Corporate activities

How to implement ?

- ① Think from Future back to Current
Back casting
- ② Problem solving in inclusive way
⇒ My Problem
Outside in

105

What is Back casting?

The diagram shows a horizontal timeline from **Present** to **Future**. A dashed arrow labeled **Forecasting** points from Present to Future. A solid arrow labeled **Back casting** points from Future back to Present. A callout box for Back casting says: "generating a desirable future, and then looking backwards from that future to the present". Another callout box says: "estimates the probabilities of various outcomes based on expected trends".

Back casting
generating a desirable future, and then looking backwards from that future to the present

estimates the probabilities of various outcomes based on expected trends

Forecasting

Present Future

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What is Outside-In?

The diagram shows a central hub with four arrows pointing towards it: **External Needs** (people icon), **External Data** (bar chart icon), **Social Needs** (globe icon), and **Global Needs** (globe icon). From this central hub, an arrow points to a building icon labeled **Near Future**, which then points to another building icon labeled **Future**.

External Needs

External Data

Social Needs

Global Needs

Near Future

Future

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How to implement?

The flowchart consists of five circular steps connected by arrows in a clockwise cycle:

- Step 01: Understanding the SDGs** (lightbulb icon)
- Step 02: Defining priorities** (document icon)
- Step 03: Setting goals** (target icon)
- Step 04: Integrating** (gears icon)
- Step 05: Reporting & communicating** (megaphone icon)

A box at the top right says: "From the Future Goal to current issue." with an arrow pointing to Step 03.

Step 01: Understanding the SDGs

Step 02: Defining priorities

Step 03: Setting goals

Step 04: Integrating

Step 05: Reporting & communicating

From the Future Goal to current issue.

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5. Executive Summary

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Executive Summary (1/2)

Chapter 1. Digital revolution of automotive industry in the world

The automotive industry is under going a profound transformation.

- Connectivity** : Every Toyota car is having Data Communication Module.
- Autonomous** : BMW introduced autonomous bike.
- Shared & Services** : HONDA started BIKE rental services in Japan.
- Electric** : Chinese scooter company is exporting Electric scooter for Vietnamese students.

Chapter 2. Data Science Revolution with using AI & IoT

Software is eating the world.

- Increase of Degree of integration for Semiconductor is so significant.
- Computers are downsizing every 20 years and reducing cost dramatically.
- Automotive company needs to become a software company.
- Data is more important than AI model.
- AI technology will grow up with your accurate and appropriate data.

Executive Summary (2/2)

Chapter 3. Concept of Digital Factory & Roadmap

Critical Success Factor of Digital Factory is collecting the useful Real Time accurate Data.

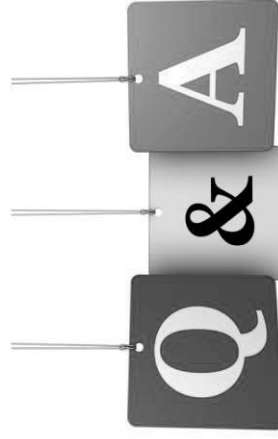
- Smart Manufacturing Platform is IoT/ BIGDATA/ AI.
- Digital tools can help improving productivity and reducing the cost through visualization.
- Harley Davidson has started IoT implementation at the factory in 2010 with success.
- Hero has got the proposal of pilot project Digital Kaizen with IoT/AI with CIJ/JICA.
- Pilot project is having a potential to become the source for making fire.

Chapter 4. How you motivate employee?

Recommendation for using TPS and SDGs related long-term strategies to motivate employee.

- TPS is not only a group of tools but respecting for each employee's abilities.
- If senior management is committing to the long-term KAIZEN, people will follow.
- SDGs should link to the daily operation of the enterprises.
- My plan related SDGs can be created with the “backcasting” and “outside-in” methodologies.

6. Q & A Time



Connected Bikes with IoT | Smart two wheeler | Bosch mySPIN (1minute)
https://youtu.be/XD6-g_aa1mg

CASE: Digital Innovation and Mobility | Mercedes-Benz Talk | CES 2019 (27minutes)
<https://youtu.be/dGb333lvK6w>

Software is eating the world. (4minutes)
<https://youtu.be/UW5kbit2s0>

Harley-Davidson York Manufacturing Facility- United States of America (3minutes)
<https://www.youtube.com/watch?v=3IU6F488IC4>

Why digital twins will be the backbone of industry in the future (3minutes)
<https://www.youtube.com/watch?v=ObGhb9CCHP8>

Sustainability Strategy: Backcasting from Success (5minutes)
<https://www.youtube.com/watch?v=DeDm-HTFuUY>

Other useful link for your reference.

Connected Bikes with IoT | Smart two wheeler | Bosch mySPIN (1minute)
https://youtu.be/XD6-g_aa1mg

CASE: Digital Innovation and Mobility | Mercedes-Benz Talk | CES 2019 (27minutes)
<https://youtu.be/dGb333lvK6w>

Software is eating the world. (4minutes)
<https://youtu.be/UW5kbit2s0>

Harley-Davidson York Manufacturing Facility- United States of America (3minutes)
<https://www.youtube.com/watch?v=3IU6F488IC4>

Why digital twins will be the backbone of industry in the future (3minutes)
<https://www.youtube.com/watch?v=ObGhb9CCHP8>

Sustainability Strategy: Backcasting from Success (5minutes)
<https://www.youtube.com/watch?v=DeDm-HTFuUY>

Thank you very much for Listening!!

Let's start Digital Transformation from Digital Factory!!

Thank you

A6. Suggestions from the viewpoint of TPS

Hero MotoCorp Ltd.

Fuel tank welding shop

**To increase “First Time Right”
ZERO DEFECT PROJECT**

Suggestions from the viewpoint of TPS

JICA K. Yoshida

2020.01.07

Hero MotoCorp Ltd.
Fuel tank welding shop

To increase "First Time Right" ZERO DEFECT PROJECT

Suggestions from the viewpoint of TPS

JICA K. Yoshida
2020.01.07

2

TPS KEY WORDS

3

TPS KEY WORDS

Production

Production flow must be entirely smooth.

生産の流れは完全にスムーズでなければならない

One-piece-flow manufacturing easily finds problems in the production line.

一徹流は、ムダを排除する最も良い方法である

Quality

Quality should be ensured in each production process.

品質は、それぞれの生産工程で確保されるべきである

You must only send fine quality products to the next process.

後工程には、よい品質のものを送らなくてはならない

We need to find the root cause when defective products are made.

私たちが、不良品ができた時には、その真原因を見つけなくてはならない

We must be careful not to let these defects occur again.

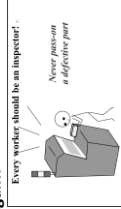
私たちが、これらの不良を再び生じさせないように注意しなくてはならない

It is costly to keep making defects.

不良を作り続けるのは損失が大きい

100% defect-free goods. The later process shouldn't accept any defects from the earlier process. Control!

100% 不良のない製品。後工程は、前工程から不良品を受け取ってはならない。管理！



4

Visualization

Production process that can be found out immediately when a problem occurs
Process where the problem process can be seen visually

問題が発生したときにすぐに気づけることのできる生産工程
問題のプロセスを直感的に確認できるプロセス

The spirit of TPS

First, "bring up a human being," then manage them.

The term "bring up a human being" encompasses the spirit of TPS. 人材育成という言葉には、下流生産労務の全てが集約されている。

Many people think that TPS is just a manufacturing method.

"To Human resource development" is the most important thing, and TPS is where people who grow up are making things while continues

KAIZEN/continuous improvement every day.

日々の改善活動は継続するモノづくりの手法である。多くの人が多岐に渡る。

That's why there are no reboards and you can always make the strongest manufacturing.

Manufacturing is not something that can be done with machines and methods.

The main constituent is just workers, and workers at the site can think better for themselves and solve for themselves.

モノづくりは、機械や方法によってできるものではない。

「現場は機械や方法でなく、熟練した労働者の知恵と経験で成る。だから、現場で働く人たちが自分自身で考え、問題を解決する。モノづくりは人づくり」



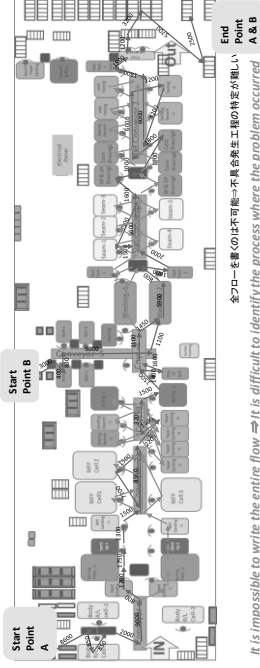
5

Fuel tank welding shop

Current status survey

6

Scaled layout of tank body welding line with operators and Flow of Material (Flow represents only one MIG WELDING machine)

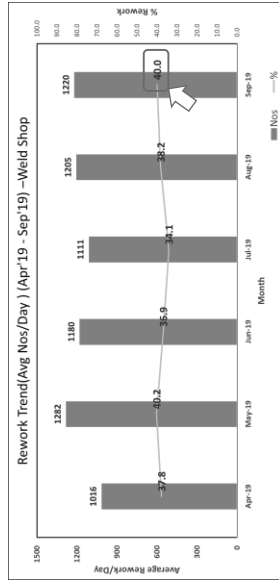


It is impossible to write the entire flow ⇒ it is difficult to identify the process where the problem occurred
全フロ一を筆のほは不可能⇒不具合発生工程の特定が難しい A & B

View:

- Worker density is very high and workers interfere with each other
- Very complicated (congested enough to write the flow of all machines & workers)
- Difficulty in quality control (unable to identify workers for defects)
- No space for intermediate inspection and rework

Weld Shop Rework Trend (Last 6 months)



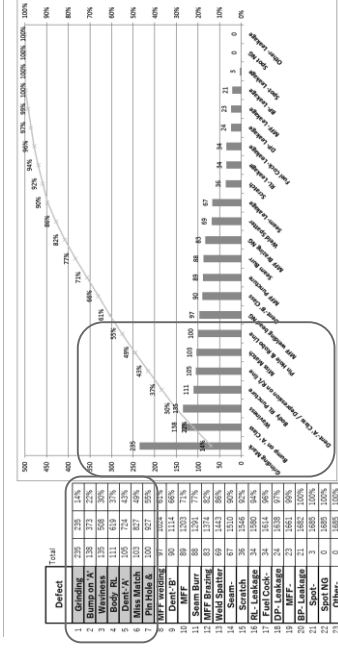
View:

- Too many in-line reworks (Even if there are multiple problems in one tank, the number of repairs is counted as one)
- Defects are sent to the next process (10% of defects are returned from Paint Shop)

8

Collect quality data

Defect Pareto -- Avg defects of Group 1 & Group 2



To increase "First Time Right"
ZERO DEFECT PROJECT

9

I. Change to proper production layout

<Layout concept>

- 1. Quality assurance can be ensured
 - Tank flows do not intersect
 - No interference between workers
 - Easy to find the process where the problem occurred & the operator
 - Create an intermediate inspection & rework process (Especially when producing new products or adjusting equipment)

Develop 2 (or 3) production lines

Improve quality / productivity while competing for each production lines

- 2. Be flexible with production fluctuations
 - Multiple models can be produced simultaneously
 - Easy relocation of machines and workers
- 3. Low running cost
- 4. Safe and good working environment

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II. Introduce "Zone Control System"

- 1. Never pass-on defects parts to the following process
 - Implementation of interim inspection (& rework)
 - Accept only 100% good products → Creating pallets that can guarantee 100% quality
 - Only 100% good products are sent to Paint Shop

<Suggestion (One Idea)>

Implement Intermediate inspection (& rework)

Do not bring any defects into each zone

Do not leave any defects outside each

15

III. Produce parts according to takt time

<Current problem>

- The current production line cannot keep takt time
- Takt Time is influenced by the cycle time of three MIG welding process
- Takt time varies. It may cause workers

<Suggestion (One Idea)>

- Operators place only one part in the CV.
- Takt time can be accurately controlled according to production volume
- Can check takt time at any time

One pitch can be determined by conveyor speed

1 pitch

Conveyor-1

Cell-1, Cell-2, Cell-3

16

IV. Develop human resource

- 1. Contract employee ⇒ Long-term employment (permanent employee) ⇒ To Human resource development"
- 2. Develop human resource
 - Enhancement of employee training (including Moral)
 - Practical training for new employees (Develop "Training room")
 - Review the morning meeting (including education, discipline, etc.)
 - QC activity
 - Multiple-skilled worker
 - Motivation: Multiple-skilled worker → rotation → Leader

Develop "Robot-aided promotion"

TPS is where people who grow up are making things while continues KAIZEN/improvements every day.

「人を育てるのが最も重要で、それによって人が、日の改善を続けることができるようになるのが日本の強みだ。」

17

V. Others

Items below were proposed at the meeting on December 18, 2019

- Inspection of BOP to be Done Properly
- Elimination of denting process by changing of jig
- Defect Wise, Stage Wise and Operator Wise Analysis to be continued
- Stage wise skill attributes to be finalized, specific levels to be defined
- Stage wise training material to be prepared
- Ensure Trained and Competent Person Deployed in Stage
- No Reward System and Less Motivation/Moral of Workers
- Improve work environment, dust, noise level and welding light containment
- Team Member involvement in Defect Reduction
- Practical Training Machines to be provide for Training of Denting, Bead Grinding, Paper Sanding and Buffing
- Training Program must be followed before deployment on critical specific stages
- PQCT Adherence Level to Improve

18

Thank you

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A7.Final Report (Aerostar Helmets)

(CII-JICA Project)

VSME 2.0
Productivity Improvement
through
Integration of TPS & IOT/AI

January 2021

Aerostar Helmets and Accessories

4. Current status survey results and improvement plans

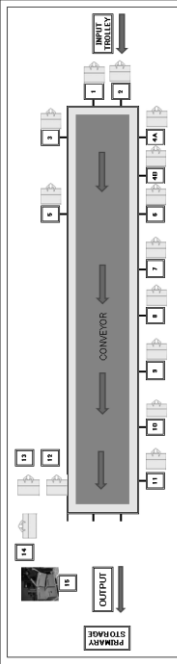
- Analysis and proposal by Yoshida -

11

LAYOUT (Line-NO.3)

AEROSTAR HELMETS & ACCESSORIES

ASSEMBLY LAYOUT LINE NO. - 03



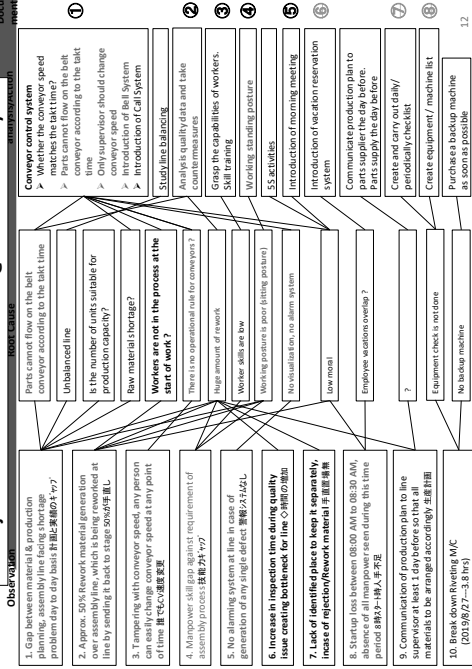
LEGENDS :

- 1 : SILVER MESH PASTING 5 : SUB ASSEMBLY OF MAIN IO 10 : VISION FITTING WITH GSI 14 : INNER BOX PASTING & LABEL PASTING
- 2 : ARGENT FITTING WITH 6 : NECK FITTING WITH HELMET 1 : AND WEIGHT MASS 15 : MASTER CARTON PASTING & LABEL PASTING
- 3 : SOLDERING 7 : NECK CURTAIN FITTING 12 : FINAL INSPECTION
- 4A : ORN STRIP REVOLTING LIB 8 : ORN STRIP FITTING 13 : FOAM BAG PASTING
- 4B : ORN STRIP REVOLTING - 9 : MECHANISM FITTING

PREPARED BY: OPERATOR, YOSHIDA

10

Major Reasons of Production Loss @ Helmet Assembly



12

① Conveyor control system

- Whether the conveyor speed matches the takt time?
- Parts cannot flow on the belt conveyor according to the takt time
- Only supervisor should change conveyor speed
- Introduction of Call System
- Introduction of Call System

13

Conditions for single piece flow on the belt conveyor

- All workers start work at the same time and finish work at the same time
- Is the tact time(19.8sec) correct?
- Run only good products (no faults in the raw material)
- Do not throw defects into the next process (if you find a defect, call the sub-leader/supervisor to fix / reject on the spot)
- If a defect is found at the final inspection, correct it outside the process. (if you bring it in the process and correct it, the flow does not flow normally)
- Basically, when a problem occurs and a repair is necessary, the worker who made defect works overtime and repairs.
- Must be well line balancing
- Create a management system so that there is no hindrance to the operation of the line even if there are workers on holidays

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- a. Production efficiency (current status: end of June, 2019)
- b. The concept of single-rolling on a belt conveyor
- c. Introduction of a system that stops when the conveyor is full of parts
- d. Install a switch to stop the conveyor and stop the conveyor in case of emergency
- e. Introduce parts call system
- f. Introduce Production control board
- g. Ideal production line management system (draft)

15

a. Production efficiency (current status: June 2019)

Working days:	26 day/mth		
Working hours:	13 hrs/day		
Tact time:	19.8 sec		
Calculated production volume			
Efficiency	Formula	unit/day	unit/mth
100%	$11 \times 3600 / 19.8 \times 1.0$	2,000	52,000
90%	$11 \times 3600 / 19.8 \times 0.9$	1,800	46,800
80%	$11 \times 3600 / 19.8 \times 0.8$	1,600	41,600
70%	$11 \times 3600 / 19.8 \times 0.7$	1,400	36,400
60%	$11 \times 3600 / 19.8 \times 0.6$	1,200	31,200
50%	$11 \times 3600 / 19.8 \times 0.5$	1,000	26,000

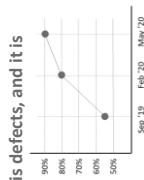
Problem

- Low production efficiency (56% to 71%)
- Very large variation from day to day
- The main cause of low production efficiency is defects, and it is essential to reduce defects in the process

Target (Tentative)

Production efficiency:
90% or more (1,800 unit / day, 46,800 unit / mth)

DATE	NO. OF WORKING DAYS	unit/day	Production Efficiency
2019/6/26	20	1,410	71%
2019/6/28	20	1,340	67%
2019/6/27	19	1,710	86%



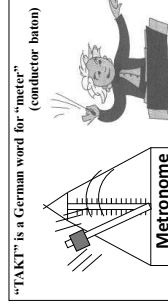
16

<Reference> Takt time

Exact time required to process one product
Takt time is the pace of production determined by the rate of customer demand



$$\text{Takt Time} = \frac{\text{Monthly Operating Time}}{\text{Monthly Production Quantity}} = \frac{88\text{hrs} \times 2.5\text{days}}{200\text{ hrs/month}} = \frac{220\text{ hrs}}{200\text{ hrs/month}} = 1.1\text{ min}$$



Takt time = $\frac{\text{Time available second per working day}}{\text{Volume daily production requirement}}$
Cycle Time = $\frac{\text{Actual time required for a worker to complete one cycle of his job process including walking distance.}}{\text{}}$

NOTE:
Adjust takt time according to production volume (increase/ decrease)

17

b. The concept of single-rolling on a belt conveyor

Purpose: To produce as planned with the set takt time

基本的に、ピッチごとにワークピースの必要
ピッチごとにコンベヤに部品
を投入し、ピッチごとにワークピースを運ぶ

Put only one part on a conveyor per pitch

Stop the conveyor in case of missing raw material

Pitch: decide in work area

Draw white lines

1 pitch

The conveyor speed will be determined by the speed at which one pitch advances with the takt time.

コンベヤの速度は、タクトタイムでピッチが進む速度によって決まる

18

c. Introduction of a system that stops when the conveyor is full of parts

d. Install a switch to stop the conveyor and stop the conveyor in case of emergency

Purpose: Operate the belt conveyor correctly (Basically, stop the conveyor when there is an abnormality, including defects)

3-1 When the part on the conveyor reach the conveyor end, the sensor detects this and automatically stops the conveyor and sound buzzer if you take parts, the conveyor will automatically restart and buzzer will stop sound

3-2 (Draft) When a danger or abnormality occurs, press the switch to emergency stop the conveyor. In both cases(3-1, 3-2), the buzzer sounds and the mini-Andon lights up to indicate the reason for the stop. By pressing the emergency stop release switch, the line will restarts the conveyor. The conveyor stop time is automatically recorded. The reason for conveyor stoppage is recorded by the sub-leader in the record book

19

e. Introduce parts call system (when supply is delayed and there are no parts to work on)

Purpose: Call parts supplier before material runs out to prevent production line from shutting down

When parts are about to run out, the process person press a button to inform the parts supplier

If the button is pressed, the requested part name is displayed on an mini-Andon board and at the same time a buzzer/melody is sounded to inform the parts supplier.

20

f. Introduce Production control board

Consider whether it will help or not that all workers can see

- Display production plan and actual output on the display board so that all workers can see
- Increasing worker awareness of production
- Inspire competition between production lines

Plan	7:40 -8:00	8:00 -9:00	9:00 -10:00	10:00 -12:00	12:00 -13:00
Actual					
Line					
Stop					

(Input manual)

(Conveyor sensor)

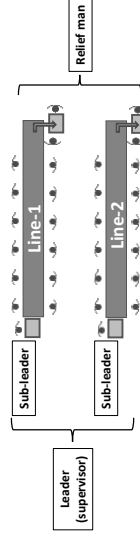
(Conveyor sensor)

21

g. Ideal production line management system (draft)

Purpose: Build a stronger production line (high production efficiency with no defects)
 Even if workers take leave or leave the line (e.g. go to the toilet) the production line operates normally

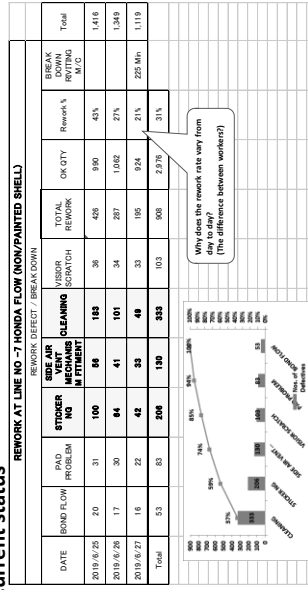
Leader (supervisor)	1	role
Sub-leader (Person on who can work in any process)	2	Manage the entire HONDA line (especially quality assurance) Respond to production line abnormalities (morning meeting, daily report, training, KAIZEN/5S activity) Corresponding when workers take leave, etc
Relief man (Person who can work in any process)	1	Respond to production line abnormalities (especially quality assurance) Respond to production line abnormalities (morning meeting, daily report, training, KAIZEN/5S activity) Corresponding when workers take leave, etc Rework work KAIZEN/5S activity, etc



② Analysis quality data and take countermeasures

A lot of rework
 First, reduce rework
 To do so, investigate and analyze the cause of rework

Current status



Receiving inspection

Objective: Investigate the quality at the time of acceptance and investigate whether it is the cause of rework

Survey method: inspect raw materials for 4 hours a day for 3 days

Sample of check list

Date	No. of inspection	OK QTY	No. of defective	Failure phenomenon	Scratch	Dirt	Failure phenomenon	Possible cause
Material								
Total								
Date	No. of inspection	OK QTY	No. of defective	Failure phenomenon	Scratch	Dirt	Failure phenomenon	Possible cause
Material								
Total								
Date	No. of inspection	OK QTY	No. of defective	Failure phenomenon	Scratch	Dirt	Failure phenomenon	Possible cause
Material								
Total								

③ Grasp the capabilities of workers Skill training

Item	Safety	Quality	Procedure	Vital part	Speed
100%	Safety work is always protected.	Acceptance can be carried out stably.	Work is repeated rhythmically.	There is no error.	It ends within a set time.
75%	Work is possible with the incapability of operation which is not.	It is on the level which can pass an inspection.	Repetition work can be performed in the same procedure each time.	There is no rework.	It ends within a set time.
50%	Understands the point of a safe motor and work is possible.	Not less than 75% of a ratio of successful operations	Although it is occurring work stops.	It can complete, although there is rework.	Less than 125% of T.T
15%	Understands the point of a safe motor.	Not less than 50% of a ratio of successful operations	A procedure is mistaken although it is occurring.	Work is possible although operations are repeated.	Less than 150% of T.T

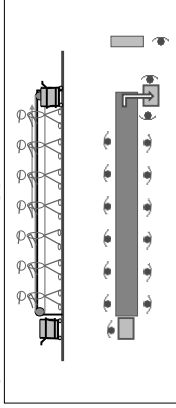
26

④ Working standing posture

Purpose: Improve productivity and quality by working standing up
Current Assembly Line (Work in sitting position)

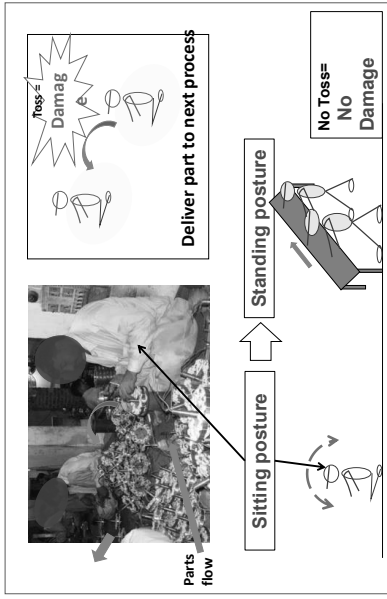


Ideal Assembly Line (Work in Standing position)



27

<Reference> Quality falls down in sitting position



28

<Reference> Productivity increase in standing position (1)

Before Kaizen



After Kaizen



More Kaizen?

After KAIZEN

- Reduced cost (No helper)
- Reduce defects (Less handling = Less damage)
(Not put parts on the flower directory)

29

What are the problems?

- 1) Waste of Transportation
- 2) Waste of Waiting
- 3) He can't work without helper

Why?

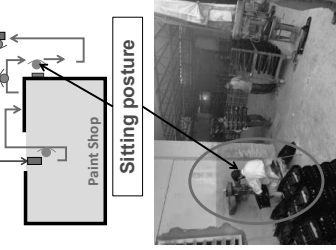
He is sitting

Sitting posture → Standing posture



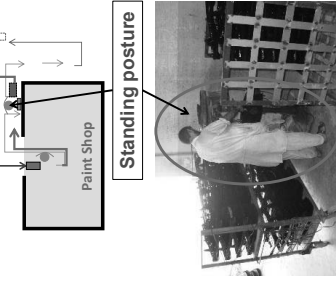
Before Kaizen

Sitting posture



After Kaizen

Standing posture



Reduced cost (No helper)

⑤ Introduction of morning meeting

Morning meeting

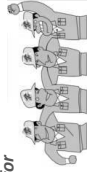
The idea of TPS:

- Manufacturing is not something that can be done with machines or techniques.
- The subject is just a person, and people on the ground can "think for themselves and solve for themselves" to make better things.
- First, "make a human being" and manage them.
- The word "make a human being" is the essence of TPS.

Purpose:

Checking workers, checking work for the day, sharing and checking information, and improving work efficiency
 In addition, the morning meeting is meaningful as a place for education and training:

- > confirmation of the worker's absence / health status for the day
- > internal communication report
- > confirmation of the progress of the target
- > confirmation of work for the day



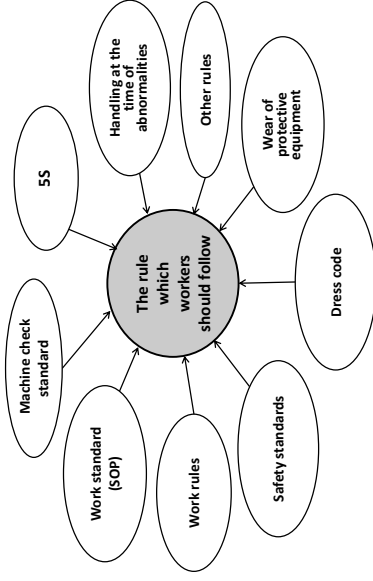
The rule which workers should follow as part of education



More than 90% of companies in Japan conduct morning meetings

<Reference> lecture at morning gather(1)

The rule which workers should follow



34

To cultivate culture that follow rules

Make understanding of the necessity of rules

Minimize the creation of rules

Clarify reasons why it can not be follow

If it is decisions that can not be followed, make it a rule that is easy to follow

Cultivate spiritual features that always follow what we have decided

35

5. Realization of Kaizen

5-1. Productivity improvement

- 1 Conveyor control system
- 2 Analysis quality data and take countermeasures
- 3 Grasp the capabilities of workers Skill training
- 4 Working standing posture

36

1 Conveyor control system

Establishing one-piece flow production

Put only one part on a conveyor per pitch
Pitch: decide in work area

BEFORE



AFTER



Conducted on 2019.12

37

① Conveyor control system

Establishing one-piece flow production

The conveyor speed will be determined by the speed at which one pitch advances with the takt time.

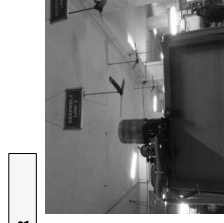


38

① Conveyor control system

Establishing one-piece flow production

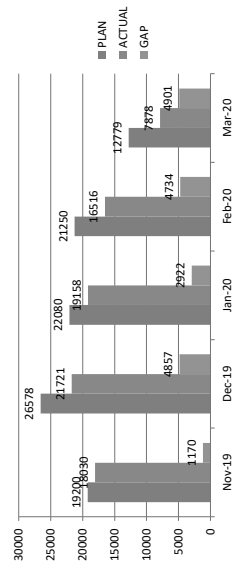
- Introduction of a system that stops when the conveyor is full of parts
- Install a switch to stop the conveyor and stop the conveyor in case of emergency



39

② Analysis quality data and take countermeasures

1. Production PLAN VS ACTUAL



Note: The factory burned down in June 2020 and the Kaizen activities ended halfway. Continue to improve at the new factory (Shree Amba)

40

④ Working standing posture

BEFORE Working sitting posture



AFTER Working standing posture



41

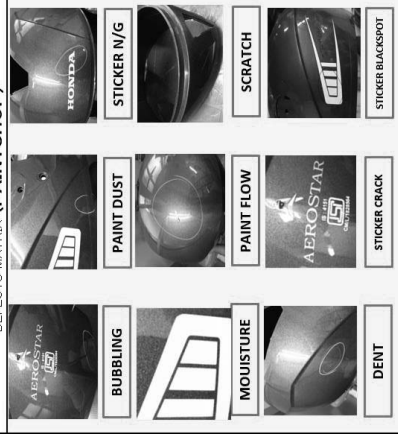
Realization of Kaizen

5-2. Quality improvement (Reduce rework)

42

Defect status-1

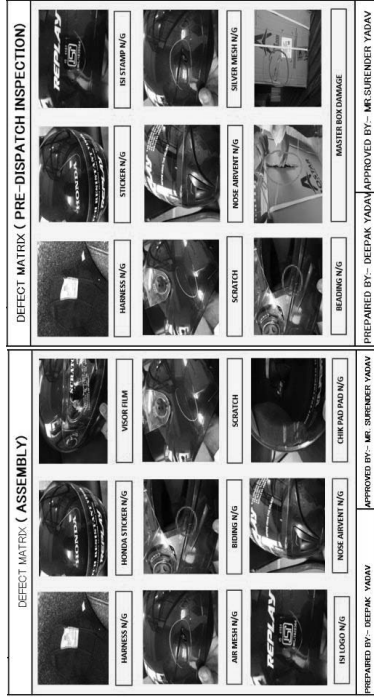
DEFECTS MATRIX (PAINTSHOP)



PREPARED BY :- DEEPAK YADAV
APPROVED BY :- MR.SURENDER YADAV

43

Defect status-2



PREPARED BY:- DEEPAK YADAV
APPROVED BY:- MR. SURENDER YADAV

44


REJECTED ANALYSIS SHEET (sample)

GENERAL INFORMATION		REASON FOR REJECTION	
Model	Part Name	Defect Type	Defect Description
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100


45

Problem :- CRACK
ROOT CAUSE :- USING METAL HAMMER FOR BUSH FITMENT OR DRILLING MANUALLY

BEFORE




AFTER



USE RUBBER HAMMER

Root Cause: USED METAL HAMMER FOR REVITING OPERATION



CRACK

REJECTED MATERIAL REPLACED WITH OK MATERIAL

MATERIAL CRACK AT ASSEMBLY STAGE


46

Problem :- REVITING NG
ROOT CAUSE :- REVITING DONE MANUALLY

BEFORE



AFTER



Root Cause: MANUAL OPERATION DONE FOR REVITING




REVITING NG

ACTION: CHINA REVITING M/C IMPLEMENTED FOR REVITING OPERATION


47

Problem: No trolley standards (Trolley dimensions vary)

hitting



A



B

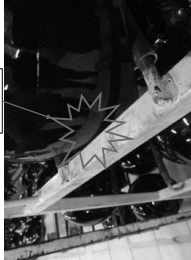
A ≠ B

Suggestion: Standardized trolley dimensions


48

Problem: Very low quality awareness of both supervisor/leader and workers

hitting



Insufficient cover



Suggestion:

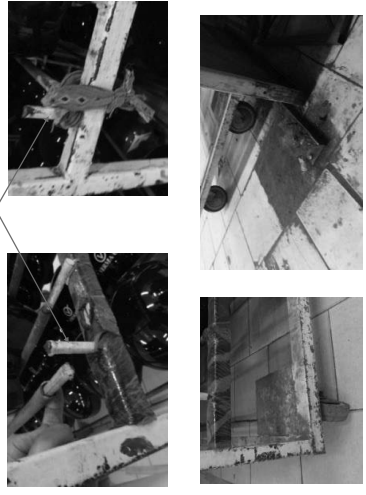
1. Renew all scratch protection covers
2. Installation of Rubber Cover on all iron rods and iron square pipe
3. Paint the iron part with white paint
4. Number the trolleys and clean and manage all trolleys regularly

The purpose is not only to prevent scratches caused by trolleys, but also to raise workers' awareness of quality

49

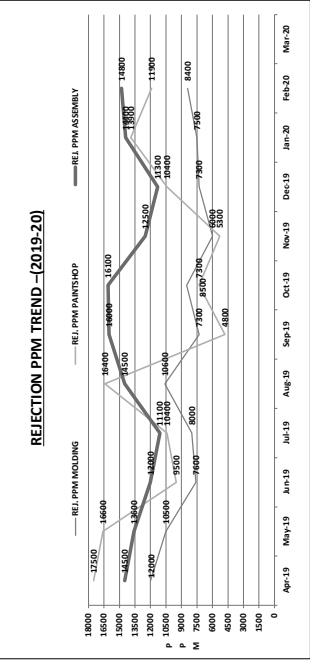
Problem: Very low quality of both supervisor/leader and workers

No maintenance even broken!



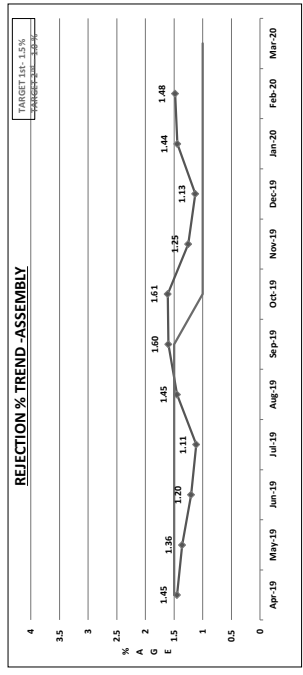
The purpose is not only to prevent put dust in the paint shop, but also to raise workers' awareness of quality (Dress is important)

Rejection status (Molding, Paint, Assembly)

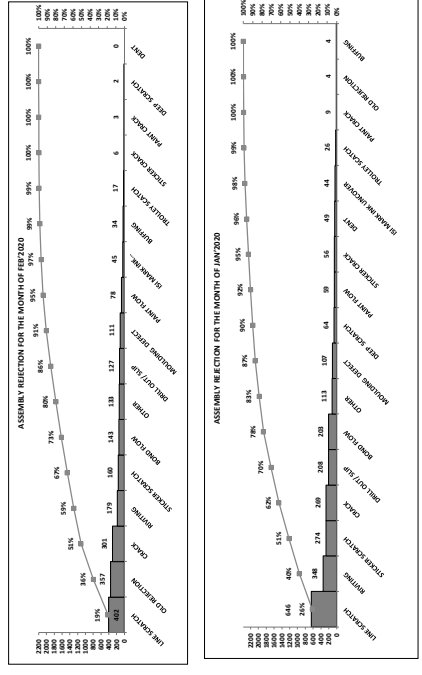


Note: The factory burned down in June 2020 and the Kaizen activities ended halfway Continue to improve at the new factory (Shree Amba)

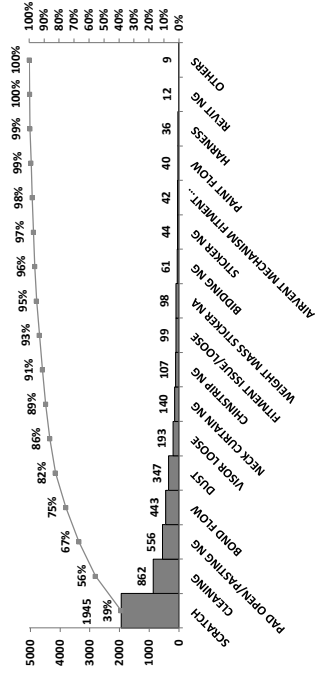
Rejection Trend (Assembly line)



Contents of the defect item



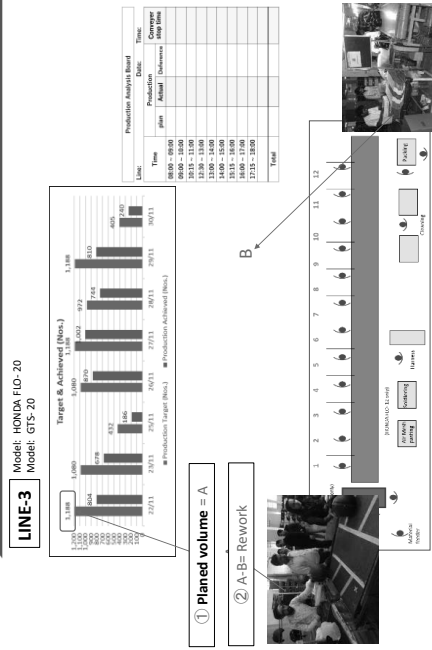
REWORK DETAIL – FEB '20



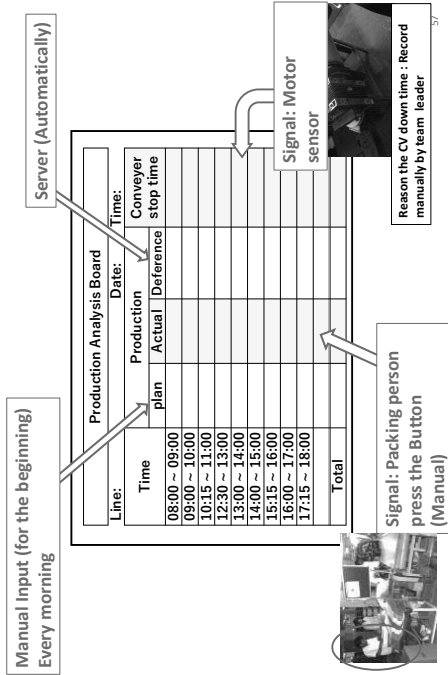
Realization of Kaizen

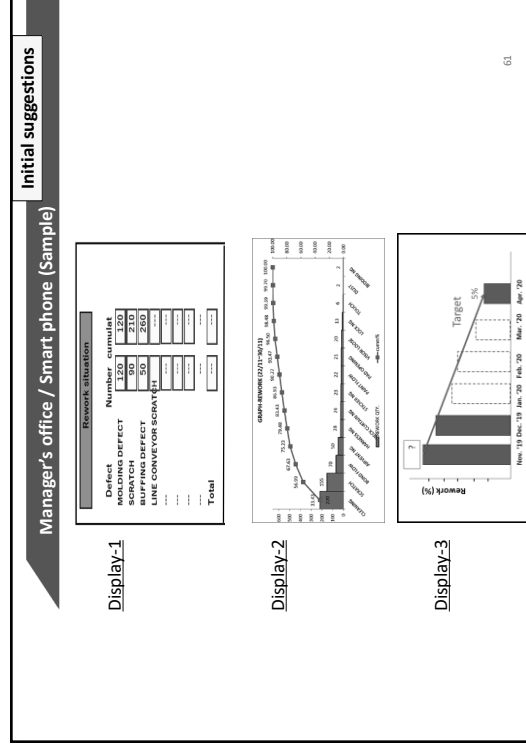
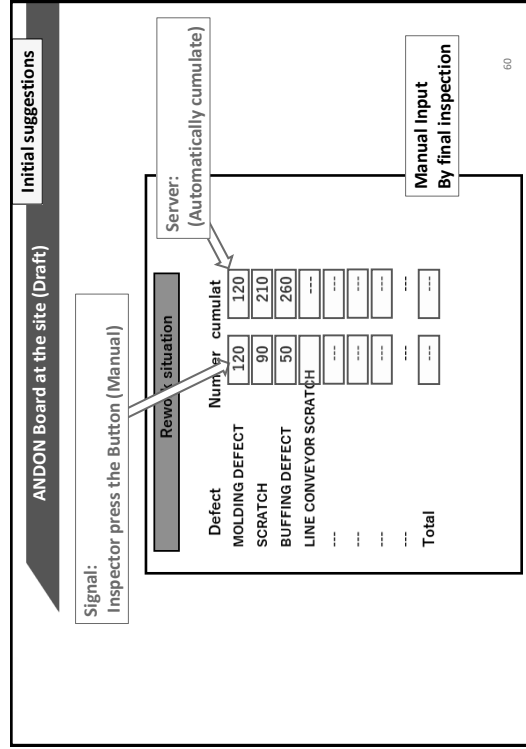
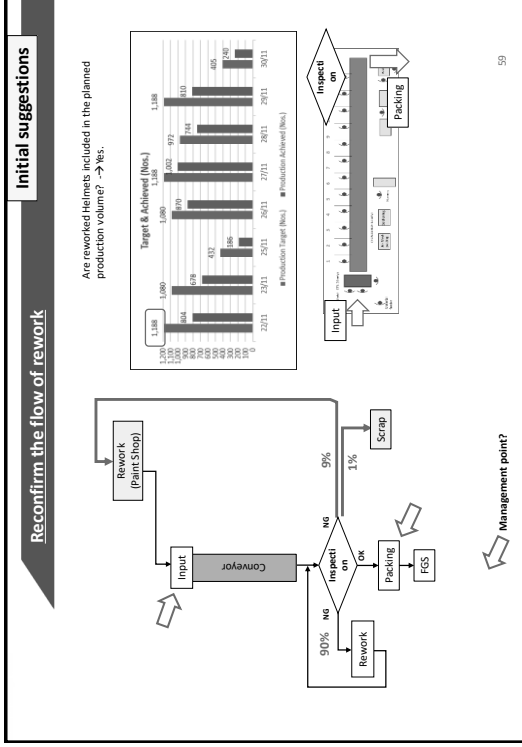
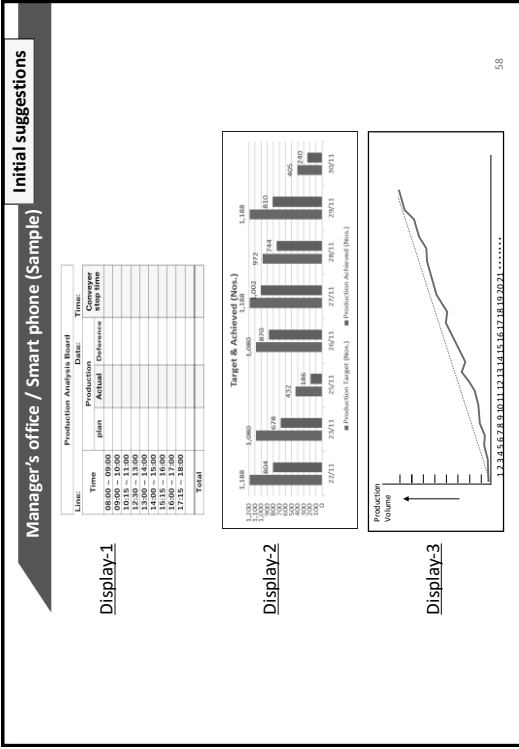
5-3. Introduce a simply ANDON system (IoT)

Initial suggestions



ANDON Board at the site (Draft)

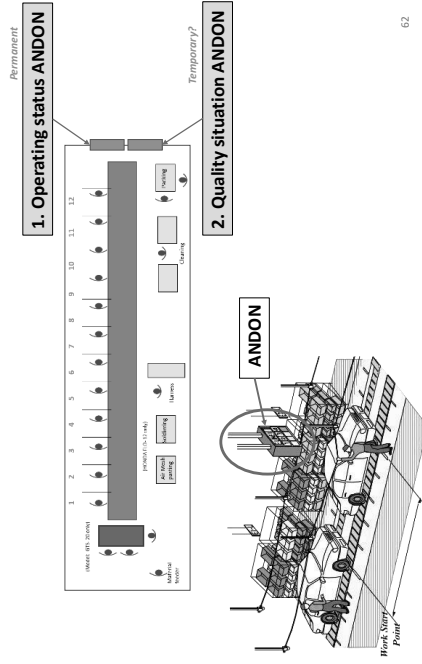




Andon installation location

Initial suggestions

Install where all related workers can see at a glance



62

SHREE AMBA INDUSTRIES ROORKEE

lot PROJECT DEVELOPMENT PROGRESS STATUS

GTS HELMET LINE



63

SHREE AMBA INDUSTRIES ROORKEE

lot Task & Target

SR. NO	TASK	TARGET DATE	STATUS
1	Ruby & Rails installation on Server	05-NOV-2020	DONE
2	Run Demo Application on Server – Developed by Omiya San	05-NOV-2020	DONE
3	Development – As Per Scope Discussed	20-JAN-2021	In Process

64

SHREE AMBA INDUSTRIES ROORKEE

lot Development Content & Target

SR. NO.	CONTENT	TARGET DATE	STATUS
1	Home Page	24-NOV-2020	Done
2	Login Screen & Authentication 認証	05-DEC-2020	In Process
3	Production Plan Screen	20-DEC-2020	Pending
4	Production / Rejection / Rework Entry Update	05-JAN-2021	Pending
5	Production Report Auto Mail	05-JAN-2021	Pending
6	Reports – Andon Dashboard Display	20-JAN-2021	Pending

65

Production Plan – Elements Of This Screen

PRODUCTION PLAN									
Date:	xx/xx/xxxx	Line:	GTS LINE - 1						
Time:	xx:xx	Shift:	A						
Planned Quantity:	1000	Net Time:	sec						
Time	Hourly			Cumulate			Plan	Actual	Def.
	Plan	Actual	Def.	Plan	Actual	Def.			
08:00	10:30	250				250			
10:45	12:30	175				425			
13:00	16:00	300				725			
16:15	16:30	25				750			
16:30	19:00	250				1000			

- User will login into the application and select the line to update shift wise hourly production plan

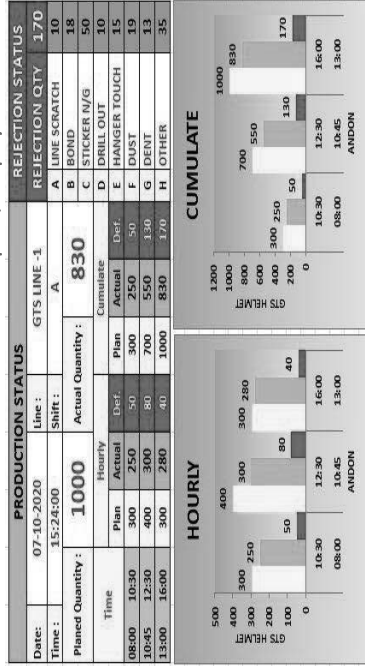
Production / Rejection / Rework Entry – Elements Of This Screen

- When user will select the Line, production plan will be automatically populate.

Quality User will Update OK Production / Rejection (With Reason)

Date:	Time:	Line:	Shift:	Planned Quantity:	Actual:	Def.	Rejection Reason:
xx/xx/xxxx	xx:xx	GTS LINE - 1	A	1000	250	750	1

Andon Dashboard Report / Display





Note: The factory burned down in June 2020 and the Kaizen activities ended halfway



Realization of Kaizen

5-4. 5S activities (5S, safety, environment, moral)



Assembly shop

SHOP : STORE DEPARTMENT		DOC. No. : Rev. No. : Eff Date :																			
LOCATION : STORE		5's SHEET																			
STARTED ON : 9-12-19		FINISHED ON : 9-12-19																			
BEFORE IMPROVEMENT	AFTER IMPROVEMENT																				
																					
OBSERVATION : Material is grounded.		IMPLEMENT : Material is placed in blue bin.																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/> A</td><td>Productivity Increase</td></tr> <tr><td><input type="checkbox"/> B</td><td>Quality Improved</td></tr> <tr><td><input type="checkbox"/> C</td><td>Cost Saving</td></tr> <tr><td><input type="checkbox"/> D</td><td>Delivery Fast</td></tr> <tr><td><input type="checkbox"/> S</td><td>Safety</td></tr> <tr><td><input type="checkbox"/> M</td><td>Moral Increase</td></tr> </table>		<input type="checkbox"/> A	Productivity Increase	<input type="checkbox"/> B	Quality Improved	<input type="checkbox"/> C	Cost Saving	<input type="checkbox"/> D	Delivery Fast	<input type="checkbox"/> S	Safety	<input type="checkbox"/> M	Moral Increase	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2">FACILITATOR:</td></tr> <tr><td>Mr. Dipain</td><td></td></tr> <tr><td>Mr. Sagar</td><td></td></tr> </table>		FACILITATOR:		Mr. Dipain		Mr. Sagar	
<input type="checkbox"/> A	Productivity Increase																				
<input type="checkbox"/> B	Quality Improved																				
<input type="checkbox"/> C	Cost Saving																				
<input type="checkbox"/> D	Delivery Fast																				
<input type="checkbox"/> S	Safety																				
<input type="checkbox"/> M	Moral Increase																				
FACILITATOR:																					
Mr. Dipain																					
Mr. Sagar																					
RESULT - 1) 5's Maintained.																					
BENEFITS : 1) Safety increased																					



Assembly shop

SHOP :		DOC. No. : Rev. No. : Eff Date :																			
LOCATION :		5's SHEET																			
STARTED ON :		FINISHED ON :																			
BEFORE IMPROVEMENT	AFTER IMPROVEMENT																				
																					
OBSERVATION : Chin strap material is on the ground.		IMPLEMENT : Chin strap material is removed on the ground.																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/> A</td><td>Productivity Increase</td></tr> <tr><td><input type="checkbox"/> B</td><td>Quality Improved</td></tr> <tr><td><input type="checkbox"/> C</td><td>Cost Saving</td></tr> <tr><td><input type="checkbox"/> D</td><td>Delivery Fast</td></tr> <tr><td><input type="checkbox"/> S</td><td>Safety</td></tr> <tr><td><input type="checkbox"/> M</td><td>Moral Increase</td></tr> </table>		<input type="checkbox"/> A	Productivity Increase	<input type="checkbox"/> B	Quality Improved	<input type="checkbox"/> C	Cost Saving	<input type="checkbox"/> D	Delivery Fast	<input type="checkbox"/> S	Safety	<input type="checkbox"/> M	Moral Increase	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2">FACILITATOR:</td></tr> <tr><td>Mr.</td><td></td></tr> <tr><td>Mr.</td><td></td></tr> </table>		FACILITATOR:		Mr.		Mr.	
<input type="checkbox"/> A	Productivity Increase																				
<input type="checkbox"/> B	Quality Improved																				
<input type="checkbox"/> C	Cost Saving																				
<input type="checkbox"/> D	Delivery Fast																				
<input type="checkbox"/> S	Safety																				
<input type="checkbox"/> M	Moral Increase																				
FACILITATOR:																					
Mr.																					
Mr.																					
RESULT - 1) 5's Maintained.																					
BENEFITS : 1) Safety increased																					



Assembly shop

SHOP : ASSEMBLY DEPARTMENT		DOC. No. : Rev. No. : Eff Date :																			
LOCATION : ASSEMBLY		5's SHEET																			
STARTED ON : 9-12-19		FINISHED ON : 9-12-19																			
BEFORE IMPROVEMENT	AFTER IMPROVEMENT																				
																					
OBSERVATION : Beading is placed under the working table without a blue bin.		IMPLEMENT : The beading is placed in the blue bin under the working table so that it is maintained in 5's.																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/> A</td><td>Productivity Increase</td></tr> <tr><td><input type="checkbox"/> B</td><td>Quality Improved</td></tr> <tr><td><input type="checkbox"/> C</td><td>Cost Saving</td></tr> <tr><td><input type="checkbox"/> D</td><td>Delivery Fast</td></tr> <tr><td><input type="checkbox"/> S</td><td>Safety</td></tr> <tr><td><input type="checkbox"/> M</td><td>Moral Increase</td></tr> </table>		<input type="checkbox"/> A	Productivity Increase	<input type="checkbox"/> B	Quality Improved	<input type="checkbox"/> C	Cost Saving	<input type="checkbox"/> D	Delivery Fast	<input type="checkbox"/> S	Safety	<input type="checkbox"/> M	Moral Increase	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2">FACILITATOR:</td></tr> <tr><td>Mr. Rishabh</td><td></td></tr> <tr><td>Mr. Dinesh</td><td></td></tr> </table>		FACILITATOR:		Mr. Rishabh		Mr. Dinesh	
<input type="checkbox"/> A	Productivity Increase																				
<input type="checkbox"/> B	Quality Improved																				
<input type="checkbox"/> C	Cost Saving																				
<input type="checkbox"/> D	Delivery Fast																				
<input type="checkbox"/> S	Safety																				
<input type="checkbox"/> M	Moral Increase																				
FACILITATOR:																					
Mr. Rishabh																					
Mr. Dinesh																					
RESULT - 1) 5's Maintained.																					
BENEFITS : 1) Safety increased																					

Assembly shop



SHOP : HR DEPARTMENT		DOC. No. : Rev. No. : Eff Date :																			
LOCATION : PERIPHERAL AREA		5's SHEET																			
STARTED ON : 11-12-19		FINISHED ON : 11-12-19																			
BEFORE IMPROVEMENT	AFTER IMPROVEMENT																				
																					
OBSERVATION : The empty master carton is placed below the material conveyor in the dispatch area.		IMPLEMENT : The empty master carton below the material conveyor in the dispatch area was removed from there.																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td><input type="checkbox"/> A</td><td>Productivity Increase</td></tr> <tr><td><input type="checkbox"/> B</td><td>Quality Improved</td></tr> <tr><td><input type="checkbox"/> C</td><td>Cost Saving</td></tr> <tr><td><input type="checkbox"/> D</td><td>Delivery Fast</td></tr> <tr><td><input type="checkbox"/> S</td><td>Safety</td></tr> <tr><td><input type="checkbox"/> M</td><td>Moral Increase</td></tr> </table>		<input type="checkbox"/> A	Productivity Increase	<input type="checkbox"/> B	Quality Improved	<input type="checkbox"/> C	Cost Saving	<input type="checkbox"/> D	Delivery Fast	<input type="checkbox"/> S	Safety	<input type="checkbox"/> M	Moral Increase	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2">FACILITATOR:</td></tr> <tr><td>Mr. Naresh</td><td></td></tr> <tr><td>Mr. Vipin</td><td></td></tr> </table>		FACILITATOR:		Mr. Naresh		Mr. Vipin	
<input type="checkbox"/> A	Productivity Increase																				
<input type="checkbox"/> B	Quality Improved																				
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<input type="checkbox"/> S	Safety																				
<input type="checkbox"/> M	Moral Increase																				
FACILITATOR:																					
Mr. Naresh																					
Mr. Vipin																					
RESULT - 1) 5's Maintained.																					
BENEFITS : 1) Safety increased																					

Assembly shop

SHOP : STORE DEPARTMENT	DOC. No. :	5's SHEET	Rev. No. :
LOCATION : STORE	Eff. Date :		
STARTED ON : 8-12-19	FINISHED ON : 8-12-19		
BEFORE IMPROVEMENT	AFTER IMPROVEMENT		
			
OBSERVATION : The quality inspection rack does not have Thermocool bars outside properly and the Visor box is not in proper place.	IMPLEMENT : The thermocool bars were correctly placed in the quality inspection rack and the Visor box is removed from it.		
RESULT - 1) 5's Maintained.	FACILITATOR: Mr. Depain Mr. Sagar		
BENEFITS : 1) Material Easy Check from Quality Inspection Rack.			
Z Productivity Increase			
Q Quality Improved			
C Cost Saving			
D Delivery Fast			
S Safety			
M Moral Increase			



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Assembly shop

SHOP : STORE DEPARTMENT	DOC. No. :	5's SHEET	Rev. No. :
LOCATION : STORE	Eff. Date :		
STARTED ON : 8-12-19	FINISHED ON : 8-12-19		
BEFORE IMPROVEMENT	AFTER IMPROVEMENT		
			
OBSERVATION : The material has been on the gangway due to the material rack becoming full.	IMPLEMENT : The frame material placed on the gangway is placed in the second rack and the gangway is clean.		
RESULT - 1) 5's Maintained.	FACILITATOR: Mr. Depain Mr. Sagar		
BENEFITS : 1) Safety Increased			
Z Productivity Increase			
Q Quality Improved			
C Cost Saving			
D Delivery Fast			
S Safety			
M Moral Increase			



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Assembly shop

SHOP : STORE DEPARTMENT	DOC. No. :	5's SHEET	Rev. No. :
LOCATION : STORE	Eff. Date :		
STARTED ON : 8-12-19	FINISHED ON : 8-12-19		
BEFORE IMPROVEMENT	AFTER IMPROVEMENT		
			
OBSERVATION : There is no identification tag on the master carton.	IMPLEMENT : Identification tags have been placed on the master carton.		
RESULT - 1) 5's Maintained.	FACILITATOR: Mr. Depain Mr. Sagar		
BENEFITS : 1) Safety Increased			
Z Productivity Increase			
Q Quality Improved			
C Cost Saving			
D Delivery Fast			
S Safety			
M Moral Increase			



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Assembly shop

SHOP : ASSEMBLY DEPARTMENT	DOC. No. :	5's SHEET	Rev. No. :
LOCATION : ASSEMBLY	Eff. Date :		
STARTED ON : 8-12-19	FINISHED ON : 8-12-19		
BEFORE IMPROVEMENT	AFTER IMPROVEMENT		
			
OBSERVATION : The back side of the Line-8 has many Master Carton, Blue Bin and Rejected Thermocool.	IMPLEMENT : The back side of the Line-8 has many Master Carton, Blue Bin and Rejected Thermocool.		
RESULT - 1) Space is found to keep material.	FACILITATOR: Mr. Rishabh Mr. Naveer.		
BENEFITS : 1) 5's Maintained			
Z Productivity Increase			
Q Quality Improved			
C Cost Saving			
D Delivery Fast			
S Safety			
M Moral Increase			



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Assembly shop

	SHOP : ASSEMBLY DEPARTMENT	DOC. No. : Rev. No. : Eff. Date :	5's SHEET												
	LOCATION : ASSEMBLY														
	STARTED ON : 8-12-19	FINISHED ON : 8-12-19													
	BEFORE IMPROVEMENT	AFTER IMPROVEMENT													
															
	OBSERVATION :- Assembly ok material placed on gangway.														
	IMPLEMENT :- Assembly ok material placed on dispatch area material remove from gangway.														
	RESULT - 1) 5's Maintained.														
	FACILITATOR: Mr. Riakabh Mr. Navar														
	BENEFITS : -1) Safety increased														
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>P</td><td>Productivity Increase</td></tr> <tr><td>Q</td><td>Quality Improved</td></tr> <tr><td>C</td><td>Cost Saving</td></tr> <tr><td>D</td><td>Delivery Fast</td></tr> <tr><td>S</td><td>Safety</td></tr> <tr><td>M</td><td>Moral Increase</td></tr> </table>			P	Productivity Increase	Q	Quality Improved	C	Cost Saving	D	Delivery Fast	S	Safety	M	Moral Increase
P	Productivity Increase														
Q	Quality Improved														
C	Cost Saving														
D	Delivery Fast														
S	Safety														
M	Moral Increase														

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Assembly shop


	SHOP : FG. DEPARTMENT	DOC. No. : Rev. No. : Eff. Date :	5's SHEET												
	LOCATION : FG. AREA														
	STARTED ON : 8-12-19	FINISHED ON : 8-12-19													
	BEFORE IMPROVEMENT	AFTER IMPROVEMENT													
															
	OBSERVATION :- Dispatch material was not properly placed.														
	IMPLEMENT :- Dispatch material was properly placed.														
	RESULT - 1) 5's Maintained.														
	FACILITATOR: Mr. ABHISHEK Mr. ASWANI														
	BENEFITS : 1) Safety increased														
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>P</td><td>Productivity Increase</td></tr> <tr><td>Q</td><td>Quality Improved</td></tr> <tr><td>C</td><td>Cost Saving</td></tr> <tr><td>D</td><td>Delivery Fast</td></tr> <tr><td>S</td><td>Safety</td></tr> <tr><td>M</td><td>Moral Increase</td></tr> </table>			P	Productivity Increase	Q	Quality Improved	C	Cost Saving	D	Delivery Fast	S	Safety	M	Moral Increase
P	Productivity Increase														
Q	Quality Improved														
C	Cost Saving														
D	Delivery Fast														
S	Safety														
M	Moral Increase														

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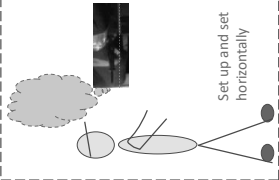
Harmful smoke rises worker's face

Assembly shop

This ventilation fan is not working well




Idea-1
Installed above and angled



Idea-2
Set up and set horizontally

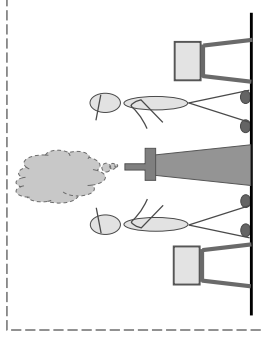
80

Assembly shop



> Set the jig high so that smoke does not hit workers face

> Working on standing position (Improve work efficiency)






idea

✓ Harmful smoke rises worker's face
✓ Working on sitting position (Poor work efficiency)


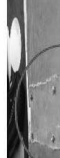

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Buffing Department

	SHOP : Buffing Area LOCATION : All Shop Floors STARTED ON : 30/01/2020	DOC. No. : Rev. No. : Eff Date :	KAIZEN IDEA SHEET FINISHED ON : 10/22/2020
BEFORE IMPROVEMENT		BEFORE IMPROVEMENT	
<p>Observation: Sensor required on conveyor</p> <p>KAIZEN THEME : Sensor required on conveyor</p> <p>IDEA : Sensor installed on conveyor</p> <p>RESULT – 1) Quality Improve</p> <p>BENEFITS : 1) Parts are not falling at the end of conveyor</p>		<p>KAIZEN THEME : Due to the conveyor belt packing, there can be a problem of scratches and dent in the part.</p> <p>IDEA : We have removed the conveyor belt packing, so that the problem of scratch and dent will not come.</p> <p>RESULT – 1) OK buffing parts are running on the conveyor.</p> <p>BENEFITS : 1) Safety</p>	
<p>FACILITATOR: Mr. SARJIT SINGH Mr. Bineet</p>		<p>FACILITATOR: Mr. SARJIT SINGH Mr. Bineet</p>	
<p>Z Productivity Increase G Quality Improved C Cost Saving D Delivery Fast S Safety M Moral Increase</p>		<p>Z Productivity Increase G Quality Improved C Cost Saving D Delivery Fast S Safety M Moral Increase</p>	




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Buffing Department

	SHOP : Buffing Area LOCATION : All Shop Floors STARTED ON : 4/02/2020	DOC. No. : Rev. No. : Eff Date :	KAIZEN IDEA SHEET FINISHED ON : 4/02/2020
BEFORE IMPROVEMENT		BEFORE IMPROVEMENT	
<p>KAIZEN THEME : Due to the conveyor belt packing, there can be a problem of scratches and dent in the part.</p> <p>IDEA : We have removed the conveyor belt packing, so that the problem of scratch and dent will not come.</p> <p>RESULT – 1) OK buffing parts are running on the conveyor.</p> <p>BENEFITS : 1) Safety</p>		<p>KAIZEN THEME : Due to the conveyor belt packing, there can be a problem of scratches and dent in the part.</p> <p>IDEA : We have removed the conveyor belt packing, so that the problem of scratch and dent will not come.</p> <p>RESULT – 1) OK buffing parts are running on the conveyor.</p> <p>BENEFITS : 1) Quality Improved 2) Safety</p>	
<p>FACILITATOR: Mr. SARJIT SINGH Mr. Bineet</p>		<p>FACILITATOR: Mr. SARJIT SINGH Mr. Bineet</p>	
<p>Z Productivity Increase G Quality Improved C Cost Saving D Delivery Fast S Safety M Moral Increase</p>		<p>Z Productivity Increase G Quality Improved C Cost Saving D Delivery Fast S Safety M Moral Increase</p>	




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Buffing Department

	SHOP : Buffing Area LOCATION : All Shop Floors STARTED ON : 28/07/2020	DOC. No. : Rev. No. : Eff Date :	KAIZEN IDEA SHEET FINISHED ON : 28/07/2020
BEFORE IMPROVEMENT		BEFORE IMPROVEMENT	
<p>KAIZEN THEME : face mask not used by operator.</p> <p>IDEA : face mask used properly.</p> <p>RESULT – 1) Moral Increase</p> <p>BENEFITS : 1) safety</p>		<p>KAIZEN THEME : Dust collector are not working condition</p> <p>IDEA : Dust collector working properly</p> <p>RESULT – 1) Production smooth</p> <p>BENEFITS : 1) Productivity Increase</p>	
<p>FACILITATOR: Mr. SARJIT SINGH Mr. Bineet</p>		<p>FACILITATOR: Mr. SARJIT SINGH Mr. Bineet</p>	
<p>Z Productivity Increase G Quality Improved C Cost Saving D Delivery Fast S Safety M Moral Increase</p>		<p>Z Productivity Increase G Quality Improved C Cost Saving D Delivery Fast S Safety M Moral Increase</p>	




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Buffing Department

	SHOP : Buffing Area LOCATION : All Shop Floors STARTED ON : 10/2/2020	DOC. No. : Rev. No. : Eff Date :	KAIZEN IDEA SHEET FINISHED ON : 3/02/2020
BEFORE IMPROVEMENT		BEFORE IMPROVEMENT	
<p>KAIZEN THEME : Dust collector are not working condition</p> <p>IDEA : Dust collector working properly</p> <p>RESULT – 1) Production smooth</p> <p>BENEFITS : 1) Productivity Increase</p>		<p>KAIZEN THEME : Dust collector are not working condition</p> <p>IDEA : Dust collector working properly</p> <p>RESULT – 1) Production smooth</p> <p>BENEFITS : 1) Productivity Increase</p>	
<p>FACILITATOR: Mr. SARJIT SINGH Mr. Bineet</p>		<p>FACILITATOR: Mr. SARJIT SINGH Mr. Bineet</p>	
<p>Z Productivity Increase G Quality Improved C Cost Saving D Delivery Fast S Safety M Moral Increase</p>		<p>Z Productivity Increase G Quality Improved C Cost Saving D Delivery Fast S Safety M Moral Increase</p>	




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Buffing Department

	SHOP : Buffing Area	DOC. No. : Rev. No. : Eff Date :
	LOCATION : All Shop Floors	KAIZEN IDEA SHEET
STARTED ON : 27/01/2020	FINISHED ON : 29/01/2020	
AFTER IMPROVEMENT		
		
BEFORE IMPROVEMENT		
		
OBSERVATION : Conveyor gear & chain open		
IDEA : Conveyor gear & chain cover by box		
FACILITATOR: Mr. SARJIT SINGH Mr. Bineet		
RESULT - 1) Moral Increase		
BENEFITS : 1) Safety		
Z	Productivity Increase	
G	Quality Improved	
C	Cost Saving	
D	Delivery Fast	
S	Safety	
M	Moral Increase	




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F.G. Department

	SHOP : FG Area (1 st Floor)	DOC. No. : Rev. No. : Eff Date :
	LOCATION : FG Area	KAIZEN IDEA SHEET
STARTED ON : 3/02/2020	FINISHED ON : 4/02/2020	
AFTER IMPROVEMENT		
		
BEFORE IMPROVEMENT		
		
OBSERVATION : Fire Extinguisher cylinder not available in FG Area (1 st Floor).		
IDEA : Fire Extinguisher Cylinder available in FG Area (1 st Floor).		
FACILITATOR: Mr. Abhishek Mr. Ashwani		
RESULT - 1) SAFETY PURPOSE		
BENEFITS : 1) SAFETY		
Z	Productivity Increase	
G	Quality Improved	
C	Cost Saving	
D	Delivery Fast	
S	Safety	
M	Moral Increase	




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F.G. Department

	SHOP : FG Area (1 st Floor)	DOC. No. : Rev. No. : Eff Date :
	LOCATION : FG AREA	KAIZEN IDEA SHEET
STARTED ON : 21/01/2020	FINISHED ON : 27/02/2020	
AFTER IMPROVEMENT		
		
BEFORE IMPROVEMENT		
		
OBSERVATION - Material is placed on the gangway in the FG first floor, which causes trouble in the movement.		
IDEA - We have put the material behind the yellow line from the gangway so that movement can be appropriate in the gangway.		
FACILITATOR: 1) ASWANI 2) ABHISHEK		
RESULT - 1) 5% Maintain		
BENEFITS : 1) Easy material movement.		
Z	Productivity Increase	
G	Quality Improved	
C	Cost Saving	
D	Delivery Fast	
S	Safety	
M	Moral Increase	




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Hard Coating Department

	SHOP : Hard Coating Area	DOC. No. : Rev. No. : Eff Date :
	LOCATION : Hard Coating Dept	KAIZEN IDEA SHEET
STARTED ON : 4/02/2020	FINISHED ON : 4/02/2020	
AFTER IMPROVEMENT		
		
BEFORE IMPROVEMENT		
		
OBSERVATION - The checker plate is not used in hard coating area for plastic pipes on the floor.		
IDEA - Checker plate is used in hard coating area for plastic pipes on the floor.		
FACILITATOR: Mr. Ravendra Mohan		
RESULT - 1) Maintain Safety		
BENEFITS : 1) Putting a checker plate on a plastic pile will not damage.		
Z	Productivity Increase	
G	Quality Improved	
C	Cost Saving	
D	Delivery Fast	
S	Safety	
M	Moral Increase	




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Hard Coating Department

	DOC. No. : Rev. No. : Eff Date :	KAIZEN IDEA SHEET												
	SHOP : Hard Coating Area LOCATION : Hard Coating Dept. STARTED ON : 3/02/2020 FINISHED ON : 3/02/2020	AFTER IMPROVEMENT												
														
OBSERVATION : Suction Pipe open & dent present in suction pipe. IDEA : Suction Pipe cover with iron mesh and dent to be remove a suction pipe. RESULT – 1) Morale Increase. BENEFITS : 1) Safety a suction pipe.	FACILITATOR: Mr. Ravendra Mohan													
<table border="1"> <tr><td><input checked="" type="checkbox"/></td><td>Productivity Increase</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Quality Improved</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Cost Saving</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Delivery Fast</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Safety</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Morale Increase</td></tr> </table>	<input checked="" type="checkbox"/>	Productivity Increase	<input checked="" type="checkbox"/>	Quality Improved	<input checked="" type="checkbox"/>	Cost Saving	<input checked="" type="checkbox"/>	Delivery Fast	<input checked="" type="checkbox"/>	Safety	<input checked="" type="checkbox"/>	Morale Increase		
<input checked="" type="checkbox"/>	Productivity Increase													
<input checked="" type="checkbox"/>	Quality Improved													
<input checked="" type="checkbox"/>	Cost Saving													
<input checked="" type="checkbox"/>	Delivery Fast													
<input checked="" type="checkbox"/>	Safety													
<input checked="" type="checkbox"/>	Morale Increase													




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Hard Coating Department

	DOC. No. : Rev. No. : Eff Date :	KAIZEN IDEA SHEET												
	SHOP : Hard Coating Area LOCATION : Hard Coating Dept. STARTED ON : 3/01/2020 FINISHED ON : 3/10/2020	AFTER IMPROVEMENT												
														
OBSERVATION : Lux Light is not available in Hard Coating Department. IDEA : Lux Light has been installed in hard coating department. RESULT – 1) The use of lux light makes visior film pasting easier. BENEFITS : 1) It is easy to work.	FACILITATOR: Mr. Ravendra Mohan													
<table border="1"> <tr><td><input checked="" type="checkbox"/></td><td>Productivity Increase</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Quality Improved</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Cost Saving</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Delivery Fast</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Safety</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Morale Increase</td></tr> </table>	<input checked="" type="checkbox"/>	Productivity Increase	<input checked="" type="checkbox"/>	Quality Improved	<input checked="" type="checkbox"/>	Cost Saving	<input checked="" type="checkbox"/>	Delivery Fast	<input checked="" type="checkbox"/>	Safety	<input checked="" type="checkbox"/>	Morale Increase		
<input checked="" type="checkbox"/>	Productivity Increase													
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<input checked="" type="checkbox"/>	Delivery Fast													
<input checked="" type="checkbox"/>	Safety													
<input checked="" type="checkbox"/>	Morale Increase													




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Hard Coating Department

	DOC. No. : Rev. No. : Eff Date :	KAIZEN IDEA SHEET												
	SHOP : Hard Coating Area LOCATION : Hard Coating Dept. STARTED ON : 28/07/2020 FINISHED ON : 31/07/2020	AFTER IMPROVEMENT												
														
OBSERVATION : The make cartons and the bins are not in the right place in the gangway. IDEA : All material placing in Blue Bin. Material identification is on the blue bin. RESULT – Maintain 5's BENEFITS : There is a lot of space in the gangway	FACILITATOR: Mr. Ravendra Mohan													
<table border="1"> <tr><td><input checked="" type="checkbox"/></td><td>Productivity Increase</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Quality Improved</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Cost Saving</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Delivery Fast</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Safety</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Morale Increase</td></tr> </table>	<input checked="" type="checkbox"/>	Productivity Increase	<input checked="" type="checkbox"/>	Quality Improved	<input checked="" type="checkbox"/>	Cost Saving	<input checked="" type="checkbox"/>	Delivery Fast	<input checked="" type="checkbox"/>	Safety	<input checked="" type="checkbox"/>	Morale Increase		
<input checked="" type="checkbox"/>	Productivity Increase													
<input checked="" type="checkbox"/>	Quality Improved													
<input checked="" type="checkbox"/>	Cost Saving													
<input checked="" type="checkbox"/>	Delivery Fast													
<input checked="" type="checkbox"/>	Safety													
<input checked="" type="checkbox"/>	Morale Increase													



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STITCHING Department

	DOC. No. : Rev. No. : Eff Date :	KAIZEN IDEA SHEET												
	SHOP : STITCHING AREA LOCATION : Replay HARNESS DEPTT STARTED ON : 28/07/2020 FINISHED ON : 30/07/2020	AFTER IMPROVEMENT												
NA														
OBSERVATION : The replay Harness department is not connected to the gangway. IDEA : The replay Harness department is connected to the gangway. RESULT – 1) 5's Maintain BENEFITS : 1) Easy material movement.	FACILITATOR: Mr. Prasant Mr. Anshu													
<table border="1"> <tr><td><input checked="" type="checkbox"/></td><td>Productivity Increase</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Quality Improved</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Cost Saving</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Delivery Fast</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Safety</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>Morale Increase</td></tr> </table>	<input checked="" type="checkbox"/>	Productivity Increase	<input checked="" type="checkbox"/>	Quality Improved	<input checked="" type="checkbox"/>	Cost Saving	<input checked="" type="checkbox"/>	Delivery Fast	<input checked="" type="checkbox"/>	Safety	<input checked="" type="checkbox"/>	Morale Increase		
<input checked="" type="checkbox"/>	Productivity Increase													
<input checked="" type="checkbox"/>	Quality Improved													
<input checked="" type="checkbox"/>	Cost Saving													
<input checked="" type="checkbox"/>	Delivery Fast													
<input checked="" type="checkbox"/>	Safety													
<input checked="" type="checkbox"/>	Morale Increase													



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STITCHING Department

SHOP : AEROSTAR HARNES AERA		DOC. No. : Rev. No. : Eff Date :
LOCATION : HARNES DEPT 11		KAIZEN IDEA SHEET
STARTED ON : 30/01/2020	FINISHED ON : 31/01/2020	
BEFORE IMPROVEMENT		AFTER IMPROVEMENT
		
OBSERVATION : Electrical wire is not piping On floor.		IDEA : Electrical wire is piping On floor.
RESULT – (1) It has become safety.		FACILITATOR: Mr. Prasant Mr. Anshu.
BENEFITS : 1) Safety		
<input checked="" type="checkbox"/> Productivity Increase	<input type="checkbox"/> Quality Improved	
<input type="checkbox"/> Cost Saving	<input type="checkbox"/> Delivery Fast	
<input type="checkbox"/> Safety	<input type="checkbox"/> Moral Increase	



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Others

SHOP : HR DEPARTMENT		DOC. No. : Rev. No. : Eff Date :
LOCATION : PHERIPERAL AREA		5'S SHEET
STARTED ON : 10-12-19	FINISHED ON : 12-12-19	
BEFORE IMPROVEMENT		AFTER IMPROVEMENT
		
OBSERVATION : There are pipes in the garden area.		IMPLEMENT : Pipes have been removed from the garden area.
RESULT – (1) 5's Maintained.		FACILITATOR: Mr. Naresh Mr. Rupesh
BENEFITS : 1) Safety increased		
<input checked="" type="checkbox"/> Productivity Increase	<input type="checkbox"/> Quality Improved	
<input type="checkbox"/> Cost Saving	<input type="checkbox"/> Delivery Fast	
<input type="checkbox"/> Safety	<input type="checkbox"/> Moral Increase	



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Others

SHOP : HR DEPARTMENT		DOC. No. : Rev. No. : Eff Date :
LOCATION : PHERIPERAL AREA		5'S SHEET
STARTED ON : 10-12-19	FINISHED ON : 11-12-19	
BEFORE IMPROVEMENT		AFTER IMPROVEMENT
		
OBSERVATION : The cylinder is not in its proper place		IMPLEMENT : The area of iron mesh has been defined to keep the cylinder.
RESULT – (1) 5's Maintained.		FACILITATOR: Mr. Naresh Mr. Rupesh
BENEFITS : 1) Safety increased		
<input checked="" type="checkbox"/> Productivity Increase	<input type="checkbox"/> Quality Improved	
<input type="checkbox"/> Cost Saving	<input type="checkbox"/> Delivery Fast	
<input type="checkbox"/> Safety	<input type="checkbox"/> Moral Increase	

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Others

SHOP : HR DEPARTMENT		DOC. No. : Rev. No. : Eff Date :
LOCATION : PHERIPERAL AREA		5'S SHEET
STARTED ON : 11-12-19	FINISHED ON : 11-12-19	
BEFORE IMPROVEMENT		AFTER IMPROVEMENT
		
OBSERVATION : The empty box is placed on the gangway.		IMPLEMENT : The empty box is removed on the gangway.
RESULT – (1) 5's Maintained.		FACILITATOR: Mr. Naresh Mr. Vipin
BENEFITS : 1) Safety		
<input checked="" type="checkbox"/> Productivity Increase	<input type="checkbox"/> Quality Improved	
<input type="checkbox"/> Cost Saving	<input type="checkbox"/> Delivery Fast	
<input type="checkbox"/> Safety	<input type="checkbox"/> Moral Increase	

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Comments

Add comments to the last page, something like---
**Impressions of KAIZEN activities with JICA & CII*
**Future plans*
**Etc.*

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Thank you

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A8.Final Report (SONA BLW)

(CII-JICA Project)

VSME 2.0
Productivity Improvement
through
Integration of TPS & IOT/AI

January 2021


SONA BLW PRECISION FORGINGS LTD.
GURGAON PLANT

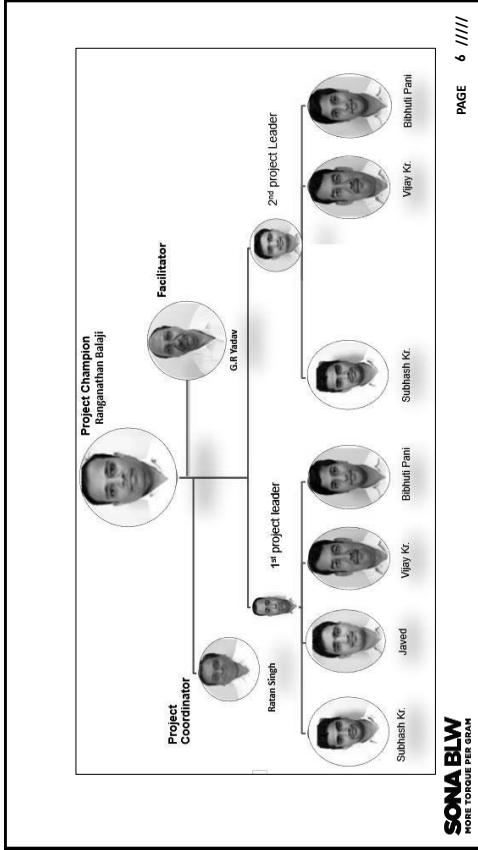


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PART-I	
KAIZEN – Based on TPS	

OBJECTIVE	
<ul style="list-style-type: none"> Implementation of Make One Bin---Inspect One Bin---Pack One Bin Horizontal deployment of Unit#2' best learnings Mapping of Plant on micro level and identifying the MUDA , NVA's. Eliminate the unnecessary transportation of material flow. Implementation No. of Kaizen 10/man related to eliminates the MUDA & NVA'S activities. 	
Plant: Unit II & III	

Project Organization Structure	
<p>SONA TEAM</p> <p>Project Facilitator : R. Balaji Project Coordinator: Ratan Singh Project Leader : unit head name</p> <p>TPS Team:</p> <ol style="list-style-type: none"> Sanjay Khanna Subhash Javed Vijay Bibhuti <p>IOT /AI Team:</p> <ol style="list-style-type: none"> Ranjeet Bhagat Singh Roshan Ashish Rishabh 	<p>JICA TEAM(Experts)</p> <ol style="list-style-type: none"> Dr. Hiroshi Jogasaki (Overseer) Mr. Kiyoshi Yoshida (TPS) Mr. Hiroki Omiya (IoT/AI) <p>CIJ</p> <p>Mr. Amit Vishnoi (Expert) Dr. Sarita Nagpal (Principal Adviser)</p> <p>CIJ: The Confederation of Indian Industry</p>
	

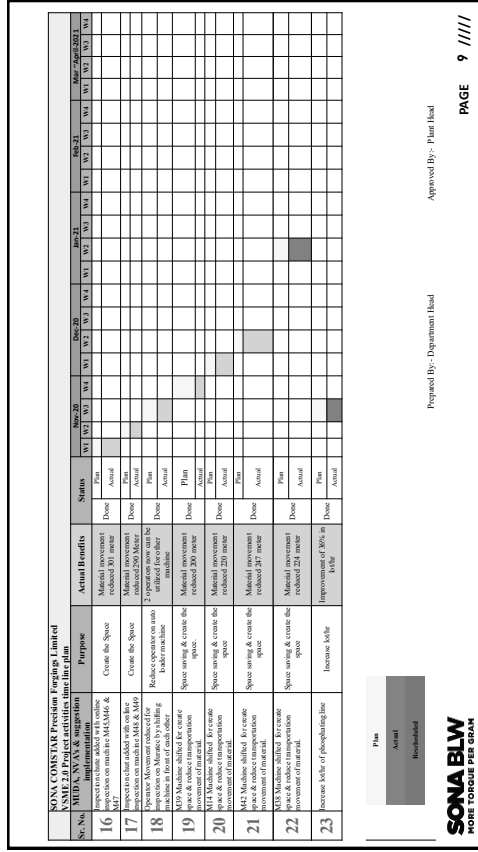
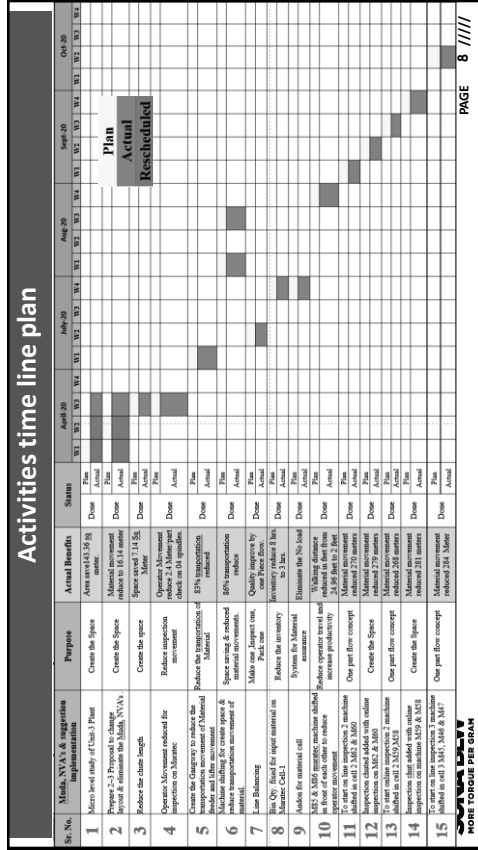


CII **JICA**

Ceremony at Kick-off meeting

Mr. Jogasaki presenting at the Kick-off meeting

Mr. Yoshida speaking in the Kaizen lecture






Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
3	Reduce the chute length of muratic machines (M85 & M86)	Space saving of 7.14 sq meters and operator movement reduced 1.7 meters.	<p>Space Saving in Sq. Meters</p> <p>Operator Movement Reduced in Meters</p>	Implemented
<p>Company: Sona Blw Precision Forgings Ltd. (Unit-3)</p> <p>Dept.: Machine Shop</p> <p>Result: Space saved & material movement reduced</p> <p>Process: Hand Turning</p> <p>Month of Report: Dec-2019</p> <p>Product: Mty</p> <p>Quality: ✓</p> <p>Cost: ✓</p> <p>Delivery: ✓</p> <p>Safety: ✓</p> <p>Morale: ✓</p> <p>Environment: ✓</p> <p>Others: ✓</p> <p>Cost saving/Yr: -</p> <p>Date of Imp: 16/10/2020</p> <p>Suggested by: Avinash Jha</p> <p>Approved by: Vinita Verma</p> <p>Why-Why Analysis: Horizontal Deployment</p> <p>Comments: Material chute length was long & reduced extra space near muratic machine.</p> <p>Comments: Now chute has been reduced extra space near muratic machine.</p> <p>Benefits: Operator movement reduced to 1.7 meter. Space saved is 7.14 sq meter</p> <p>SONA BLW MORE FORGET THE REST</p>				

Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
4	Operator Movement reduced for inspection on Muratic machine (M85 & M86)	Reduce inspection movement	<p>Operator Movement Reduced in Meters</p>	Implemented
<p>Company: Sona Blw Precision Forgings Ltd. (Unit-3)</p> <p>Dept.: Machine Shop</p> <p>Result: Operator movement reduced by inspection chute placed under m/c/m.</p> <p>Process: Hand Turning</p> <p>Month of Report: Dec-2019</p> <p>Product: Mty</p> <p>Quality: ✓</p> <p>Cost: ✓</p> <p>Delivery: ✓</p> <p>Safety: ✓</p> <p>Morale: ✓</p> <p>Environment: ✓</p> <p>Others: ✓</p> <p>Cost saving/Yr: -</p> <p>Date of Imp: 16/10/2020</p> <p>Suggested by: Avinash Jha</p> <p>Approved by: Vinita Verma</p> <p>Why-Why Analysis: Horizontal Deployment</p> <p>Comments: Earlier operator had to travel a distance of 2.7 meter for part inspection operator had to travel only 0.3 meter.</p> <p>Benefits: Operator movement reduced to 2.4 meter for each part check.</p> <p>SONA BLW MORE FORGET THE REST</p>				

Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
5	Create the Gangway to reduce the transportation of Material feeder and lifter movement	Reduce the transportation of Material feeder and lifter movement	<p>Material Movement Reduced in Meters</p>	Implemented
<p>Company: Sona Blw Precision Forgings Ltd. (Unit-3)</p> <p>Dept.: M/Shop</p> <p>Result: Implemented</p> <p>Process: Hand Turning, Phosphate, & FGS movement</p> <p>Month of Report: Dec-2019</p> <p>Product: Mty</p> <p>Quality: ✓</p> <p>Cost: ✓</p> <p>Delivery: ✓</p> <p>Safety: ✓</p> <p>Morale: ✓</p> <p>Environment: ✓</p> <p>Others: ✓</p> <p>Cost saving/Yr: -</p> <p>Suggested by: S. Khan</p> <p>Approved by: M. Ram Man</p> <p>Why-Why Analysis: Horizontal Deployment</p> <p>Comments: Gangway MA & Material transportation distance was 118.8 meters to CS delivery 20.7 meters.</p> <p>Comments: Gangway provided & material transportation distance reduced 65%. After Pallet (G-4) to CS delivery 20.7 meters.</p> <p>Benefits: Material transportation movement 83% reduced by implementing new Gangway.</p> <p>SONA BLW MORE FORGET THE REST</p>				

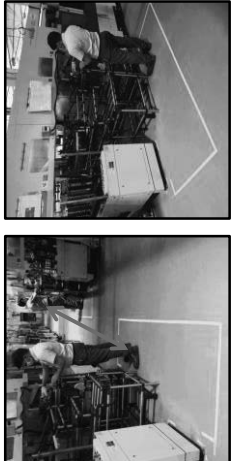
Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
6	Machine shifting for create space & reduce transportation movement of material.	Space saving & reduced material movements.	<p>Material Movement Reduced in Meters</p> <p>Space Saving in Sq. Meters</p>	Implemented
<p>Company: Sona Blw Precision Forgings Ltd. (Unit-3)</p> <p>Dept.: Machine Shop</p> <p>Result: Operator movement reduced by inspection chute placed under m/c/m.</p> <p>Process: Hand Turning</p> <p>Month of Report: Dec-2019</p> <p>Product: Mty</p> <p>Quality: ✓</p> <p>Cost: ✓</p> <p>Delivery: ✓</p> <p>Safety: ✓</p> <p>Morale: ✓</p> <p>Environment: ✓</p> <p>Others: ✓</p> <p>Cost saving/Yr: -</p> <p>Date of Imp: 16/10/2020</p> <p>Suggested by: Avinash Jha</p> <p>Approved by: Vinita Verma</p> <p>Why-Why Analysis: Horizontal Deployment</p> <p>Comments: Now for part inspection operator had to travel only 0.3 meter.</p> <p>Benefits: Operator movement reduced to 2.4 meter for each part check.</p> <p>SONA BLW MORE FORGET THE REST</p>				

Sl. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status																		
7	Line Balancing	Make one, inspect one, Pack one	Quality improve by one Piece flow. PPLH improved 7.3%. Implemented	Implemented																		
<p>Company: Sonu Constar Unit-3 Subject: Make one, inspect one, Pack one</p> <p>Dept.: QC-4 / M/Shop Result: Implemented Process: QC-4 Harri Marking</p> <p>Month of Report: Feb-2020</p> <p>Before  After </p> <p>QC-4 PPLH Make 1, Inspect 1, Pack 1</p> <p>In nos./hrs: <table border="1"> <tr><td>171</td><td>181</td></tr> <tr><td>200</td><td></td></tr> <tr><td>180</td><td></td></tr> <tr><td>150</td><td></td></tr> <tr><td>120</td><td></td></tr> <tr><td>90</td><td></td></tr> <tr><td>60</td><td></td></tr> <tr><td>30</td><td></td></tr> <tr><td>0</td><td></td></tr> </table> Before After</p> <p>1. In terms of productivity:- Increase 0.170 instead of 0.600 by individual 5 Min. Quick feedback mechanism for improve FTR 100%. 2. Reduce the rejection and rework. 3. Saving of the space. 4. Improve the ergonomics.</p> <p>Comments: 1. Manpower for inspection & packing will be in the production. Horizontal Deployment M72, M46, M17, M71</p> <p>Why-Why Analysis Idea Not in mind.</p> <p>Briefly: In terms of productivity:- 10% to 20% increase in line output, Quick feedback mechanism for improve FTR, 100% labor for rejection and rework, improve quality. Saving of the space.</p> <p>Approved by:  Javed Kaur Mr. Ram Nihal</p>					171	181	200		180		150		120		90		60		30		0	
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200																						
180																						
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120																						
90																						
60																						
30																						
0																						

Operator Movement reduced on Muratec-M/c

- Reduce the fatigue of operator as per social distancing.
- Reduce manual time of operator (walking & inspection time)
- Improve PPLH 15%.
- Easy to handle 02 spindle by single manpower.

Muratec m/c existing layout with two o/p for understanding

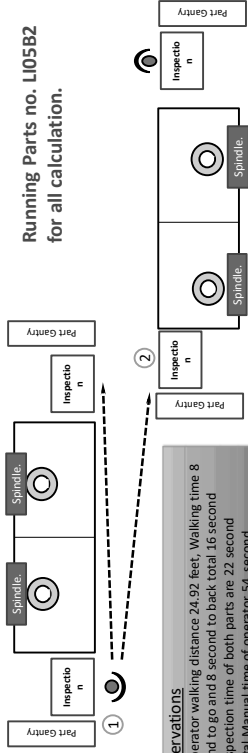


SONA BLW
MORE TORQUE PER GRAM

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Present Layout of Muratec-M/c (M85 & M86)

Running Parts no. LI05B2 for all calculation.



Observations

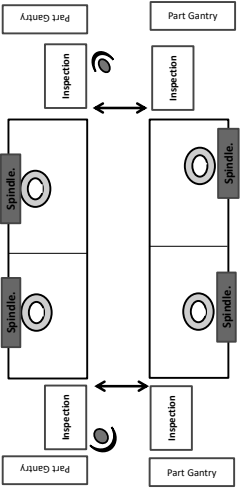
- Operator walking distance 24.92 feet, Walking time 8 second to go and 8 second to back total 16 second
- Inspection time of both parts are 22 second
- Total Manual time of operator -54 second
- Auto time of one spindle 35.50 second
- Part loading time in table 16 second. 1 parts loading time is 1.1 sec. (14 parts loading in row).
- Every times 4 to 6 parts accumulate for inspection.
- Chances of inspection missing by operator.
- Production/Hrs. target - 104.nos. from 01 spindle.

SONA BLW
MORE TORQUE PER GRAM

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Proposed Layout Muratec-M/c (M85 & M86)

Running Parts no. LI05B2 for all calculation.



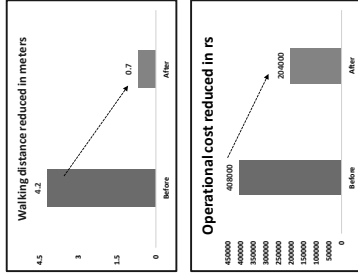
> Advantage

- Operator walking distance reduced from 16 sec. to 2 sec.
- Walking distance reduced in feet from 24.96 feet to 2 feet.
- Saved 02 extra manpower for operational both spindle of Machine as per layout.
- Saved extra floor Space by New Layout. Machine's (20x25= 500 square feet / 46.452 Square meters).
- Improved PPLH (685 nos. to 808 nos./Shift), Because of 02 spindle operation feasible by single manpower

SONA BLW
MORE TORQUE PER GRAM

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Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
7	<p>Company: Son Blw Precision Forgings Ltd. (Unit-3)</p> <p>Subject: Reduce operator travel</p> <p>Dept.: Machine Shop</p> <p>Result: Operator movement speed by eliminating speed motion box</p> <p>Process: Hard Turning (Funic Controller)</p> <p>Month of Report: _____</p> <p>Productivity: _____</p> <p>Quality: <input checked="" type="checkbox"/></p> <p>Cost: <input checked="" type="checkbox"/></p> <p>Delivery: <input checked="" type="checkbox"/></p> <p>Safety: <input checked="" type="checkbox"/></p> <p>Morale: <input checked="" type="checkbox"/></p> <p>Environment: <input checked="" type="checkbox"/></p> <p>Others: _____</p> <p>Cost saving/Yr: 204000 rs</p> <p>Date of Implement: 26/08/2020</p> <p>Suggested by: Avinash Jha</p> <p>Approved by: Vikas Verma</p>	Reduce walking distance of operator	Walking distance reduced from 4.2 meter to 0.7 meter.	Implemented
<p>Comments: Fatigue for operator and not easy to handle 2 spindles at same time</p> <p>Comments: Now by machine shifting to handle 2 spindles at same time</p> <p>Comments: Now by machine shifting to handle 2 spindles at same time</p> <p>Why-Why Analysis: Horizontal Deployment</p> <p>Benefits: Operator walking distance reduced from 16 sec. to 2 sec. Walking distance reduced in meter from 4.2 m. to 0.7 meter. Time manpower for operational both spindle of machine and cost saving 204000 rs/year.</p>				



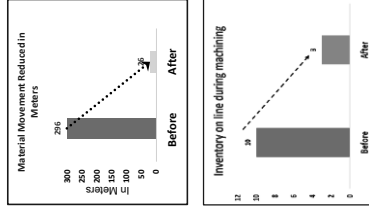
Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
12	<p>Company: Son Blw Precision Forgings Ltd. (Unit-3)</p> <p>Subject: Make one inspect one, Pick one</p> <p>Dept.: Machine Shop</p> <p>Result: Space saved & material movement reduced</p> <p>Process: Hard Turning (Funic Controller)</p> <p>Month of Report: _____</p> <p>Productivity: <input checked="" type="checkbox"/></p> <p>Quality: <input checked="" type="checkbox"/></p> <p>Cost: <input checked="" type="checkbox"/></p> <p>Delivery: <input checked="" type="checkbox"/></p> <p>Safety: <input checked="" type="checkbox"/></p> <p>Morale: <input checked="" type="checkbox"/></p> <p>Environment: <input checked="" type="checkbox"/></p> <p>Others: _____</p> <p>Cost saving/Yr: _____</p> <p>Date of Implement: 13/09/2020</p> <p>Suggested by: Avinash Jha</p> <p>Approved by: Vikas Verma</p>	Create the Space	Material movement reduced 279 meter. Inventory decreased by 5 bans.	Implemented
<p>Comments: Barter parts need to travel a distance for PVC</p> <p>Comments: Barter parts need to travel a distance for PVC</p> <p>Comments: Barter parts need to travel a distance for PVC</p> <p>Why-Why Analysis: Horizontal Deployment</p> <p>Benefits: Quick feedback mechanism for achieving 100% PTH. Quick feedback if any problem arise during any stage. One line inspection & one line dispatch</p>				



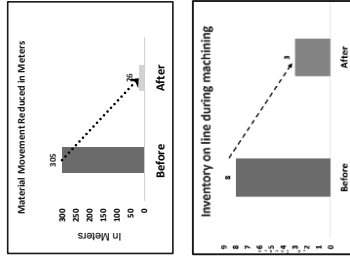
BEFORE

AFTER

Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
11	<p>Company: Son Blw Precision Forgings Ltd. (Unit-3)</p> <p>Subject: Make one inspect one, Pick one</p> <p>Dept.: Machine Shop</p> <p>Result: Space saved & material movement reduced</p> <p>Process: Hard Turning (Funic Controller)</p> <p>Month of Report: _____</p> <p>Productivity: <input checked="" type="checkbox"/></p> <p>Quality: <input checked="" type="checkbox"/></p> <p>Cost: <input checked="" type="checkbox"/></p> <p>Delivery: <input checked="" type="checkbox"/></p> <p>Safety: <input checked="" type="checkbox"/></p> <p>Morale: <input checked="" type="checkbox"/></p> <p>Environment: <input checked="" type="checkbox"/></p> <p>Others: _____</p> <p>Cost saving/Yr: _____</p> <p>Date of Implement: 06/09/2020</p> <p>Suggested by: Avinash Jha</p> <p>Approved by: Vikas Verma</p>	One part flow concept	Material movement reduced 270 meter. Inventory decreased by 7 bans.	Implemented
<p>Comments: Operator's work is difficult to understand and inspection and packing was done in batches</p> <p>Comments: Operator's work is difficult to understand and inspection and packing was done in batches</p> <p>Comments: Operator's work is difficult to understand and inspection and packing was done in batches</p> <p>Why-Why Analysis: Horizontal Deployment</p> <p>Benefits: Quick feedback mechanism for achieving 100% PTH. Quick feedback if any problem arise during any stage. One line inspection & one line dispatch</p>				



Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
12	<p>Company: Son Blw Precision Forgings Ltd. (Unit-3)</p> <p>Subject: Make one inspect one, Pick one</p> <p>Dept.: Machine Shop</p> <p>Result: Space saved & material movement reduced</p> <p>Process: Hard Turning (Funic Controller)</p> <p>Month of Report: _____</p> <p>Productivity: <input checked="" type="checkbox"/></p> <p>Quality: <input checked="" type="checkbox"/></p> <p>Cost: <input checked="" type="checkbox"/></p> <p>Delivery: <input checked="" type="checkbox"/></p> <p>Safety: <input checked="" type="checkbox"/></p> <p>Morale: <input checked="" type="checkbox"/></p> <p>Environment: <input checked="" type="checkbox"/></p> <p>Others: _____</p> <p>Cost saving/Yr: _____</p> <p>Date of Implement: 13/09/2020</p> <p>Suggested by: Avinash Jha</p> <p>Approved by: Vikas Verma</p>	Create the Space	Material movement reduced 279 meter. Inventory decreased by 5 bans.	Implemented
<p>Comments: Barter parts need to travel a distance for PVC</p> <p>Comments: Barter parts need to travel a distance for PVC</p> <p>Comments: Barter parts need to travel a distance for PVC</p> <p>Why-Why Analysis: Horizontal Deployment</p> <p>Benefits: Quick feedback mechanism for achieving 100% PTH. Quick feedback if any problem arise during any stage. One line inspection & one line dispatch</p>				







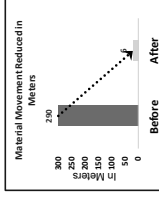
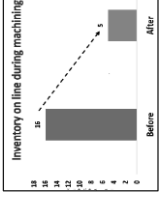








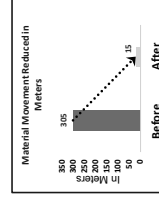
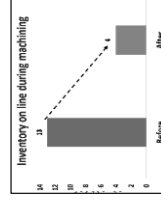
Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
13	Online inspection (M58 & M59) Company: Sona Blw Precision Forging Ltd. (Unit-3) Subject: Make one inspect one, Pack one	One part flow concept Result: Spare saved & material movement reduced Process: Hard Turning (Fauc Controller)	Material movement reduced 268 meter. Inventory reduced by 8 bins. Material Movement Reduced in Meters Before: 300, After: 280 Inventory on line during machining Before: 14, After: 4	Implemented
<p>Comments: Operation not only to understand and also spare is a spare for transportation.</p> <p>Why-Why Analysis</p> <p>Comments: Now one part made, and packed at the same line thus increasing the delivery rate.</p> <p>Horizontal Deployment</p> <p>Benefits: Quick feedback mechanism for achieving 100% FTR. Quick feedback if any problem arise during any stage. One line inspection & one line dispatch</p> <p>SONA BLW MOBE TORQUE DIE SRAM</p>				







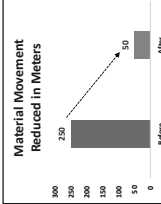
Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
14	Inspection chute added (M58 & M59) Company: Sona Blw Precision Forging Ltd. (Unit-3) Subject: Make one inspect one, Pack one	Create the space Result: Spare saved & material movement reduced Process: Hard Turning (Fauc Controller)	Material movement reduced 281 meter. Inventory reduced by 9 bins. Material Movement Reduced in Meters Before: 300, After: 21 Inventory on line during machining Before: 11, After: 2	Implemented
<p>Comments: Earlier part were checked at different locations thus increasing the delivery rate.</p> <p>Why-Why Analysis</p> <p>Comments: Now parts are inspected and packed at the same line thus increasing the delivery rate.</p> <p>Horizontal Deployment</p> <p>Benefits: Quick feedback mechanism for achieving 100% FTR. Quick feedback if any problem arise during any stage. One line inspection & one line dispatch</p> <p>SONA BLW MOBE TORQUE DIE SRAM</p>				







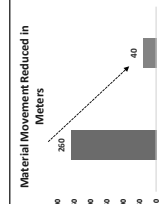
Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
15	Online inspection (M45, M46 & M47) Company: Sona Blw Precision Forging Ltd. (Unit-3) Subject: Make one inspect one, Pack one	One part flow concept Result: Spare saved & material movement reduced Process: Hard Turning (Fauc Controller)	Material movement reduced 284 meter. Inventory reduced by 5 bins. Material Movement Reduced in Meters Before: 300, After: 16 Inventory on line during machining Before: 8, After: 3	Implemented
<p>Comments: If part made without then spare do the analysis who has made it as parts moved to next stage on another line for inspection.</p> <p>Why-Why Analysis</p> <p>Comments: Now one part made, inspected and we can do analysis who made it and how it can be corrected.</p> <p>Horizontal Deployment</p> <p>Benefits: Quick feedback mechanism for achieving 100% FTR. Quick feedback if any problem arise during any stage. One line inspection & one line dispatch</p> <p>SONA BLW MOBE TORQUE DIE SRAM</p>				

Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status
16	Inspection chute added (M45, M46 & M47) Company: Sona Blw Precision Forging Ltd. (Unit-3) Subject: Make one inspect one, Pack one	Create the space Result: Spare saved & material movement reduced Process: Hard Turning (Fauc Controller)	Material movement reduced 301 meter. Inventory reduced by 9 bins. Material Movement Reduced in Meters Before: 300, After: 9 Inventory on line during machining Before: 14, After: 5	Implemented
<p>Comments: Earlier it is difficult to check the part as we can only check when it moved to next stage.</p> <p>Why-Why Analysis</p> <p>Comments: Now we can check hand by hand as we can only check when it moved to next stage.</p> <p>Horizontal Deployment</p> <p>Benefits: Quick feedback mechanism for achieving 100% FTR. Quick feedback if any problem arise during any stage. One line inspection & one line dispatch</p> <p>SONA BLW MOBE TORQUE DIE SRAM</p>				

Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status																																																																
17	Online inspection (M48 & M49)	One part flow concept	Material movement reduced 284 meter. Inventory reduced by 11 bins.	Implemented																																																																
<table border="1"> <tr> <td>Company: Sona Blw Precision</td> <td>Dept.: Machine Shop</td> <td>Result: Space saved & material movement reduced</td> <td>Month of Report</td> </tr> <tr> <td>Project: M48 & M49</td> <td>Unit: 31</td> <td>Process: In-Plant Turnning (In-Plant Controller)</td> <td>2020</td> </tr> <tr> <td colspan="2">Subject: Make one inspection, Pick one</td> <td>Before</td> <td>After</td> </tr> <tr> <td colspan="2">  </td> <td colspan="2">  </td> </tr> <tr> <td>Comments: Enter the operation was difficult to work upon as the inventory was high.</td> <td>Comments: Now these free operation to work upon as the inventory has reduced to achieve our target.</td> <td>Productivity</td> <td>Quality</td> </tr> <tr> <td></td> <td>Horizontal Deployment</td> <td>Cost saving/Yr</td> <td>Delivery</td> </tr> <tr> <td>Why-Why Analysis</td> <td></td> <td>Date of Implement</td> <td>Safety</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Morale</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Environment</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Others</td> </tr> <tr> <td></td> <td></td> <td>Cost saving/Yr</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Date of Implement</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Suggested by</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Approved by</td> <td></td> </tr> <tr> <td colspan="2">SONA BLW</td> <td></td> <td></td> </tr> <tr> <td colspan="2">MORE TORQUE PER CRANK</td> <td></td> <td></td> </tr> </table>					Company: Sona Blw Precision	Dept.: Machine Shop	Result: Space saved & material movement reduced	Month of Report	Project: M48 & M49	Unit: 31	Process: In-Plant Turnning (In-Plant Controller)	2020	Subject: Make one inspection, Pick one		Before	After					Comments: Enter the operation was difficult to work upon as the inventory was high.	Comments: Now these free operation to work upon as the inventory has reduced to achieve our target.	Productivity	Quality		Horizontal Deployment	Cost saving/Yr	Delivery	Why-Why Analysis		Date of Implement	Safety				Morale				Environment				Others			Cost saving/Yr				Date of Implement				Suggested by				Approved by		SONA BLW				MORE TORQUE PER CRANK			
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	Horizontal Deployment	Cost saving/Yr	Delivery																																																																	
Why-Why Analysis		Date of Implement	Safety																																																																	
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Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status																																																																
18	Inspection chute added (M48, M49)	Create the space	Material movement reduced 290 meter. Inventory reduced by 9 bins.	Implemented																																																																
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19	M39 Machine shifted	Create the space	Material movement reduced from 250 meters to 50 meters.	Implemented																																																																
<table border="1"> <tr> <td>Company: Sona Blw Precision</td> <td>Dept.: Machine Shop</td> <td>Result: Space saved & material movement reduced</td> <td>Month of Report</td> </tr> <tr> <td>Project: M39</td> <td>Unit: 31</td> <td>Process: In-Plant Turnning (In-Plant Controller)</td> <td>2020</td> </tr> <tr> <td colspan="2">Subject: Machine shifted for space</td> <td>Before</td> <td>After</td> </tr> <tr> <td colspan="2">  </td> <td colspan="2">  </td> </tr> <tr> <td>Comments: Transportation of material was difficult as material needed to move to different location for checking</td> <td>Comments: Now after machine shifting material movement is less</td> <td>Productivity</td> <td>Quality</td> </tr> <tr> <td></td> <td>Horizontal Deployment</td> <td>Cost saving/Yr</td> <td>Delivery</td> </tr> <tr> <td>Why-Why Analysis</td> <td></td> <td>Date of Implement</td> <td>Safety</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Morale</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Environment</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Others</td> </tr> <tr> <td></td> <td></td> <td>Cost saving/Yr</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Date of Implement</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Suggested by</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Approved by</td> <td></td> </tr> <tr> <td colspan="2">SONA BLW</td> <td></td> <td></td> </tr> <tr> <td colspan="2">MORE TORQUE PER CRANK</td> <td></td> <td></td> </tr> </table>					Company: Sona Blw Precision	Dept.: Machine Shop	Result: Space saved & material movement reduced	Month of Report	Project: M39	Unit: 31	Process: In-Plant Turnning (In-Plant Controller)	2020	Subject: Machine shifted for space		Before	After					Comments: Transportation of material was difficult as material needed to move to different location for checking	Comments: Now after machine shifting material movement is less	Productivity	Quality		Horizontal Deployment	Cost saving/Yr	Delivery	Why-Why Analysis		Date of Implement	Safety				Morale				Environment				Others			Cost saving/Yr				Date of Implement				Suggested by				Approved by		SONA BLW				MORE TORQUE PER CRANK			
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Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status																																																																
20	M14 Machine shifted	Create the space	Material movement reduced from 260 meter to 40 meter	Implemented																																																																
<table border="1"> <tr> <td>Company: Sona Blw Precision</td> <td>Dept.: Machine Shop</td> <td>Result: Space saved & material movement reduced</td> <td>Month of Report</td> </tr> <tr> <td>Project: M14</td> <td>Unit: 31</td> <td>Process: In-Plant Turnning (In-Plant Controller)</td> <td>2020</td> </tr> <tr> <td colspan="2">Subject: Machine shifted for space</td> <td>Before</td> <td>After</td> </tr> <tr> <td colspan="2">  </td> <td colspan="2">  </td> </tr> <tr> <td>Comments: Transportation of material was difficult as material needed to move to different location for checking</td> <td>Comments: Now after machine shifting material movement is less</td> <td>Productivity</td> <td>Quality</td> </tr> <tr> <td></td> <td>Horizontal Deployment</td> <td>Cost saving/Yr</td> <td>Delivery</td> </tr> <tr> <td>Why-Why Analysis</td> <td></td> <td>Date of Implement</td> <td>Safety</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Morale</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Environment</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Others</td> </tr> <tr> <td></td> <td></td> <td>Cost saving/Yr</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Date of Implement</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Suggested by</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Approved by</td> <td></td> </tr> <tr> <td colspan="2">SONA BLW</td> <td></td> <td></td> </tr> <tr> <td colspan="2">MORE TORQUE PER CRANK</td> <td></td> <td></td> </tr> </table>					Company: Sona Blw Precision	Dept.: Machine Shop	Result: Space saved & material movement reduced	Month of Report	Project: M14	Unit: 31	Process: In-Plant Turnning (In-Plant Controller)	2020	Subject: Machine shifted for space		Before	After					Comments: Transportation of material was difficult as material needed to move to different location for checking	Comments: Now after machine shifting material movement is less	Productivity	Quality		Horizontal Deployment	Cost saving/Yr	Delivery	Why-Why Analysis		Date of Implement	Safety				Morale				Environment				Others			Cost saving/Yr				Date of Implement				Suggested by				Approved by		SONA BLW				MORE TORQUE PER CRANK			
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Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status																																				
21	M42 Machine shifted	Create the space	Material movement reduced from 290 meters to 43 meters	Implemented																																				
<table border="1"> <tr> <td>Company: Sona Blw Precision Forgeing Ltd. (Unit-3)</td> <td>Dept.: Machine Shop</td> <td>Result: Space saved & material movement reduced</td> <td>Month of Report</td> </tr> <tr> <td>Subject: Machine shifted for space</td> <td>Before</td> <td>After</td> <td>Prese: (Red Turning) (onic Controller)</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Comments: Transportation of material was reduced to move to different location for checking.</td> <td>Productive</td> <td>Quality</td> <td>Cost</td> </tr> <tr> <td></td> <td>Delivery</td> <td>Safety</td> <td>Morale</td> </tr> <tr> <td></td> <td>Environment</td> <td>Others</td> <td></td> </tr> <tr> <td>Why-Why Analysis</td> <td>Horizontal Deployment</td> <td>Cost saving/Yr</td> <td>Date of Implement</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Suggested by</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Approved by</td> </tr> </table>					Company: Sona Blw Precision Forgeing Ltd. (Unit-3)	Dept.: Machine Shop	Result: Space saved & material movement reduced	Month of Report	Subject: Machine shifted for space	Before	After	Prese: (Red Turning) (onic Controller)					Comments: Transportation of material was reduced to move to different location for checking.	Productive	Quality	Cost		Delivery	Safety	Morale		Environment	Others		Why-Why Analysis	Horizontal Deployment	Cost saving/Yr	Date of Implement				Suggested by				Approved by
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			Suggested by																																					
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<p>Material Movement Reduced in Meters</p> <table border="1"> <tr> <th>Category</th> <th>Value (Meters)</th> </tr> <tr> <td>Before</td> <td>290</td> </tr> <tr> <td>After</td> <td>43</td> </tr> </table>					Category	Value (Meters)	Before	290	After	43																														
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<p>SONA BLW MORE TORQUE PER GRAM</p>																																								

Sr. No.	Muda, NVA's & suggestion implementation	Purpose	Actual Benefits	Status																																				
22	M38 Machine shifted	Create the space	Material movement reduced 256 meters to 32 meters.	Implemented																																				
<table border="1"> <tr> <td>Company: Sona Blw Precision Forgeing Ltd. (Unit-3)</td> <td>Dept.: Machine Shop</td> <td>Result: Space saved & material movement reduced</td> <td>Month of Report</td> </tr> <tr> <td>Subject: Machine shifted for space</td> <td>Before</td> <td>After</td> <td>Prese: (Red Turning) (onic Controller)</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Comments: Transportation of material was reduced to move to different location for checking.</td> <td>Productive</td> <td>Quality</td> <td>Cost</td> </tr> <tr> <td></td> <td>Delivery</td> <td>Safety</td> <td>Morale</td> </tr> <tr> <td></td> <td>Environment</td> <td>Others</td> <td></td> </tr> <tr> <td>Why-Why Analysis</td> <td>Horizontal Deployment</td> <td>Cost saving/Yr</td> <td>Date of Implement</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Suggested by</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Approved by</td> </tr> </table>					Company: Sona Blw Precision Forgeing Ltd. (Unit-3)	Dept.: Machine Shop	Result: Space saved & material movement reduced	Month of Report	Subject: Machine shifted for space	Before	After	Prese: (Red Turning) (onic Controller)					Comments: Transportation of material was reduced to move to different location for checking.	Productive	Quality	Cost		Delivery	Safety	Morale		Environment	Others		Why-Why Analysis	Horizontal Deployment	Cost saving/Yr	Date of Implement				Suggested by				Approved by
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Category	Value (Meters)																																							
Before	256																																							
After	32																																							
<p>SONA BLW MORE TORQUE PER GRAM</p>																																								

Muda Elimination in Phosphating Cell

Objective :
To improve 2.4 lots per hour to 4 lots per hour

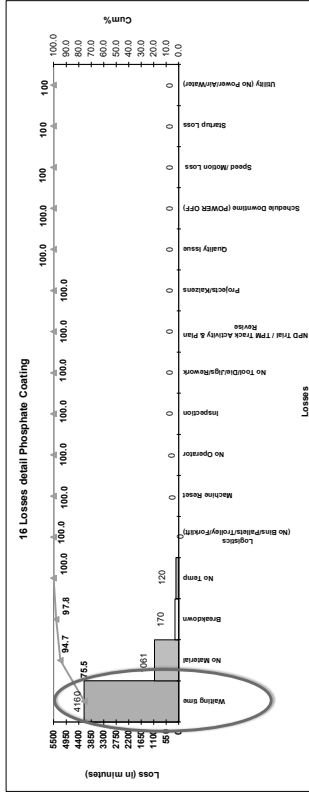
SONA BLW
MORE TORQUE PER GRAM

Trend of output : Lot/hr

Year	Output (Lot/hr)
FY:18	1.6
FY:19	2.1
FY:20	2.4
Aug	2.42
Sept	2.44
Oct	2.77
Nov	3.26
Dec	3.29
Jan-21	3.8

SONA BLW
MORE TORQUE PER GRAM

16 Losses in phosphating Sep '20

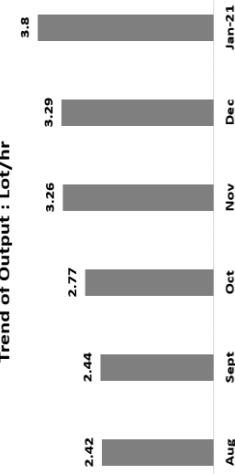


Action executed to achieve results

Sr.#	Problem	Reason	Action to be taken	Prevent Resp	When	Status
1	Waiting time for empty trollies was 74.5% to total loss time	Against standard requirement of 7 trollies, we were operating on 5 trollies	2 trollies need to procure	N/A	1st Nov	Completed
2	Waiting time for empty trollies was 19.2% to total loss time	hand to mount material from Hard machining & OSP HT	Flexible timing of heater start-ups, Heaters to be started only once have opening stock of 4K for phosphating	Need to review on hourly basis	Rattan Singh	Immediately Completed

Results

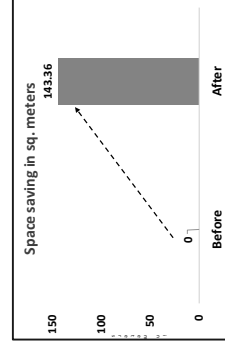
Trend of Output : Lot/hr



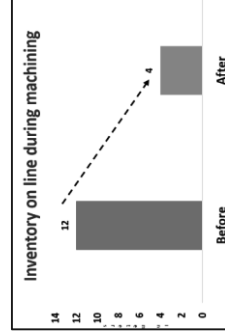
Improved by 36 %

Over all result

Tangible benefits-1

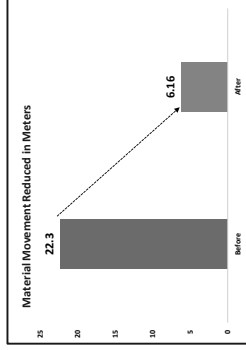


1. Area saved - 143.36 meter

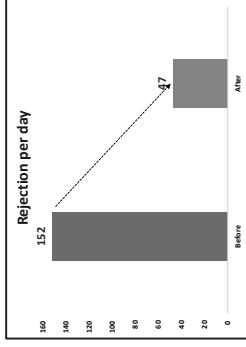


2. Inventory reduced -12 bins to 4 bins

Tangible benefits-2

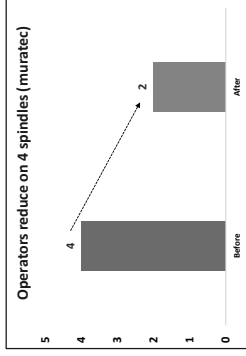


3. Material movement reduced - 22.3 meter to 6.16 meter

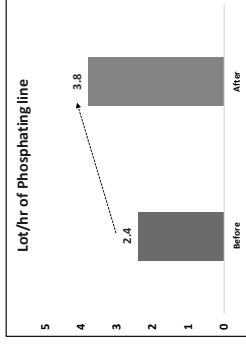


4. Rejection reduced from 152 parts to 47 parts per day

Tangible benefits-3



5. Manpower reduced from 4 to 2 nos on muratec machine



6. Lot/hr increased from 2.4 to 3.8

Intangible benefits

1. Team spirit of operators increased.
2. Fatigue has been reduced.
3. Key learnings on MUDA, NVA activities is enhanced.
4. Focus work environment has been created.
5. Recognition to employees for there good work.

PART - II

DIGITAL KAIZEN – RUBY ON RAILS LEARNING

Team Member

- Ranjeet Singh
- Bibhuti Pani
- Bhagat Singh
- Ashish Tiwari
- Rishabh Goel
- Raushan Kumar



Mr. Omiya during the IoT lecture



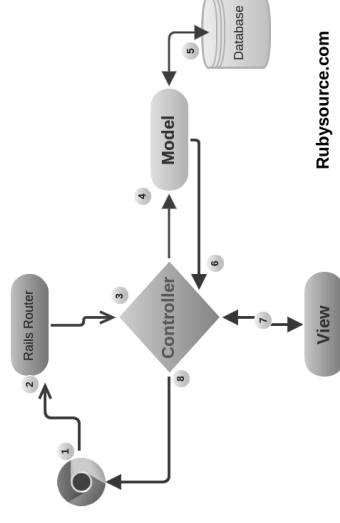
Topics Covered

1. Introduction to Ruby on Rails
2. Understanding MCV diagram
3. Working with Numbers and Strings
4. Various Functions & Methods of Numbers & Strings
5. Assignment – Developing Rock Paper Scissor game.
6. Installation of Rails using Ruby Command prompt
7. Generating ROR Project
8. CRUD Functionality

1. Introduction to Ruby on Rails

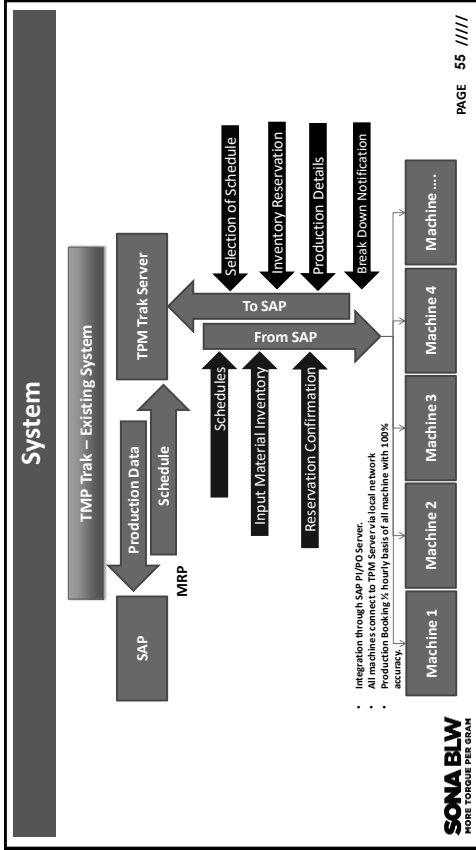
- Ruby on Rails is a web application framework written in Ruby, a dynamic programming language.
- Ruby on Rails uses the Model-View-Controller (MVC) architecture pattern to organize application programming.
- A Model in a Ruby on Rails framework maps to a table in a database
- A Controller is the component of Rails that responds to external requests from the web server to the application, and responds to the external request by determining which view file to render
- A View in the default configuration of Rails is an erb file. It is typically converted to output html at run-time

2. Understanding MCV diagram



8. CRUD Functionality

- CRUD operations are commonly used in web development and it stands for:
 - Create – creating a record
 - Read – reading a record
 - Update – update/editing a record
 - Delete – deleting the record
- Following this CRUD functions ROR provides 7 different routes:-
 - Index – will display a list of all the records
 - New – will let the user to create a new record
 - Create – this will save the newly created record
 - Show – will display the record
 - Edit – will help to edit the saved record
 - Update – will save the edited record
 - Destroy – will delete the record



Child Item Selection with Batch wise

Schedule Selection

Part No.	Part Name	QTY	Priority	Activity	Machine
123456789	ALUMINUM SHAFT	1000	1	12-15-2019	Machine 1
123456789	ALUMINUM SHAFT	1000	1	12-15-2019	Machine 2
123456789	ALUMINUM SHAFT	1000	1	12-15-2019	Machine 3
123456789	ALUMINUM SHAFT	1000	1	12-15-2019	Machine 4

Child Item Selection

Child Part	Batch	Available Qty	Priority	Reserve Qty	Release Date
123456789-001	001	1000	1	0	12-15-2019
123456789-002	002	1000	1	0	12-15-2019
123456789-003	003	1000	1	0	12-15-2019
123456789-004	004	1000	1	0 <td>12-15-2019</td>	12-15-2019

Production Running

CYCLE STARTED: 12/15/2019 11:14:19 AM
 Released Qty: 10
 Batch Count: 1
 Part No.: 123456789
 Part Name: ALUMINUM SHAFT
 Child Part No.: 123456789-001
 Child Part Name: ALUMINUM SHAFT
 Name: 58 S
 MFD Manufacturing: 0 S
 MFD Manufacturing: 0 S
 Release date: 12-15-2019

Release sending to SAP

CONFIRM SCHEDULE RELEASE
 Part No.: 123456789
 Part Name: ALUMINUM SHAFT
 Child Part No.: 123456789-001
 Child Part Name: ALUMINUM SHAFT
 YES NO
 No. of Child Parts: 10
 Estimated Time: 0.5
 Remaining Time: 0.5

Sona Andon- Production Area Information

Work Center	Machine Description	Part Number	Schedule Quantity	Tables Completed till Time	Shift	Machine Status	Last Known Process Status
MM6-65-41	MERATEC AW 120 MCHS	ALHMBL-S006-300-0	2,500	453	1P	Cycle Running	In Production
MM6-65-42	MERATEC AW 120 MCHS	ALHMBL-M016-300-0	2,200	174		ED stand	Machine Breakdown (STRK) Aug 15 2019 3:48
MM6-65-43	CNC MACHINE LT2LM	ALHMBL-L006-300-0	540	146	1P	ED stand	PRODUCTION (END) Aug 19 2019 11:23AM
MM6-65-44	MERATEC AW 120	ALHMBL-M006-300-0	2,500	586	555	91	Cycle Running
MM6-65-45	MERATEC AW 120	ALHMBL-M006-300-0	2,000	586	554	91	Cycle Running
MM6-65-46	MERATEC AW 120	ALHMBL-L006-300-0	850	291	55	1P	Cycle Running
MM6-65-47	CNC TCB MCHS	ALHMBL-L006-300-0	1,300	531	504	91	Cycle Running
MM6-65-48	CNC TCB MCHS	ALHMBL-C001-300-0	500	519	387	75	Cycle Running
MM6-65-49	CNC TCB MCHS	ALHMBL-S001-300-0	400	331	295	78	Cycle Running

Andon In Shop Floor

Time	Target (per hour)	Actual
07:50:08	840	640
08:10:09	840	1680
09:10:10	840	2520
10:10:11	840	3360
11:10:12	840	4200

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TPM Reports

Reports

- Production Report - Machine-wise
- Production Report - Component-wise
- Downtime Report
- Andon In Shop Floor Report - Machine-wise
- Production and Downtime Report - Daily By Hour
- MIS Report
- Breakdown Phenomena Report

Report Type: Production Report - Machine-wise

Type: Machine-wise

Shift: [Dropdown]

Format: Format - 1

From Date: DD-MM-YYYY

To Date: DD-MM-YYYY

Plant ID: Plant All

Machine ID: Machine All

Buttons: Generate, Cancel

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Conclusion

Since Sona Comstar already had an existing TPM Trak Andon and tracking system which is integrated with Machine at shop floor and SAP servers using HMI, Management took the decision to upgrade the existing system instead of deploying addition ROR software

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THANKS

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A9.Final Report (Hero MotoCorp)

(CII-JICA Project)

VSME 2.0
Productivity Improvement
through
Integration of TPS & IOT/AI

March 2021

Hero MotoCorp Ltd.

The Aim of the VSME2.0 Kaizen and IoT/AI Course

Kaizen

- A Method of Managing People and Things
- Process oriented
- Continuous improvement
- Long-term progressive effects
- All working together
- Open
- Flexible
- Tacit knowledge

Integration of Business Management
Master the Synergy between Kaizen and IoT/AI to gain the knowledge of the embodiment of Competitive management structure

IoT/AI Reform by utilization

- Technology-centric management methods
- Results-oriented (achievement-oriented)
- Innovation
- Short-term dramatic effects
- Individual team creation
- Close
- Rigid
- Explicit knowledge

Project Start Date:- Oct,2019
Project Completion Date:- June(2nd Week),2020

Theme: To increase "First Time Right" & achieve ZERO DEFECT in Weld Shop (Current Defect 40%)

Project Facilitator :- Yashpal Sardana
Project Coordinator:- Vikasdeep
Project Leader :- S.K.Agrawal

TPS Team:-

- Gurvinder Singh
- Subhash
- Akanshu Sharma
- Arun Nandal
- Sanjay Raghav

IOT /AI Team:-

- Kapil Sharma
- Vishal Vashishth
- Subhash
- Nitin Pancholi
- Sunil Chahar

Experts

- Mr. Kiyoshi Yoshida (JICA)
- Dr. Hiroshi Jogasaki (JICA)
- Mr. Hiroki Omiya (JICA)
- Mr. Amit Vishnoi (CII)

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Analyse the Factors	45~ 97
Develop & Implement Countermeasure	98~137
Confirming Results	138~139
Standardization, Control & Reflection	140~144

1. Selecting theme:

Reference-**TOYOTA PRODUCTION SYSTEM** (Bamer)



Production
Production flow must be entirely smooth.

One-piece-flow manufacturing easily finds problems in the production line.

One-piece-flow manufacturing is the best method to eliminate waste.

Quality

Quality should be ensured in each production process.

You must only send fine quality products to the next process.

We need to find the root cause when defective products are made.

We must be careful not to let these defects occur again.

It is costly to keep making defects.

100% defect-free goods. The later process shouldn't accept any defects from the earlier process.

"Zone Control"



1. Selecting theme:

Visualization

Production process that can be found out immediately when a problem occurs
Process where the problem process can be seen visually

The spirit of TPS

First, "bring up a human being" then manage them.
The term "bring up a human being" encompasses the spirit of TPS.

Many people think that TPS is just a manufacturing method.

"To Human resource development" is the most important thing, and TPS is where people who grow up are making things while continues KAIZEN/improvements every day.

That's why there are no rebounds and you can always make the strongest manufacturing.

Manufacturing is not something that can be done with machines and methods.
The main constituent is just workers, and workers at the site can think better for themselves and solve for themselves.

"Manufacturing is human development"



2. Understanding the Current Situation and Setting Targets

2.1 Current Scenario

Production

- Production flow not exactly smooth.
- Tough to find the problems in the current situation impacting
- Challenging to manufacturing like in TPS will be the best method to eliminate waste

Quality

- Quality is not being ensured in each production process.
- Focus on time bound corrective & preventive measures is weak when defective products are made
- Cost of poor quality is high.

The later process shouldn't accept any defects from the earlier process.
"Zone Control" is missing.

Visualization

Production process that can find out immediately when a problem occurs. Process where the problem process can be seen visually

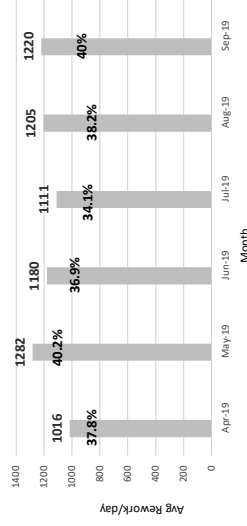
Operational Excellence level is inadequate to achieve zero-defect. So will be the focus area.



2. Understanding the Current Situation and Setting Targets

2.2 Data collection

Rework trend for last 6 months:

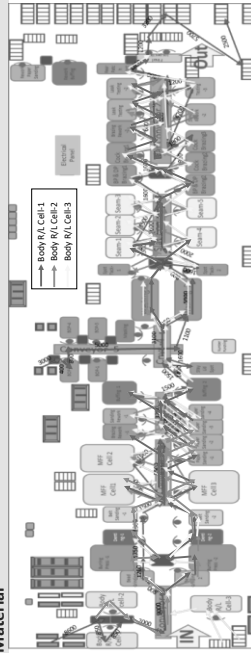


View:

- Too many in-line reworks [Even if there are multiple problems (defects) in one tank, the number of repairs is counted as one(defective)]
- Defects are sent to the next process (10% of defects are returned from Paint Shop-internal customer)

RW is high (40%) & consistent as well, proves it's chronic & complex nature.

Scaled Existing layout of Fuel tank body welding line with operators and Flow of Material



Observation:

- Worker density is very high and workers interfere with each other
- Very complicated (congested enough to write the flow of all machines & workers)
- Difficulty in quality control (unable to identify workers for defects)
- No space for intermediate inspection and rework

Operational Excellence level is inadequate to achieve zero-defect. So will be the focus area.

Part flow
 Defected part
 Reworked part

Observation:

- The defected part (Body R/L or Fuel Tank) travels through the production line without getting corrected at the point of generation.
- Process Operator don't have tools/means to Correct the defect at generation point.
- The defected part travels from one Zone to another and travels back for rework undergoing series of Operations. It contributes to Zigzag part flow.

Defected part is not reworked at location of generation of defect. Rework path forms 7 loops. Zone wise defect control with quality gate to be strengthened.

View:

- Very short work experience (0.39 months on average: By calculation, a fresh worker joins in every 2.3 days)
- Workers with only 4 months experience for jobs that require advanced skills
- In particular, Denting process gives secondary problems if there is little skill

Experience Vs defect relationship

Comparison of Nos of defects when a newcomer enters every 4 months vs. every 3 years (Image)

Many defects occur each time a new employee joins the company

CASE 1: Experience-0.4 Year

CASE 2: Experience-4 Year

Result: Frequent change of workers may cause many defects

Defect occurrence is consistent because of frequent change of workers - A fresh worker joins in every 2.3 days

Data Collection

Defect Pareto - Total defects of both groups (18-22 Nov 2019)

Zone-1: 75%
Zone-2: 24%
Zone-3: 1%

Zone-1 contributes to maximum % of defects (75%), followed by Zone-3 (24%) & Zone-2 (0% approx.)
Hence, Zone-1 will be the area to be focused further.

1.2 Phenomenon are contributing to 79% of the total defects and top 7 defects contributes 57%.

Data Collection

Defect Pareto - Total defects of both groups (18-22 Nov 2019)

Zone-1: 75%
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Top 7 defects

1. Grinding Marks
2. Bump
3. Dent A class
4. Pin Hole
5. Body R/L Puncture
6. MFF puncture
7. B class dent (side dents)

Top 6 defect relationship with stages:

No.	OP.1	OP.2	OP.3	OP.4	OP.5	OP.6	OP.7	OP.8	OP.9	OP.10	OP.11	OP.12	OP.13	OP.14	OP.15	OP.16	OP.17	OP.18	
Defect	Process	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
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20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77
59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
70	71	72	73	74	75	76	77												

S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
13.	Process	Doing Process for less Duration leaving mark	20 Secs Min	22 Secs	OK	
14.	Process	Orientation of Part during Operation	Vertical & Horizontal	Vertical & Horizontal	OK	
15.	Process	Shaping of Part while buffing	No Shaking	Part is shaking while buffing	NG	
16.	Process	Uneven Spacing between application of operation while doing buffing	No Space	No Space	OK	
17.	Process	No Visual Inspection or inspection by Touch after performing Operation	Operator should check by Hand	Procedure followed by all operators	OK	

Shaking of part & No self inspection of part are NG factors.

4.1.1.2 Probable Causes for Defect Generation: GRINDING MARKS

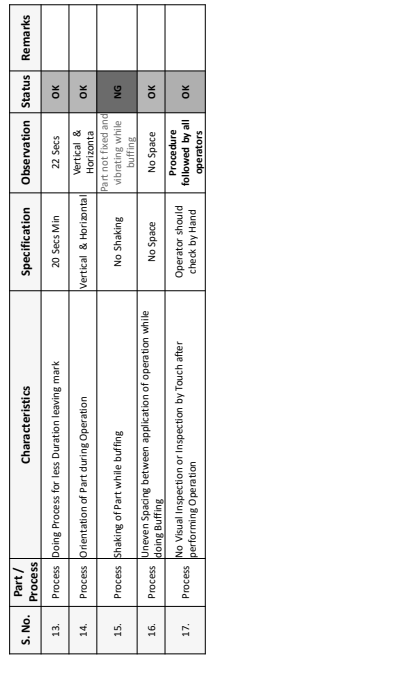
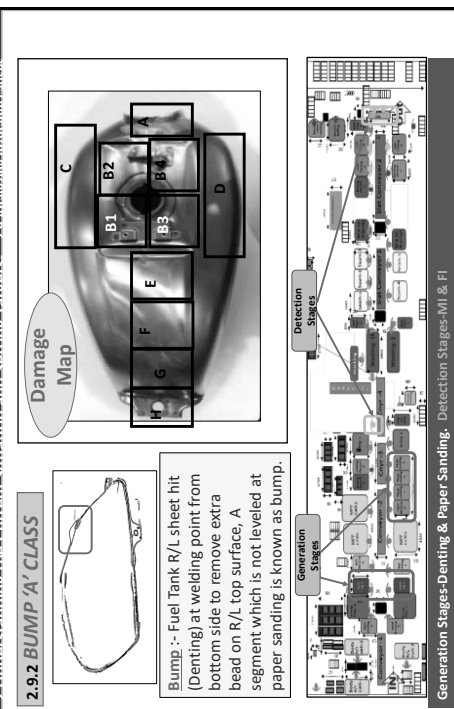
S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
1.	Part	Dents on Material	No Dents on Input Material	No Dents on Input Material	OK	
2.	Part	Oil/Grease on Material	No Oil	No Oil	OK	
3.	Part	Deep Scratches on Input Material (R/L)	No Deep Scratches on Input Material	Minor Scratches on Input Material	NG	
4.	Part	Waviness on Material	No Waviness on Input Material	No waviness on Input Material	OK	
5.	Process	Pressure Applied while Paper Buffing	Manual operation	Manual operation	OK	
6.	Process	Part Moving with respect to wheel Method	Manual operation	Manual operation	OK	
7.	Process	Buffing wheel Specification	Grit Size → 220 Dia-300 x 150		OK	Test Certificate Available
8.	Process	RPM of Buffing Wheel	2800	2800	OK	
9.	Process	Buffing wheel Change Frequency	300 Components	300 Components	OK	
10.	Process	Air Pressure/Leakage on Paper sanding	4.5 kg/cm2	4.5 kg/cm2	OK	
11.	Process	Buffing Machine grinding	4 point	4 points	OK	
12.	Process	Hindrance to part	No Hindrance	No Hindrance	OK	

Dents, deep scratches, waviness on input material & Buffing wheel change frequency are NG factors

4.1.1.2 Probable Causes for Defect Generation: GRINDING MARKS

S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
13.	Process	Doing Process for less Duration leaving mark	20 Secs Min	22 Secs	OK	
14.	Process	Orientation of Part during Operation	Vertical & Horizontal	Vertical & Horizontal	OK	
15.	Process	Shaping of Part while buffing	No Shaking	Part is shaking while buffing	NG	
16.	Process	Uneven Spacing between application of operation while doing buffing	No Space	No Space	OK	
17.	Process	No Visual Inspection or inspection by Touch after performing Operation	Operator should check by Hand	Procedure followed by all operators	OK	

Shaking of part & No self inspection of part are NG factors.



Probable Causes for Bump 'A' class defect are determined through C&E Diagram.

2.9.2.2 Probable Causes for Defect Generation: **BUMP 'A' CLASS**

S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
1.	Process	Less Pressure Applied while Paper Sanding	-	Manual operation	OK	
2.	Process	Specification of sanding paper	Grit Size 120	NG	NG	
3.	Process	Sanding Paper change frequency	Every 30 Components	OK	OK	
4.	Process	Hammer chaper frequency	Weakly	OK	OK	
5.	Process	Air Pressure/Air leakage	4.5 kg/cm2	OK	OK	
6.	Process	RPM of Sanding paper	-	4.5 kg/cm2	NG	No Specification
7.	Process	Uneven denting	-	Denting uneven due to manual operation	NG	
8.	Process	Vibration of Deniting Station	-	Procedure not strictly followed by all operators	OK	
9.	Process	No Visual Inspection or Inspection by Touch after performing Operation	-	Operator should check by hand	OK	
10.	Process	Cycle time	-	Manual operation	OK	
11.	Part	Dirt on Material	-	Minor Dirt Remains	OK	
12.	Part	Oil/Grease on Material	-	No Oil/Grease shouldn't be present	OK	
13.	Part	Excessive Roboline	-	Roboline should be within limits	OK	

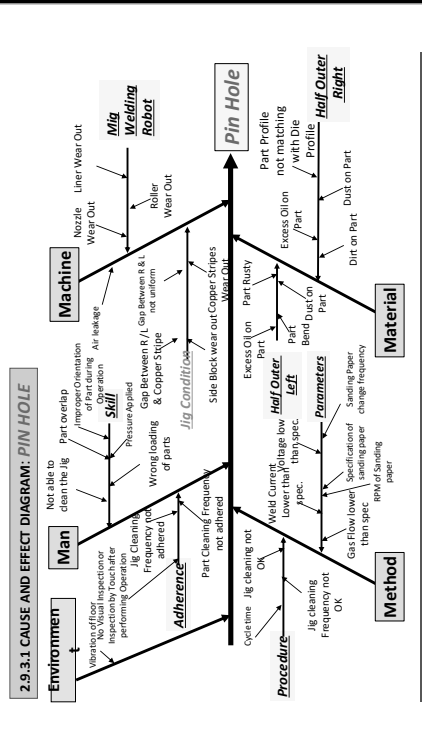
Uneven denting, Vibration of floor, Oil/grease on material & Sanding Paper change freq. are NG factors.

2.9.2.2 Probable Causes for Defect Generation: **BUMP 'A' CLASS**

S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
14.	Process	Improper Orientation of Part during Operation	-	Manual operation	OK	
15.	Process	Improper Handling of Part	Part should be Handled with Care	Part handled properly	OK	
16.	Process	Shaping of Part while sanding	Part shouldn't shake	Part trembled while sanding	NG	
17.	Process	Wrinkle after MFT welding	No wrinkle	Observed in SP+ Model	NG	

Shaking of part while handling is NG factor.

2.9.3.1 CAUSE AND EFFECT DIAGRAM: **PIN HOLE**



Probable Causes for Pin Hole defect are determined through C&E Diagram.

2.9.3 PIN HOLE

Pin Hole: A small hole generated at Body R/L MIG welding process due to incomplete penetration/contamination of molten metal, which is not grinded & leveled at paper sanding operation.

Generation Stages: (Detailed flowchart showing process steps from material preparation to final inspection, with arrows indicating the progression of the defect.)

Detection Stages: (Detailed flowchart showing inspection points and actions taken at various stages of the process to identify and address the defect.)

Generation Stages- Body R/L MIG Welding & Paper Sanding, Detection Stages- MI & FI

2.9.3.2 Probable Causes for Defect Generation: PIN HOLE

S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
1.	Part	Dirt/Dust on Part (R/L)	No Dirt/Dust on Part	No Dirt/Dust	OK	
2.	Part	Excess Oil on Part (R/L)	No oil on Part	Minor Oil Remains	OK	
3.	Part	Part Profile (R/L) not Matching with Die	Should be 0.3-0.5mm	Found 0.1 mm (Visual Check)	NG	Filler gauge unavailable
4.	Part	Bending/Dent on part (R/L)	No Dents on Part	Weakness and Dent on Part due to handling	NG	
5.	Process	Gap between R/L and Copper Stripe	No Gap	No Gap	OK	
6.	Process	Side Block/Copper Stripes Wear Out	No Wear Out	No Wear Out	OK	
7.	Process	Specification of sanding paper	Grit Size: 120	Grit Size: 120	NG	To be verified by PE
8.	Process	Sanding Paper change frequency	Every 30 Components	30 Components	OK	
9.	Process	Gap between R/L not Uniform	Gap should be Uniform	Gap varying with more at center and less at joints	NG	
10.	Process	Nozzle/liner/Nozzle Wear Out	No Wear Out	No wear out	OK	
11.	Process	Improper Jig Cleaning	Proper Jig Cleaning	No blackness and oil	OK	
12.	Process	Part Overlap	No Overlapping	Slight Overlap along neck area SP1+	NG	
13.	Process	Cycle Time	-	Manual operation	OK	
14.	Process	No Visual Inspection or Inspection by Touch after performing Operation	Operator should do visual inspection before Paper Sanding	Procedure not strictly followed by all operators	NG	

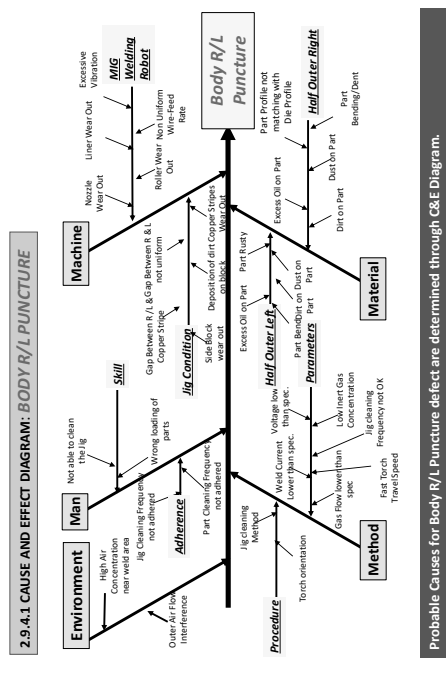
Oil on part, mismatching Die, Dent on part, R/L gap, Unclean Jig are NG factors.

2.9.3.2 Probable Causes for Defect Generation: PIN HOLE

S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
15	Process	Wrong Loading of Parts	Proper Loading of Parts	Parts Loaded Properly	OK	
16	Process	Weld/Voltage Lower than specified	14-18 V	17 V, 10 A	OK	
17	Process	Low Gas Flow Speed	16-22 LPM	21 LPM	OK	
18	Process	Low Inert Gas Concentration	82:18	18:53	OK	
19	Process	Outer Air Flow Interference	No Interference	No Interference	OK	
20	Process	Pressure Applied	-	Manual operation	OK	
21.	Process	Improper Orientation of Part	-	Manual operation	OK	

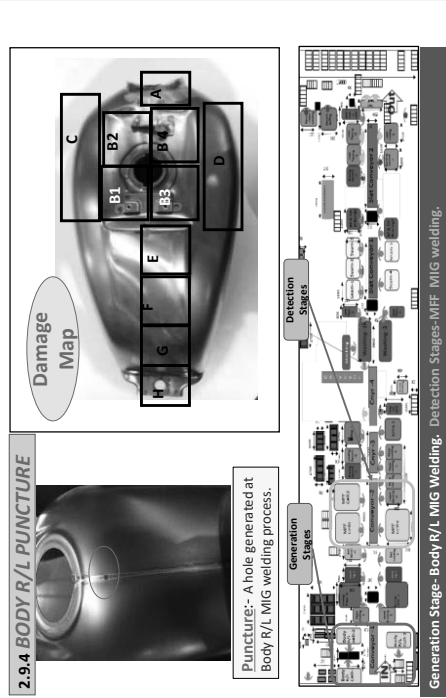
Low inert Gas concentration is NG factor.

2.9.4.1 CAUSE AND EFFECT DIAGRAM: BODY R/L PUNCTURE



Probable Causes for Body R/L Puncture defect are determined through C&E Diagram.

2.9.4 BODY R/L PUNCTURE



Puncture:- A hole generated at Body R/L MIG welding process.

S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
15	Process	Wrong Loading of Parts	Proper Loading of Parts	Parts Loaded Properly	OK	
16	Process	Weld/Voltage Lower than specified	34-18 V	17 V, 110 A	OK	
17	Process	Low Gas Flow Speed	16-22 LPM	21 LPM	OK	
18	Process	Low Inert Gas Concentration	82-18	18.53	OK	
19	Process	Outer Air Flow Interference	No Interference	No Interference	OK	

2.9.4.2 Probable Causes for Defect Generation: BODY R/L PUNCTURE

S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
1.	Part	Dirt/Dust on Part	No Dirt/Dust on Part	No Dirt/Dust	OK	
2.	Part	Excess Oil on Part	No Oil on Part	Minor Oil Remains	NG	
3.	Part	Part Profile not Matching with Die	Should be 0.3-0.5mm	Found 0.1, mm (Visual Check)	NG	Filler usage unavoidable
4.	Part	Bending/Dent on part	No Dents on Part	Weakness and Dent on Part due to handling	NG	
5.	Process	Gap between R/L and Copper Stripe	No Gap	No Gap	OK	
6.	Process	Side Block/Copper Stripes Wear Out	No Wear Out	No Wear Out	OK	
7.	Process	Deposition of Dirt on Block	No Dirt on Block	Dirt/Oil on Block	NG	
8.	Process	Gap between R/L not Uniform	Gap should be Uniform	Gap Varying with more at Centre and less at end points	NG	
9.	Process	Nozzle/Liner/Boiler Wear Out	No Wear Out	No Wear Out	OK	
10.	Process	Non-Uniform Wire Feed Rate	Should be Uniform	Uniform (No Blackness)	OK	
11.	Process	Excessive Vibration	Should be as per the specification	Remains as per the specification	OK	
12.	Process	Fast Torch Travel Speed	Proper Jig Cleaning	Jig contains Blackness and Oil	OK	
13.	Process	Improper Jig Cleaning	No Overlap	No overlap	OK	
14.	Process	Part Overlap			OK	

Oil on part, mismatching die, Dent on part, Dirt on part, R/L gap, Unclean Jig, part overlap are NG factors.

2.9.5.1 CAUSE AND EFFECT DIAGRAM: DENT 'A' CLASS

2.9.4.2 Probable Causes for Defect Generation: BODY R/L PUNCTURE

S. No.	Part / Process	Characteristics	Specification	Observation	Status	Remarks
1.	Part	Dirt/Dust on Part	No Dirt/Dust on Part	No Dirt/Dust	OK	
2.	Part	Excess Oil on Part	No Oil on Part	Minor Oil Remains	NG	
3.	Part	Part Profile not Matching with Die	Should be 0.3-0.5mm	Found 0.1, mm (Visual Check)	NG	Filler usage unavoidable
4.	Part	Bending/Dent on part	No Dents on Part	Weakness and Dent on Part due to handling	NG	
5.	Process	Gap between R/L and Copper Stripe	No Gap	No Gap	OK	
6.	Process	Side Block/Copper Stripes Wear Out	No Wear Out	No Wear Out	OK	
7.	Process	Deposition of Dirt on Block	No Dirt on Block	Dirt/Oil on Block	NG	
8.	Process	Gap between R/L not Uniform	Gap should be Uniform	Gap Varying with more at Centre and less at end points	NG	
9.	Process	Nozzle/Liner/Boiler Wear Out	No Wear Out	No Wear Out	OK	
10.	Process	Non-Uniform Wire Feed Rate	Should be Uniform	Uniform (No Blackness)	OK	
11.	Process	Excessive Vibration	Should be as per the specification	Remains as per the specification	OK	
12.	Process	Fast Torch Travel Speed	Proper Jig Cleaning	Jig contains Blackness and Oil	OK	
13.	Process	Improper Jig Cleaning	No Overlap	No overlap	OK	
14.	Process	Part Overlap			OK	

Oil on part, mismatching die, Dent on part, Dirt on part, R/L gap, Unclean Jig, part overlap are NG factors.

2.9.5 DENT 'A' CLASS

Dent :- Fuel Tank R/L sheet hit (Denting) at welding point from bottom side to remove extra bead on R/L top surface. A segment which is not leveled (depressed) at paper sanding.

2.9.5.2 Probable Causes for Defect Generation: **'DENT 'A' CLASS**

S. No.	Part/ Process	Characteristics	Specification	Observation	Status	Remarks
1.	Process	less Pressure Applied while Paper Sanding	-	Manual operation	OK	To be Verified BY FE
2.	Process	Specification of sanding paper	Grit Size-180	Grit Size-120	NG	
3.	Process	Sanding Paper change frequency	Every 30 Components	30 Components	OK	
4.	Process	Oil block change frequency	-	As per condition	OK	
5.	Process	Hammer change frequency	-	Weekly	OK	
6.	Process	Air Pressure/Air leakage	4.5 kg/cm2	4.5 kg/cm2	OK	
7.	Process	RPM of Sanding paper	-	-	No Specification	
8.	Process	uneven denting	Denting should be Even	Denting uneven due to manual operation	NG	
9.	Process	Vibration of floor	-	-	OK	
10.	Process	No Visual Inspection or Inspection by Touch after performing Operation	Operator should check by Hand	Procedure not strictly followed by all operators	NG	
11.	Process	Cycle time	-	Manual operation	OK	
12.	Part	Dirt on Material	No Dirt should be present	No Dirt Remains	OK	

Sanding Paper changing frequency, uneven denting, no self inspection and oil remains on part are NG factors.

2.9.5.2 Probable Causes for Defect Generation: **'DENT 'A' CLASS**

S. No.	Part/ Process	Characteristics	Specification	Observation	Status	Remarks
1.	Process	less Pressure Applied while Paper Sanding	-	Manual operation	OK	To be Verified BY FE
2.	Process	Specification of sanding paper	Grit Size-180	Grit Size-120	NG	
3.	Process	Sanding Paper change frequency	Every 30 Components	30 Components	OK	
4.	Process	Oil block change frequency	-	As per condition	OK	
5.	Process	Hammer change frequency	-	Weekly	OK	
6.	Process	Air Pressure/Air leakage	4.5 kg/cm2	4.5 kg/cm2	OK	
7.	Process	RPM of Sanding paper	-	-	No Specification	
8.	Process	uneven denting	Denting should be Even	Denting uneven due to manual operation	NG	
9.	Process	Vibration of floor	-	-	OK	
10.	Process	No Visual Inspection or Inspection by Touch after performing Operation	Operator should check by Hand	Procedure not strictly followed by all operators	NG	
11.	Process	Cycle time	-	Manual operation	OK	
12.	Part	Dirt on Material	No Dirt should be present	No Dirt Remains	OK	

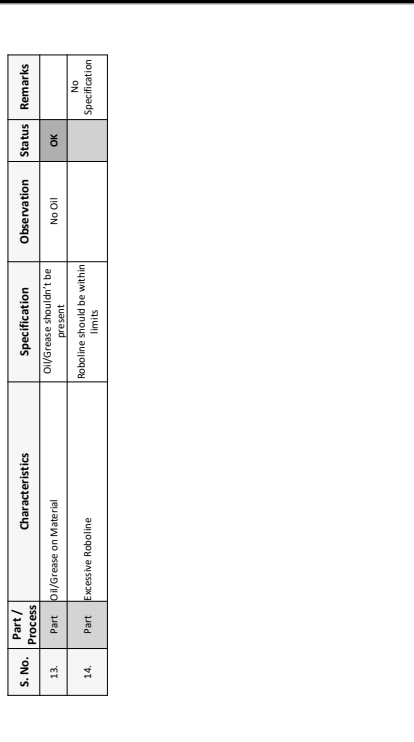
Sanding Paper changing frequency, uneven denting, no self inspection and oil remains on part are NG factors.

2.9.6 MFF PUNCTURE



MFF Puncture :- A hole generated in MFF MIG welding process due to contamination/over-penetration of arc.

2.9.6.1 CAUSE AND EFFECT DIAGRAM: **MFF PUNCTURE**



Probable Causes for MFF puncture defect are determined through C&E Diagram.

2.9.6.2 Probable Causes for Defect Generation: MFF PUNCTURE

S. No.	Part/Process	Characteristics	Specification	Observation	Status	Remarks
1.	Part	Dirt on Part (R/L + MFF)	No Dirt should be Present	No Dirt on Part	OK	
2.	Part	Crack in part (R/L)	No Crack in Part	No Crack on Part	OK	
3.	Part	Part Bend (R/L + MFF)	No Bending of Part	No Bend	OK	
4.	Part	Excess Oil on Part (R/L + MFF)	No Oil on Part	No Oil on Part	OK	
5.	Part	Bead tear-off in Body R/L	No tear-off	Some parts have bead tear-off	NG	
6.	Process	Fixture cleaning	Fixtures should be cleaned properly	Dirt/Oil present on fixture	NG	
7.	Process	Weld Current/Voltage Lower than spec.	14-13 V 60-80 A	17.6 A, 72 V	OK	
8.	Process	Gas flow lower than spec	10-22 LPM	18.7 LPM	OK	
9.	Process	Fixture Relation IRM/CT	43 secs	43 secs	OK	
10.	Process	Carbon Deposition on Nozzle	No Carbon Deposition on Nozzle	No Deposits	OK	
11.	Process	Outer Air Flow Interference	No Air Interference	No Interference	OK	
12.	Process	Adherence to Anti-Spatter Gel Application	-	-	OK	
13.	Process	Part Cleaning	Part should be cleaned properly	Regular Cleaning	OK	
14.	Process	Improper Sealing of Component	Part should be placed properly	Part placed properly	OK	

Presence of oil/dirt on fixture and dirty part are NG factors.

2.9.7 B Class Dent

S. No.	Part/Process	Characteristics	Specification	Observation	Status	Remarks
1.	Part	Deep Scratches on Input Material (R/L)	No Deep Scratches on Input Material	Minor Scratches on input material	NG	
2.	Process	Blowing of Part while buffing	No Shaking	Part not fixed and vibrating while buffing	NG	
3.	Process	Specification of sanding paper	Gr. Size 180	Gr. Size 120	NG	
4.	Process	IRPM of Sanding paper	-	IRPM of sanding paper	NG	
5.	Bump A Class	Uneven denting	Denting should be Even	Denting on more due to manual operation	NG	
6.	Process	Blowing of Part while sanding	Part shouldn't shake	Part not fixed and vibrating while sanding	NG	
7.	Process	Wrinkle after MFF welding	No wrinkle	Observed in SP Model	NG	
8.	Part	Part Profile (R/L) not Matching with Die	Should be 0.3-0.5mm	Found 0.1 mm (Visual Check)	NG	Filler gauge unavailable
9.	Body R/L PUNCH	Bending/Dent on part (R/L)	No dents on Part	Wave and Dent on Part due to handling	NG	
10.	Process	Gap between R/L not Uniform	Gap should be Uniform	Gap varying with more at center and less at end point	NG	
11.	Process	No Visual inspection or inspection by operator after performing Operation	Operator should do visual inspection before paper sanding	Operator not strictly followed the process	NG	
12.	MFF Puncture	Bead tear-off in Body R/L	No tear-off	Some part have bead tear-off	NG	
13.	Process	Fixture cleaning	Fixture should be cleaned properly	Dirt/Oil present on fixture	NG	
14.	Process	Gap between MFF Part and Body R/L not uniform	Gap should be Uniform	Gap Non-Uniform between Space	NG	

For top 6 defects, Total 14 nos abnormalities identified, same will be investigated further.

2.9.7 B Class Dent

S. No.	Part/Process	Characteristics	Specification	Observation	Status	Remarks
1.	Part	Deep Scratches on Input Material (R/L)	No Deep Scratches on Input Material	Minor Scratches on input material	NG	
2.	Process	Blowing of Part while buffing	No Shaking	Part not fixed and vibrating while buffing	NG	
3.	Process	Specification of sanding paper	Gr. Size 180	Gr. Size 120	NG	
4.	Process	IRPM of Sanding paper	-	IRPM of sanding paper	NG	
5.	Bump A Class	Uneven denting	Denting should be Even	Denting on more due to manual operation	NG	
6.	Process	Blowing of Part while sanding	Part shouldn't shake	Part not fixed and vibrating while sanding	NG	
7.	Process	Wrinkle after MFF welding	No wrinkle	Observed in SP Model	NG	
8.	Part	Part Profile (R/L) not Matching with Die	Should be 0.3-0.5mm	Found 0.1 mm (Visual Check)	NG	Filler gauge unavailable
9.	Body R/L PUNCH	Bending/Dent on part (R/L)	No dents on Part	Wave and Dent on Part due to handling	NG	
10.	Process	Gap between R/L not Uniform	Gap should be Uniform	Gap varying with more at center and less at end point	NG	
11.	Process	No Visual inspection or inspection by operator after performing Operation	Operator should do visual inspection before paper sanding	Operator not strictly followed the process	NG	
12.	MFF Puncture	Bead tear-off in Body R/L	No tear-off	Some part have bead tear-off	NG	
13.	Process	Fixture cleaning	Fixture should be cleaned properly	Dirt/Oil present on fixture	NG	
14.	Process	Gap between MFF Part and Body R/L not uniform	Gap should be Uniform	Gap Non-Uniform between Space	NG	

For top 6 defects, Total 14 nos abnormalities identified, same will be investigated further.

2.9.7 B Class Dent

S. No.	Part/Process	Characteristics	Specification	Observation	Status	Remarks
15.	Process	Holding Fixture wear out	No Wear Out	No wear out	OK	
16.	Process	Gap Between MFF Part and Body R/L not uniform	Gap should be Uniform	Gap Non-Uniform Between Space	NG	
17.	Process	MFF Orientation Locator Pin Wear Out	No Wear Out	No wear out	OK	
18.	Process	Nozzle/Liner/Bellier Wear Out	No Wear Out	No wear out	OK	
19.	Process	Non Uniform Wire-Feed Speed	Should be Uniform	Uniform	OK	
20.	Process	Excessive Vibration	-	-	ok	No Specification

Non-uniform gap in MFF and R/L and deposition of dirt on fixture are NG factors.

2.9.7 B Class Dent

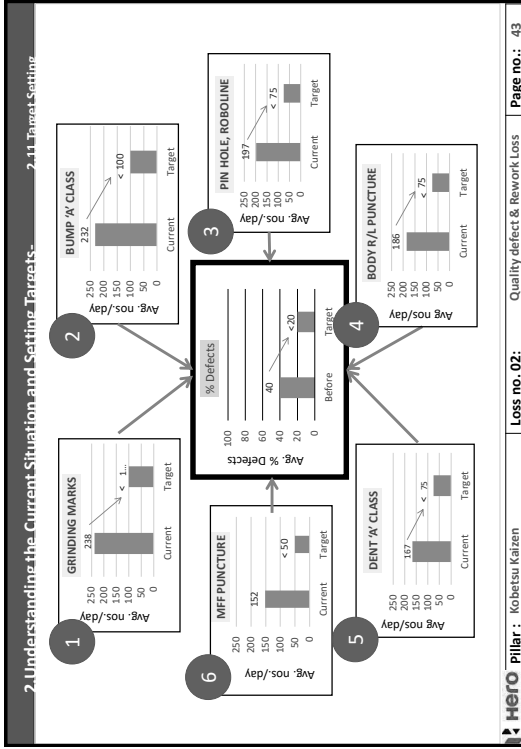
S. No.	Part/Process	Characteristics	Specification	Observation	Status	Remarks
1.	Part	Deep Scratches on Input Material (R/L)	No Deep Scratches on Input Material	Minor Scratches on input material	NG	
2.	Process	Blowing of Part while buffing	No Shaking	Part not fixed and vibrating while buffing	NG	
3.	Process	Specification of sanding paper	Gr. Size 180	Gr. Size 120	NG	
4.	Process	IRPM of Sanding paper	-	IRPM of sanding paper	NG	
5.	Bump A Class	Uneven denting	Denting should be Even	Denting on more due to manual operation	NG	
6.	Process	Blowing of Part while sanding	Part shouldn't shake	Part not fixed and vibrating while sanding	NG	
7.	Process	Wrinkle after MFF welding	No wrinkle	Observed in SP Model	NG	
8.	Part	Part Profile (R/L) not Matching with Die	Should be 0.3-0.5mm	Found 0.1 mm (Visual Check)	NG	Filler gauge unavailable
9.	Body R/L PUNCH	Bending/Dent on part (R/L)	No dents on Part	Wave and Dent on Part due to handling	NG	
10.	Process	Gap between R/L not Uniform	Gap should be Uniform	Gap varying with more at center and less at end point	NG	
11.	Process	No Visual inspection or inspection by operator after performing Operation	Operator should do visual inspection before paper sanding	Operator not strictly followed the process	NG	
12.	MFF Puncture	Bead tear-off in Body R/L	No tear-off	Some part have bead tear-off	NG	
13.	Process	Fixture cleaning	Fixture should be cleaned properly	Dirt/Oil present on fixture	NG	
14.	Process	Gap between MFF Part and Body R/L not uniform	Gap should be Uniform	Gap Non-Uniform between Space	NG	

For top 6 defects, Total 14 nos abnormalities identified, same will be investigated further.

2.9.7 B Class Dent

S. No.	Part/Process	Characteristics	Specification	Observation	Status	Remarks
1.	Part	Deep Scratches on Input Material (R/L)	No Deep Scratches on Input Material	Minor Scratches on input material	NG	
2.	Process	Blowing of Part while buffing	No Shaking	Part not fixed and vibrating while buffing	NG	
3.	Process	Specification of sanding paper	Gr. Size 180	Gr. Size 120	NG	
4.	Process	IRPM of Sanding paper	-	IRPM of sanding paper	NG	
5.	Bump A Class	Uneven denting	Denting should be Even	Denting on more due to manual operation	NG	
6.	Process	Blowing of Part while sanding	Part shouldn't shake	Part not fixed and vibrating while sanding	NG	
7.	Process	Wrinkle after MFF welding	No wrinkle	Observed in SP Model	NG	
8.	Part	Part Profile (R/L) not Matching with Die	Should be 0.3-0.5mm	Found 0.1 mm (Visual Check)	NG	Filler gauge unavailable
9.	Body R/L PUNCH	Bending/Dent on part (R/L)	No dents on Part	Wave and Dent on Part due to handling	NG	
10.	Process	Gap between R/L not Uniform	Gap should be Uniform	Gap varying with more at center and less at end point	NG	
11.	Process	No Visual inspection or inspection by operator after performing Operation	Operator should do visual inspection before paper sanding	Operator not strictly followed the process	NG	
12.	MFF Puncture	Bead tear-off in Body R/L	No tear-off	Some part have bead tear-off	NG	
13.	Process	Fixture cleaning	Fixture should be cleaned properly	Dirt/Oil present on fixture	NG	
14.	Process	Gap between MFF Part and Body R/L not uniform	Gap should be Uniform	Gap Non-Uniform between Space	NG	

For top 6 defects, Total 14 nos abnormalities identified, same will be investigated further.



1.1 Proposing improvement in Layout for lines/zones.

3. Create Plan of Action: 3.1 Decide Implementation Plan (MWH)

S.No.	What to do?	When? (deadline)	Who?
1.1	Proposing improvement in Layout for lines/zones.	18.06.2020	Gurvinder, Ananshu
1.2	Strengthening Zone Controls about defects in Existing Layout.	05.06.2020	Gurvinder
1.3	Production of parts according to takt time	15.01.2020	Gurvinder
1.4	Deep dive analysis as per Defects.	08.06.2020	Gurvinder
1.5	Rework Data capturing system development	20.11.2019	Gurvinder, Vishal
2.1	Inspection of fppr (input) to be ensured as per defined standards & review the frequencies as per potential.		Arun mandal
2.2	Equipment's related hazards / Modification to reduce handling dents.	15.01.2020	Gurvinder
2.3	Elimination of denting process by changing of jig.	21.06.2020 (Mgt approval)	Gurinder, Ananshu, Subhash
3.1	Deployment of Operators on stations in accordance with Skill Levels.	Already implemented	Gurvinder
3.2	Stage wise skill attributes to be finalised	15.05.2020	Gurvinder
3.3	Stage wise training material to be prepared	15.05.2020	Gurvinder
3.4	Practical Training Machines to be provide for Training of Denting, Bead Grinding, Paper Sanding & Buffing	10.07.2020 (Mgt approval)	Gurvinder, Ananshu
3.5	Review reward System for Motivation/Moral of Workers		Gurvinder
4	Improve work environment, dust, noise level and working light containment.		Gurvinder, Vikas

Based on data collection abnormalities identified & Sensei guidance action plan prepared.

4. Analyzing the factors - Proposing the new layout

1.1.1 Proposing improvement in Layout for lines/zones.

1.1.1 Features of appropriate Process layout & Concept

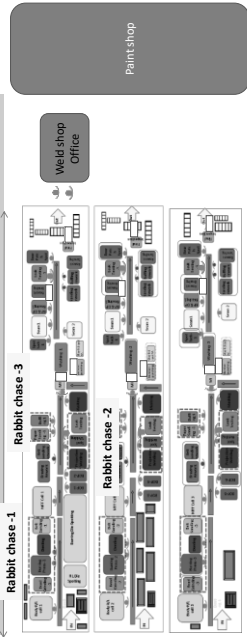
- 1. Quality assurance can be ensured
 - Tank flows do not intersect
 - No interference between workers
 - Easy to find the process where the problem occurred & the operator
 - Create an intermediate inspection & rework process (Especially when producing new products or adjusting equipment)

Develop 2 (or 3) production lines

- 2. Be flexible with production fluctuations
 - Multiple models can be produced simultaneously
 - Easy relocation of machines and workers
- 3. Low running cost
- 4. Safe and good working environment

Guidance provided by Yoshida San to be implemented during layout-option preparation.

Layout improvement option 2A (Option 2 Rabbit chase)



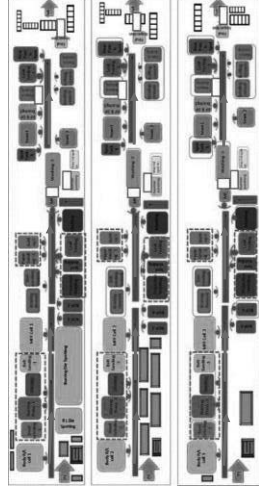
Layout Concept

3 Fiel tank manufacturing lines with rabbit chase
Each Line has capacity based on Body RM Station.

Productivity / SHR	Current		Option 3		Option 2A		Inspector	Total
	Operator	Production / SHR	Operator	Production / SHR	Operator	Production / SHR		
1638	62	26.4	1750	65	26.92	62	3	65

Layout improvement Option 2A Material flow

(For each line, Part movement is shown according to BODY R/L m/c with LINE-2 having single washing m/c.)



The Zig-Zag part motion in Existing Layout is improved to Smooth Flow, Traceability can be achieved.]

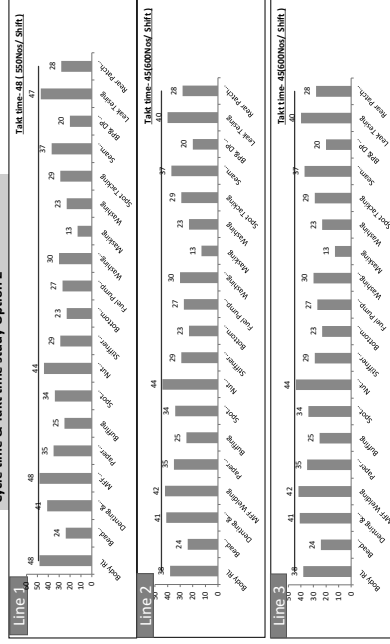
NEW MACHINE REQUIREMENT FOR LAYOUT OPTIONS

OPTION 2 & 2 A

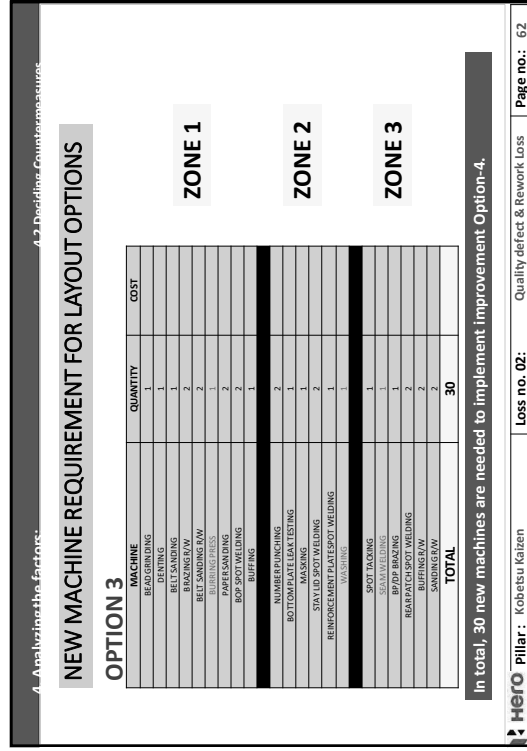
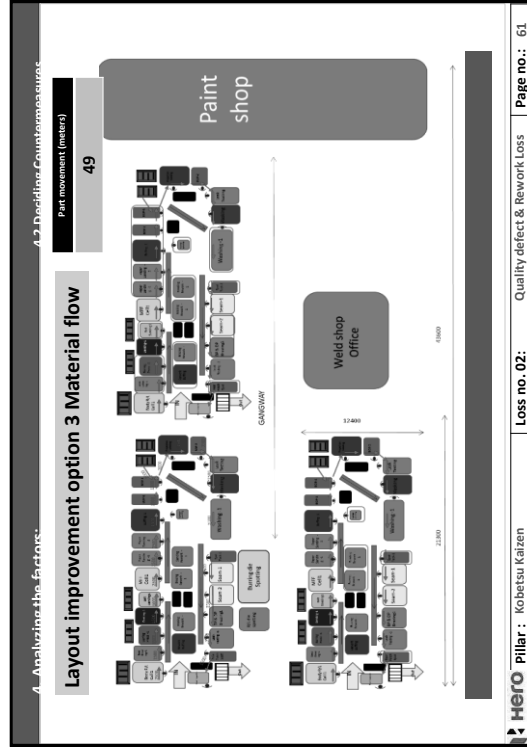
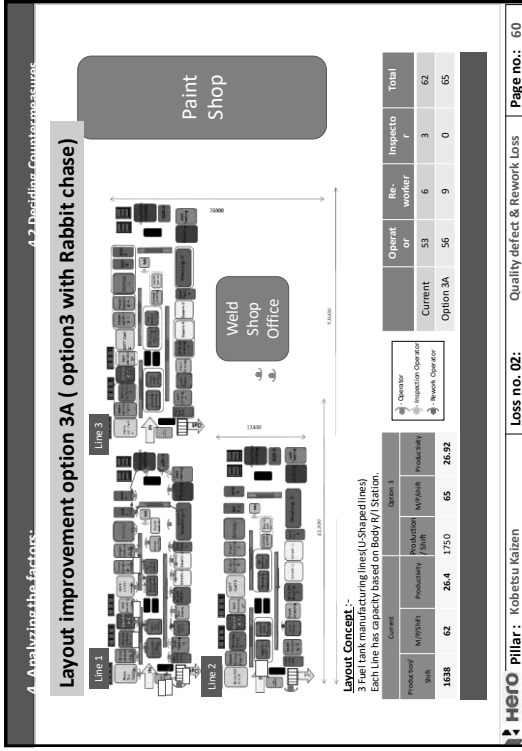
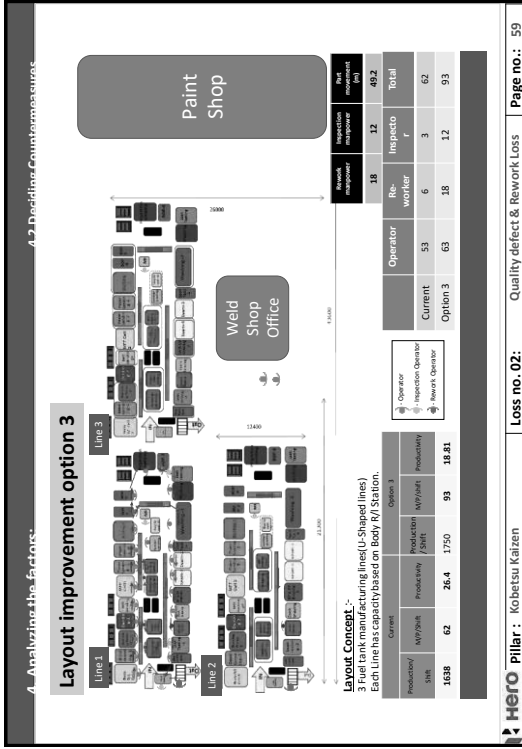
MACHINE	QUANTITY	COST
BLADGRINDING	1	
BELTGRINDING	1	
BELTSANDING	1	
BRAZING /AW	2	
BELT SANDING /AW	2	
BURRING /AW	1	
BURRING /AW	2	
BLOP SPOT WELDING	2	
BUFFING	1	
NUMBERPUNCHING	2	
BOTTOMDRILLING /LETING	1	
STAYLID SPOT WELDING	2	
REINFORCEMENT PLATE SPOT WELDING	1	
WASHING	1	
SPOT TACKLING	1	
SEAM WELDING	1	
PI/PB BRAZING	1	
REARPATCH SPOT WELDING	2	
REARPATCH SPOT WELDING	2	
SANDING /AW	2	
TOTAL	30	

In total, 30 new machines are needed to implement improvement Option-3 and Option-3A.

Cycle time & Takt time study-Option 2



Cycle time and takt time for LINE-1, LINE-2 & LINE-3 are shown separately.

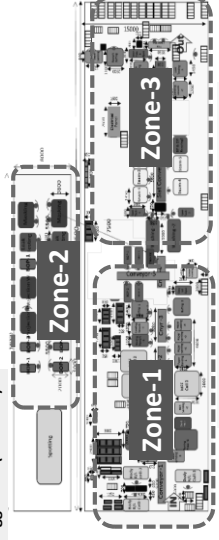


1.2 Strengthening "Zone Control System"

1.2.1 Introduce "Zone Control System" - Zone 1

- 1. Never pass-on defects parts to the following process
- > Implementation of interim inspection (& rework)
- > Accept only 100% good products → Creating pallets that can guarantee 100% quality
- > Only 100% good products are sent to Paint Shop

<Suggestion (One Idea)>



Implement intermediate inspection (& rework)

Do not bring any defects into each zone

Do not leave any defects outside each zone

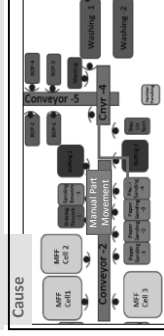
Guidance taken from Yohida San for strengthening Zone Control System.

1.2.1 Introduce "Zone Control System" - Zone 1

- 1. Never pass-on defects parts to the following process
- > Implementation of interim inspection (& rework)



Observations – Middle inspection already available in Zone 1 still defects passed to Zone 3



Middle Inspection Team member has to move 3 mtrs to send defective parts to rework station.

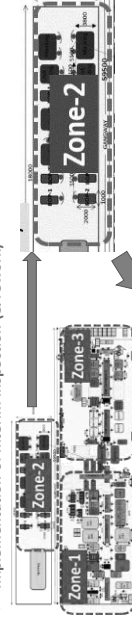
While transferring rework part team members misses inspection of 2-3 parts.

Operator movement- 3mtr

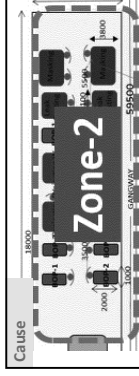
Middle inspection team member movement to be eliminated.

1.2.2 Introduce "Zone Control System" - Zone 2

- 1. Never pass-on defects parts to the following process
- > Implementation of interim inspection (& rework)



Observations – Part miss observed in BOP Spot welding operation at Zone 3.

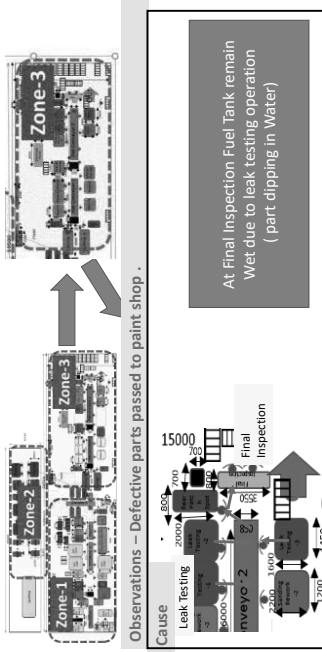


Inspection of BOP parts work content not assigned to any team Member.

Quality gate/ Inspection to be ensured by defining work content to existing station manpower/ new manpower

1.2.3 Introduce "Zone Control System" Zone 3

- 1. Never pass-on defects parts to the following process
- Implementation of Interim Inspection (& rework)



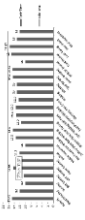
Part must be dried before final inspection. Manual/ Auto operation must be done to dry parts.

1.3 Production of parts according to takt time

1.3 Production of parts according to takt time

<Current problem>

- ➔ The current production line cannot keep takt time
- ➔ Tact Time is influenced by the cycle time of three MIG welding process
- ➔ Tact time varies. It may cause workers MURI(overburden)/MURA(uneven)



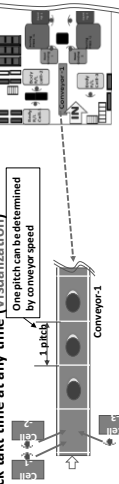
- **Not just a takt time of 1000s time**
 - Right lines indicating takt on belt conveyor-1

- Operators place only one part in the frame

<Expected effect>

- Takt time can be accurately controlled according to production volume

- Can check takt time at any time (Visualization)



Guidance of Yoshida san to be implemented.

1.4 Deep dive analysis as per Defects.

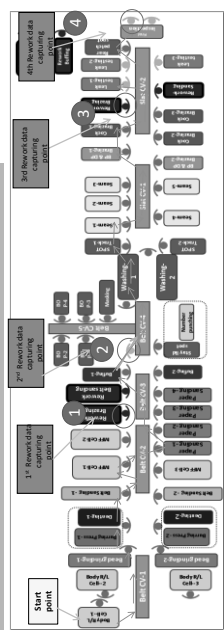
1.4 Deep dive analysis as per Defects.

S. No.	Defect	Part/ Process	Characteristics	Specification	Observation	Cause	Counter measure
1.	Grinding Marks	Part	Deep Scratches on input Material (RV)	No Deep Scratches on input Material	Minor Scratches on input material	1. Pallets condition poor 2. Poor stacking of parts 3. Stack level to be standardized	1. Pallet condition 2. Pallet stack level to be standardized
2.		Process	Shaking of Part while buffing	No Shaking	Part not fixed and vibrating while buffing	Part gripping method not standardized	Part sheet to be prepared
3.		Process	Specification of sanding paper	Grit Size 120	Grit Size 120	RPW reduces intermittently	Part to be taken with 180 grit sanding paper
4.		Process	RPW of Sanding paper	-	Denting uneven due to manual operation	Operator fatigue	Part gripping method not standardized
5.	Bump A Class	Process	Uneven denting	Denting should be Even	Denting uneven due to manual operation	Part gripping method not standardized	Part sheet to be prepared
6.		Process	Shaking of Part while sanding	Part shouldn't shake	Part not fixed and vibrating while sanding	Part gripping method not standardized	Part sheet to be prepared
7.		Process	Wrinkle after MIF welding	No wrinkle	Observed in SP Model	MIF die not then after turning press	MIF Die hole size to increase

1.4 Deep dive analysis as per Defects.

S. No.	Defect	Part/ Process	Characteristics	Specification	Observation	Cause	Counter measure
8.		Part	Part Profile (RV) not matching with D/E	Should be 0.3 to 0.5mm	Found C/L min (Visual Check)	Pallet gauge to be procured for measurement	Pallet gauge to be procured for measurement
9.		Part	Bending/Dent on part (RV)	No Dents on Part	Weakness and Dent on Part due to handling	1. Pallets condition 2. Over stacking of parts	1. Pallet condition restoration 2. Pallet audit to be standardized
10.	BODY R/L PUNCTURE & PIN HOLE	Process	Gap between RV/ not Uniform	Gap should be Uniform	Gap varying with more at centre and less at end points	Part stacking profile Specification & Inspection method not available	Part profile to be standardized. Report to be generated
11.		Process	No Visual Inspection or Inspection by Touch after performing Operation	Operator should do Visual Inspection before Paper Sanding	Procedure not strictly followed by all operators	Quality check points not displayed on work stations	Process Key Points & Quality check points to be displayed on work stations
12.		Part	Bead tear-off in Body R/L	No tear-off	Some parts have bead-off	Quality check points not displayed on work stations	Quality check points to be displayed on work stations
13	MFF Puncture	Process	Feature cleaning	Feature should be cleaned properly	De/Oil present on feature	Coating on input material gets burnt during washing	Manual process of oil to be converted to auto mechanism.
14		Process	Gap between MFF Part and Body R/L not Uniform	Gap should be Uniform	Gap Non-Uniform Between Space	Manual process of oil to be converted to auto mechanism.	Manual process of oil to be converted to auto mechanism.

1.5 Rework Data capturing system development



- Counter measures**
1. Defect wise , stage wise & part location wise rework data to be captured at 4 rework/ Inspection stations
 2. Digitalization of data capturing to improve correctness of data.

Initially manual data capturing system to be developed which will further digitalized.

1.5 Rework Data capturing system development

2.1 Inspection of BOP (input) to be ensured as per defined standards & review the frequencies as per potential.

Inspection of BOP (input) to be ensured as per defined standards & review the frequencies as per potential.

Guideline

Inspection of incoming parts & Report to be shared monthly with Prod'n.

Repair of pallets to be regularised

Pallet condition, check point to be added in CLRI of Body R/L

Pallets in Store to be kept with cover for pigeon faeces & Dirt related issue.

2.2 Equipment's related Kaizens / Modification to reduce handling dents

2.2 Equipment's related Kaizens / Modification to reduce handling dents.

Sl. No.	Problem	Root Cause	Countermeasure
1	1. No stop of the pallet	1. No stop of the pallet	1. No stop of the pallet
2	2. No stop of the pallet	2. No stop of the pallet	2. No stop of the pallet
3	3. No stop of the pallet	3. No stop of the pallet	3. No stop of the pallet
4	4. No stop of the pallet	4. No stop of the pallet	4. No stop of the pallet
5	5. No stop of the pallet	5. No stop of the pallet	5. No stop of the pallet
6	6. No stop of the pallet	6. No stop of the pallet	6. No stop of the pallet
7	7. No stop of the pallet	7. No stop of the pallet	7. No stop of the pallet

Equipment abnormalities identified & Countermeasures defined.

Equipment abnormalities identified & Countermeasures defined.

2.3 Elimination of manual denting process by changing of process by changing of Jig

2.3 Elimination of manual denting process by changing of Jig



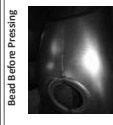
Current Process
:- Body RL Bead pressing done by bead hitting with hammer manually



Proposed PROCESS :- Body RL Bead pressing by Hydraulic Press . Successful trial done



Groove Made in die (bottom part) as per part profile.



Trial to be taken for 400 nos fuel tank with QA & PE.

3.1 Stage wise skill attributes & Current level

3.1 Stage wise skill attributes & Current level

Sl. No.	Job Title	Job Description	Current Skill Level	Target Skill Level	Training/Development Plan
1	Assembly Operator	Assembling fuel tank components	Basic	Intermediate	On-the-job training, cross-training
2	Quality Inspector	Inspecting fuel tank for defects	Intermediate	Advanced	Quality control training, defect analysis
3	Die/Dieing Operator	Operating die/dieing equipment	Basic	Advanced	Die/dieing training, equipment maintenance
4	Welding Operator	Welding fuel tank components	Intermediate	Advanced	Welding training, safety protocols
5	Painting Operator	Painting fuel tank components	Basic	Intermediate	Painting training, surface preparation
6	Final Assembly	Final assembly of fuel tank	Advanced	Expert	Final assembly training, quality assurance

Stage wise skill attributes prepared.

Suggest a proposal for Talent promotion

Contract employee ⇒ Long-term employment (permanent employee)
 → "To Human resource development"

- 2. Develop human resource
 - Enhancement of employee training (including Moral)
 - Practical training for new employees (Develop "Training room")
 - Review the morning meeting (including education, discipline, etc.)
 - QC activity
 - Multiple-skilled worker
 - Motivation: Multiple-skilled worker
 - rotation
 - sub-leader
 - leader (promotion)

Skills Training Matrix	Competency		Knowledge		Skill		Attitude	
	Current	Target	Current	Target	Current	Target	Current	Target
Operator A	○	○	○	○	○	○	○	○
Operator B	○	○	○	○	○	○	○	○
Operator C	○	○	○	○	○	○	○	○

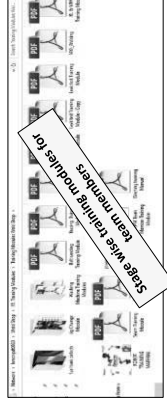
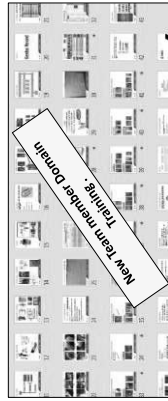
Develop "Robust production line"

TPS is where people who grow up are making things while continues KAIZEN/improvements every day.

System to be designed with incorporation of Yoshida San guidance.

3.2 Stage wise training modules/ study material

3.2 Stage wise training modules/ study material

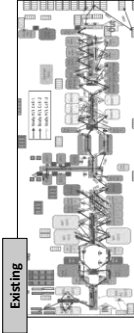


- Key Contents**
1. Dept. profiles
 2. Basics of welding
 3. Product & Processes
 4. SOP & CLRI system
 5. Suggestion scheme
 6. Integrated Mgt. System

- Key Contents**
1. Equipment Structure
 2. Equipment function
 3. Working Principle of operation.
 4. Quality check points
 5. Optimal conditions- CLRI
 6. Tools & Consumables

3.3 Team member deployment systems on various stages

3.5 Review Reward system & Proposals

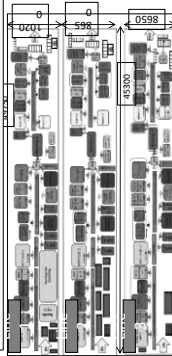


Existing

Problem-
1. In Existing system team member wise reward data can not be captured due to mix material flow.
2. Team member performance not measurable.

Proposed

Option 3 considered as final option for Reward System for reward reduction



Key Points :
1. Daily reward data generation, team member wise ,stage wise & line wise .
2. Team Member wise , stage & Line wise reward targets & actual data comparison
3. Recognition for best performers as per company policy.

Team members to be rewarded based on performance related to reward generation.

4. Work environment in current Scenario

4. Work environment in current Scenario

S. No.	Abnormalities Identified	Cause	Countermeasure	Target date
1	Dust system redesign & Repair of dust & smoke extraction system.	Design errors Not cleaned	Vendor to be called & rectification to be done	15.11.2020
2	High Noise in denting process	Elimination of Denting Process	New process development under progress	16.11.2020
3	Heavy Dust generation during buffing wheel dressing on	Elimination of Buffing wheel dressing on line	Buffing machine (offline) to be provided for wheel dressing	16.11.2020
4	Heavy noise from Washing machine blowers	Washing machine blower vibration & noise reduction	Base structure of blower mountings to be strengthened	10.07.2020
5	Heavy noise from Spot welding machine solenoid valves	Noise silencer restoration on solenoid valves	Silencers to be provided on Solenoid	10.07.2020
6	Hydraulic pump abnormal noise reduction of jig Spotting machine	Direct air release from cap, no solenoid valve	General inspection to be done of Hyd. Pump. Solenoid valve to be provided.	16.11.2020 17.11.2020
7	Noise from continuous air release from seam welding MFF cap.	Direct air release from cap, no solenoid valve		

As per below list of issues identified countermeasures implemented

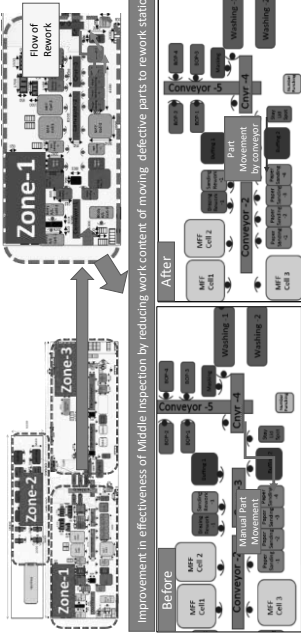
S.No.	What to do?	When (Deadline)	Who?
3.1	Propose improvement in layout for Iron/ovens.	14.06.2020	Govindaraj, Akashu
3.2	Introducing Zone Controls about defects in Existing Layout.	05.06.2020	Govindaraj
3.3	Production of parts according to last time	15.01.2020	Govindaraj
3.4	Door drive analysis as per Defects.	08.06.2020	Govindaraj
3.5	Review data capturing system development	26.11.2019	Govindaraj, Vimal Arun vandar
2.1	Inspection of 80% reports to be covered as per defined standards & criteria	15.01.2020	Govindaraj
2.2	Implement related factors / modification to reduce handling defects.	21.06.2020 (Mtg approval)	Govindaraj, Akashu, Sudhakar
2.3	Formulation of denting process by changing of jig.	Already implemented	Govindaraj
3.1	Deployment of Operators on rotations in accordance with 8m 1 week.	15.05.2020	Govindaraj
3.2	Page wise skill attributes to be finalized	15.05.2020	Govindaraj
3.3	Page wise training material to be prepared	15.05.2020	Govindaraj, Akashu
3.4	Practical Training Machines to be provided for training of Spotting, Seal printing, Paper Jamming & Blowing	10.07.2020 (Mtg approval)	Govindaraj, Akashu
3.5	Review reward system for Motivation/Incentive of Workers		Govindaraj, Vimal
4	Improve work environment, dust, noise level and lighting		Govindaraj, Vimal

1.1 Appropriate Process layout & Concept

Approval under process

1.2.1 Introduce "Zone Control System" - Zone 1

- 1. Never pass-on defects parts to the following process
- Implementation of interim inspection (& rework)



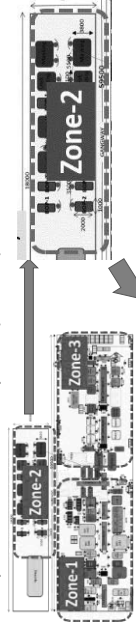
Operator movement- 3mtr

Mt Operator effectiveness Increased to 100%

Defect control achieved by strengthening Middle Inspection team member.

1.2.2 Introduce "Zone Control System" - Zone 2

- 1. Never pass-on defects parts to the following process
- Implementation of interim inspection (& rework)



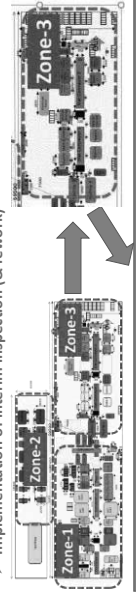
Introduction of Inspection stage for Bottom Plate Welding cell.

Bottom plate , child part inspection assigned to Bottom Plate Leak testing team member.

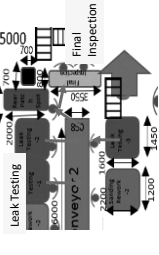
Defect control achieved by strengthening Middle inspection team member

1.2.3 Introduce "Zone Control System" - Zone 3

- 1. Never pass-on defects parts to the following process
- Implementation of interim inspection (& rework)



Improvement in effectiveness of final inspection by drying fuel tank surface before inspection.



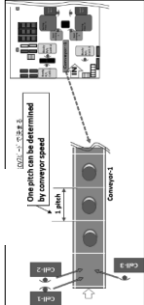
Issue :- At Final Inspection Fuel Tank remain Wet due to leak testing operation (Water dipping)
Counter Measure :- Fuel Tank dried up by team member with cloth and offered to final inspection team member.

5. Develop & Implement Counter Measures Implementation of Countermeasures


1.3 Production of parts according to takt time

<Suggestion (One Idea)>

- Right lines indicating tact on belt conveyor-
1
- Operators place only on the CV.



<Implementation >



Takt Time – 14 secs
Marking Gap- 700mm
Conveyor Speed – 50mm/sec
VFD Frequency- 18 Hz.

As per guidance slots made to match takt time.

HERO Pillar: Kobetsu Kaizen Loss no. 02: Quality defect & Rework Loss Page no.: 103

5. Develop & Implement Counter Measures Implementation of Countermeasures

1.4 Deep dive analysis as per Defects

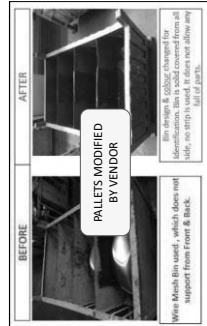
S. No.	Defect	Part / Process	Characteristics	Specification	Observation	Cause	Counter measure
1.	Grinding Marks	Part	Deep Scratches on Input Material (R/L)	No Deep Scratches on Input Material	Minor Scratches on input material	1. Pallet condition poor 2. Pallet audit not standardized	1. Pallet condition poor 2. Pallet audit not standardized
2.		Process	Shaking of Part while buffing	No Shaking	Part not fixed and vibrating while buffing	Part gripping method not standardized	Jt sheet to be prepared
3.		Process	Specification of sanding paper	Grit Size-180	Grit Size 120 used		Trial to be taken with 180 grit sanding paper
4.		Process	RPV of sanding paper		RPV reduces intermolecular lubrication		RPV unit functioning to be restored
5.	Bump-A Class	Process	Uneven denting	Denting should be even	Denting uneven due to manual operation	Operator fatigue	Denting process replacement with jacking
6.		Process	Shaking of Part while sanding	Part shouldn't shake	Parting fixed and vibrating while sanding	Part gripping method not standardized	Jt sheet to be prepared
7.		Process	Wrinkle after AMF welding	No wrinkle	Observed in Sp- Model	Part gripping method not standardized Spec after buffing Press	Miff Dia hole size to increase

HERO Pillar: Kobetsu Kaizen Loss no. 02: Quality defect & Rework Loss Page no.: 104

5. Develop & Implement Counter Measures Implementation of Countermeasures

1.4 Deep dive analysis as per defects

1.4.1 Deep Scratches on Input Material (R/L) & 2.1 Inspection of BOP (input) to be ensured as per defined standards & review the frequencies as per potential.



- BOP parts that are fed at Body RL are inspected and segregated (faulty parts) at the station only.
- Also the pallets in the storage area are covered to prevent any dust and dirt.

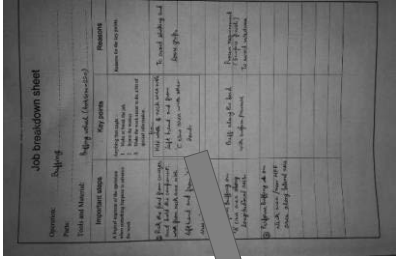
HERO Pillar: Kobetsu Kaizen Loss no. 02: Quality defect & Rework Loss Page no.: 105

5. Develop & Implement Counter Measures Implementation of Countermeasures

1.4 Deep dive analysis as per Defects.

1.4.2 Shaking of Part while buffing

Improvements :-
Defect:- Grinding mark
Cause : Part Shaking during buffing
Improvement: Gripping is standardized. JI breakdown for the operation done.



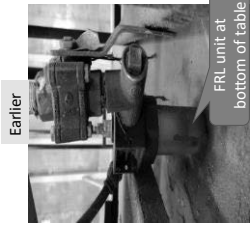
Hold R/L component from neck area with left hand and from 'C' class area from the other hand.

HERO Pillar: Kobetsu Kaizen Loss no. 02: Quality defect & Rework Loss Page no.: 106

1.4 Deep dive analysis as per Defects.

1.4.3 Specified grit size(180) sanding paper not used.

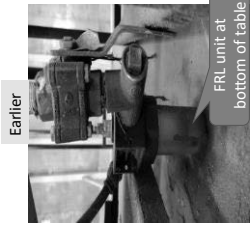
Improvements :-
 Defect:- Bump 'A' class
 Cause : Specified grit size(180) not used.
 Improvement:- Results with grit size -180 not satisfactory. Cycle time increased by 40 %.



1.4 Deep dive analysis as per Defects.

1.4.4 Reduction in RPM due to improper lubrication of paper sanding tools.

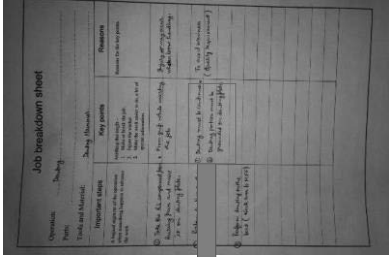
Improvements :-
 Defect:- Bump 'A' class
 Cause : Reduction in RPM due to improper lubrication.
 Improvement:- FRL position raised from ground to a height so that lubricant monitoring can be done.



1.4 Deep dive analysis as per Defects.

1.4.5 Uneven denting

Improvements :-
 Defect:- Bump 'A' class
 Cause : Uneven denting
 Improvement:- JI breakdown for the operation.



1. Denting should be continuous.
 2. Denting with constant speed

1.4 Deep dive analysis as per Defects.

1.4.6 Vibration and shaking of component

Improvements :-
 Defect:- Bump A class
 Cause : vibration and shaking of component
 Improvement:- Gripping technique standardized. JI breakdown preparation.

5S BREAKDOWN SHEET

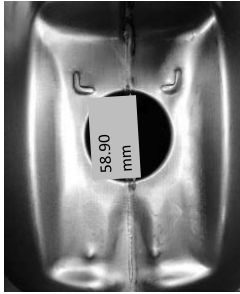
JOB DESCRIPTION	OPERATION	OPERATION	OPERATION	OPERATION	OPERATION
Tools & Materials	Tools & Materials	Tools & Materials	Tools & Materials	Tools & Materials	Tools & Materials
What is done	How is done	Why is done	How is done	Why is done	How is done
1. Pick the 5S items conveyor	1. Pick the 5S items conveyor	1. Pick the 5S items conveyor	1. Pick the 5S items conveyor	1. Pick the 5S items conveyor	1. Pick the 5S items conveyor
2. Place the 5S items conveyor	2. Place the 5S items conveyor	2. Place the 5S items conveyor	2. Place the 5S items conveyor	2. Place the 5S items conveyor	2. Place the 5S items conveyor
3. Use the 5S items conveyor	3. Use the 5S items conveyor	3. Use the 5S items conveyor	3. Use the 5S items conveyor	3. Use the 5S items conveyor	3. Use the 5S items conveyor
4. Move the 5S items conveyor	4. Move the 5S items conveyor	4. Move the 5S items conveyor	4. Move the 5S items conveyor	4. Move the 5S items conveyor	4. Move the 5S items conveyor
5. Lock for any faulty/defect	5. Lock for any faulty/defect	5. Lock for any faulty/defect	5. Lock for any faulty/defect	5. Lock for any faulty/defect	5. Lock for any faulty/defect

1.4 Deep dive analysis as per Defects.

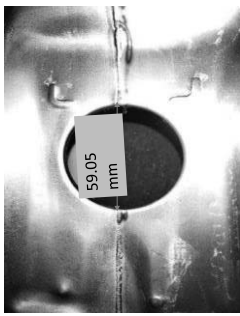
1.4.7 Wrinkle after MFF welding

Improvements :-
 Defect:- Wrinkle after MFF welding
 Cause : Smaller Hole diameter
 Improvement:- Hole diameter increased(Modification in Burring press die).

Before



After



1.4 Deep dive analysis as per Defects.

S. No.	Defect	Part / Process	Characteristics	Specification	Observation	Cause	Counter measure
8.			Part Profile (R/L) not matching with die	Should be 0.3-0.5mm	Found C/L min Visual Check	After gauge to be procured for interchange	After gauge to be procured for interchange
9.	Body R/L PUNCTURE & PIN HOLE	Part	Bending/dent on part (R/L)	No dents on Part	Weakness and Dent on Part due to handling	1. Pallet condition 2. Over stacking of parts	1. Pallet condition restoration 2. Pallet audit 3. Parts should be standardized
10.		Process	Gap between R/L not Uniform	Gap should be Uniform	Gap varying with more at centre and less at end points	Part casting profile Specification & Inspection method not available	Part profile to be generated report to be generated
11.		Process	No Visual Inspection or Inspection by Touch after performing Operation	Operator should do Visual Inspection before Paper Saveling	Procedure not strictly followed by all operators	Quality checkpoints not displayed on work stations	Process key points & Quality checkpoints to be displayed on work stations
12.		Part	Bead tear-off in body R/L	No tear-off	Some parts have bead-off	Quality checkpoints not displayed on work stations	Process key points & Quality checkpoints to be displayed on work stations
13	MFF Puncture	Process	Feature cleaning	Feature should be cleaned properly	Dr/Oil present on feature	Coating on input material gets burnt during welding	Feature to be cleaned after deep cleaning to be done weekly
14		Process	Gap between MFF Part and body R/L not uniform	Gap should be Uniform	Gap Non-uniform between Space	Manual of MFF during loading	Manual of MFF to be converted to auto mechanism.

1.4 Deep dive analysis as per defects

1.4.8 Non uniform gap between Body R/L

Improvements :-
 Defect:- Body R/L puncture
 Cause : Non uniform gap between Body R/L
 Improvement:- Jig spotting at regular intervals of 5000 welds.

Jig Spotting



BEFORE



AFTER

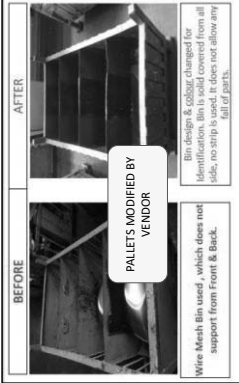
PALLETS MODIFIED BY VENDOR

Bin design & colour changed for Material identification. Non all sides, no strip is used. It does not allow any fall of parts.

1.4.1 Deep dive analysis as per defects

1.4.9 Bending/dent on R/L part because of excess stacking of R/L in pallets

Improvements :-
 Defect:- Body R/L puncture
 Cause : Bending/dent on R/L part because of excess stacking of R/L in pallets.
 Improvement:- Stacking number standardized as well as new pallets.



5. Develop & Implement Counter Measures Implementation of Countermeasures

1.4 Deep dive analysis as per defects

1.4.10 R/L gap not uniform

Improvements :-
 Defect:- R/L gap not uniform.
 Cause : Part cutting profile Specification & Inspection methods not available
 Improvement:- Pending

HERO Pillar: Kobetsu Kaizen Loss no. 02: Quality defect & Rework Loss Page no.: 115

5. Develop & Implement Counter Measures Implementation of Countermeasures

1.4 Deep dive analysis as per defects

1.4.11 No inspection after operation is performed.

Improvements :-
 Defect:- No inspection after operation is performed.
 Cause : Procedure not strictly followed by all operators.
 Improvement:- Process Key Points & Quality checkpoints to be displayed on work stations

Key Point board content prepared in Hindi.

HERO Pillar: Kobetsu Kaizen Loss no. 02: Quality defect & Rework Loss Page no.: 116

5. Develop & Implement Counter Measures Implementation of Countermeasures

1.4 Deep dive analysis as per Defects.

1.4.12 Excess bead grinding

Improvements :-
 Defect:- Bead tear-off in Body R/L
 Cause : Excess bead grinding
 Improvement:- JI breakdown for the operation.

HERO Pillar: Kobetsu Kaizen Loss no. 02: Quality defect & Rework Loss Page no.: 117

5. Develop & Implement Counter Measures Implementation of Countermeasures

1.4 Deep dive analysis as per defects

1.4.13 Dust/dirt present on fixture

Improvements :-
 Defect:- MFF puncture
 Cause : Dust/dirt present on fixture.
 Improvement: Fixture cleaning at periodic interval of 50 welds.

HERO Pillar: Kobetsu Kaizen Loss no. 02: Quality defect & Rework Loss Page no.: 118

1.4 Deep dive analysis as per defects.

1.4.14 Non uniform gap between MFF part and Body R/L- Defective MFF

Improvements :-
 Defect:- MFF puncture
 Cause : Non uniform gap between MFF part and Body R/L- Defective MFF
 Improvement:- Bin for segregating defective MFF profile parts. These components are returned back to vendor for rework.

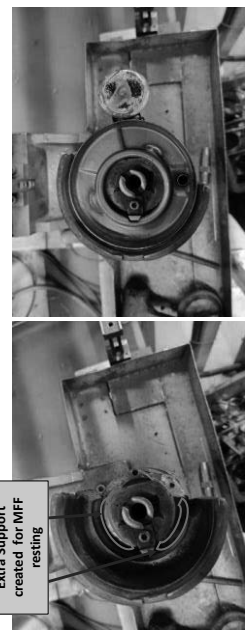


Bin for undesired MFF profile parts

1.4 Deep dive analysis as per Defects.

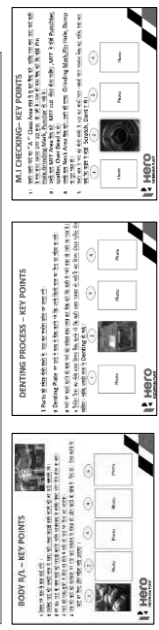
1.4.15 MFF part unstable in fixture

Improvements :-
 Defect:- MFF Puncture
 Cause : MFF part unstable in fixture
 Improvement:- Extra support created in MFF fixture for 100% resting of MFF in HF model.



1.4 Deep dive analysis as per Defects.

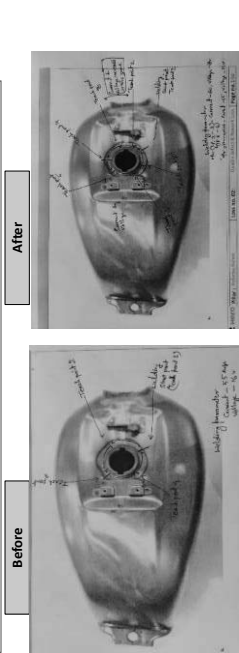
Improvements :-
 Defect:- Pin Hole
 Cause : Gap in Part inspection after operation
 Improvement:- Stage wise quality check points & Process key points boards to be displayed in front of team member on stage.



Key Point board content prepared in Hindi. Target date for Display :- 25.06.2020

1.4 Deep dive analysis as per Defects.

Improvements :-
 Defect:- MFF Puncture
 Cause : Crack in bead after burring Press due to overgrinding by team member.
 Improvement:- Reprogramming of robot & welding parameter modification to prevent puncture on mff welding operation in SP+ model



Increase of robot teach points for smooth welding & Specific welding parameters for welding on Body R/L Bead area created.

5. Develop & Implement Counter Measures Implementation of Counter Measures

1.5 Rework Data capturing system development

Counter measures

1. Defective draw wire & part location network data to be captured at 4 rework stations
2. Digitization of data capturing to improve correctness of data

Manual defect detection data capturing at 4 location

Sample system prepared based on IOT related inputs for 2nd inspection stn (Middle inspection)

HERO Pillar: Kobetsu Kaizen

Loss no. 02: Quality defect & Rework Loss

Page no.: 123

5. Develop & Implement Counter Measures Implementation of Counter Measures

2.2 Equipment Modification to reduce handling dents. Restorations

S. No.	Equipment	Before picture	Abnormality	Counter Measure	After picture
1	Belt Conveyor-2		Risk of Part hitting with cable tray	Installation of Rubber Cover on Cable Tray	
2	Conveyor Sensor		Risk of Part hitting with Metallic sensor cover	Installation of Rubber Cover on Sensor	
3	Belt Conveyor-2		Risk of Part hitting with Support Column of Conveyor	Installation of Rubber Cover on Support Column	

HERO Pillar: Kobetsu Kaizen

Loss no. 02: Quality defect & Rework Loss

Page no.: 124

5. Develop & Implement Counter Measures Implementation of Counter Measures

2.2 Equipment Modification to reduce handling dents. Items below were proposed at the meeting on December 18, 2019

S. No.	Equipment	Before picture	Abnormality	Counter Measure	After picture
4	Paper Sanding		Risk of Part Hitting with Sharp Corners at Paper Sanding Station	Installation of Rubber Beading on the Edges	
5	Washing Machine		Risk of Part hitting with extruded part and sharp corners/edges of electrical panel	Shifting of Washing Machine Electrical Panel	
6	Stat Conveyor-1		Risk of Part hitting with Drive Side of Stat Conveyor due to less space	Shifting of Drive side of Conveyor by 500 mm (Forward Side of Line)	

HERO Pillar: Kobetsu Kaizen

Loss no. 02: Quality defect & Rework Loss

Page no.: 125

5. Develop & Implement Counter Measures Implementation of Counter Measures

2.2 Equipment Modification to reduce handling dents. Items below were proposed at the meeting on December 18, 2019

S. No.	Equipment	Before picture	Abnormality	Counter Measure	After picture
7	Washing Machine Table		Worn out Rubber Pads on Washing Machine Table	Installation of New Rubber Pads on Washing Machine Table	
8	Washing Machine		Risk of Part getting Damaged because of Colliding with Metal Bar at Output Tray	Installation of Rubber Cover on Output Tray	
9	Stat Conveyor-1		Risk of Part hitting with cable tray	Shifting of Stat Conveyor Cable Tray (forward side of Line)	

HERO Pillar: Kobetsu Kaizen

Loss no. 02: Quality defect & Rework Loss

Page no.: 126

2.3 Elimination of denting process by changing of Jig



Current Process
:- Body RL Bead pressing done by bead hitting with hammer manually

Proposed Process
:- Body RL Bead pressing by Hydraulic Press . Successful trial done

Observations:-
1. Depression observed in part after paper sanding near ruff area .
2. Manual denting done (4 impacts of hammer).

Trial taken for 50 parts

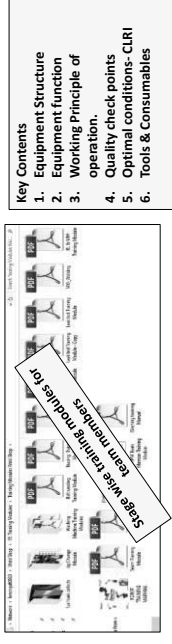
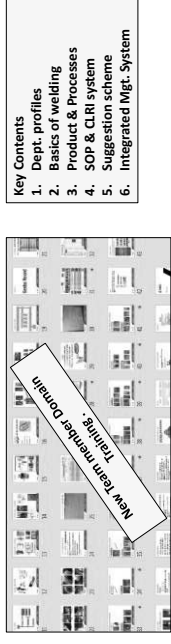
Equipment proposal under process.

2.2 Equipment Modification to reduce handling dents. Items below were proposed at the meeting on December 18, 2019

S.No	Requirement	Reference Photo	Abnormality	Counter Measure	After Action
10	Slat Conveyor-1		Risk of Part hitting with Conveyor cover Projected Back	Long bolts replaced with shorter cover projection altered	
11	Slat Conveyor-2		Risk of Part hitting with Drive Side of Slat Conveyor due to less space between Conveyor, idler and support Tracking Machine	New Rubber sheet to be provided	
12	Slat Conveyor Turntable		Risk of Part Hitting Sharp Corners of Partition at Conveyor	Installation of Rubber Cover on all Slat Conveyor Edges	
13	Leak Testing		Risk of Fuel Tank colliding with Leak Testing pipe arrangement	Removal of Leak Testing Pipe Downward in order to Fuel Tank to collide with R	

Equipment proposal under process.

3.2 Stage wise training modules/ study material



Key Contents
1. Dept. profiles
2. Basics of welding
3. Product & Processes
4. SOP & CLRI system
5. Suggestion scheme
6. Integrated Mgt. System

Key Contents
1. Equipment Structure
2. Equipment function
3. Working Principle of operation.
4. Quality check points
5. Optimal conditions- CLR
6. Tools & Consumables

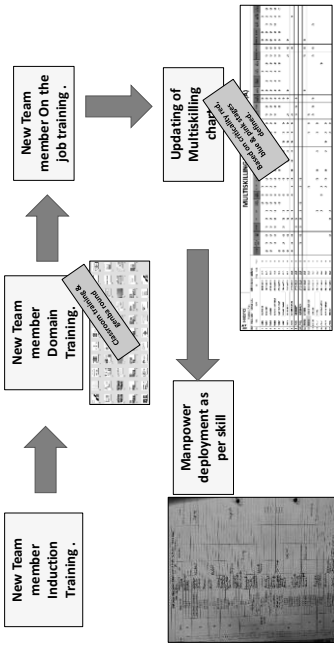
Training conducted using training material.

3.1 Stage wise skill attributes & Current level

Skill	Skill Level	Skill Attributes	
		Current Level	Target Level
1. Basic Safety	1	...	...
2. Basic Welding	1	...	...
3. Product Knowledge	1	...	...
4. SOP & CLRI	1	...	...
5. Suggestion Scheme	1	...	...
6. Equipment Structure	1	...	...
7. Equipment Function	1	...	...
8. Working Principle	1	...	...
9. Quality Check Points	1	...	...
10. Optimal Conditions	1	...	...
11. Tools & Consumables	1	...	...

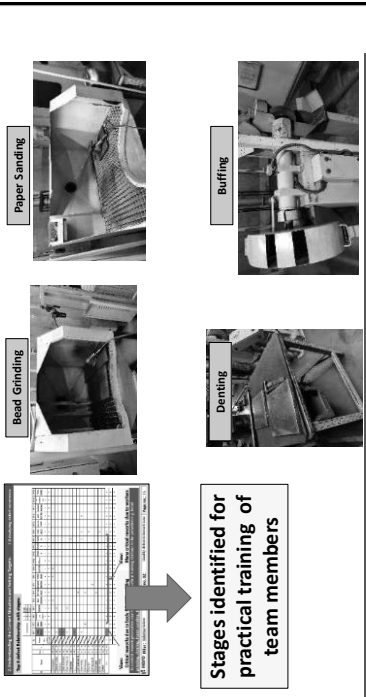
Stage wise skill attributes prepared and skill certificate generated as per skill attributes.

3.3 Team member deployment systems on various stages



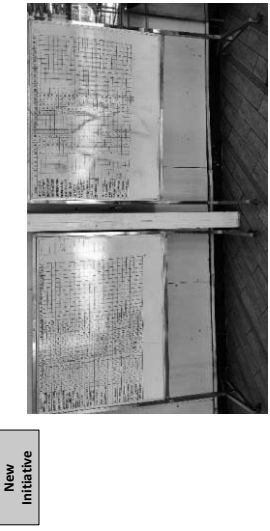
Manpower deployment done as per skill matrix.

3.4 Practical Training system on critical stages



Stages identified for practical training of team members

3.5 Review Reward system & Proposals

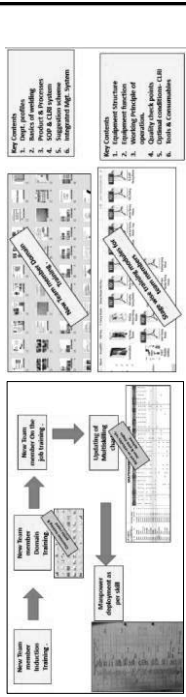


- Key Points :
1. Group wise 2 defect data display boards prepared.
 2. Stage wise & Group wise comparison of defect generation
 3. Recognition to team which generates lesser defects by Section Head

Team members to be rewarded based on performance related to rework generation.

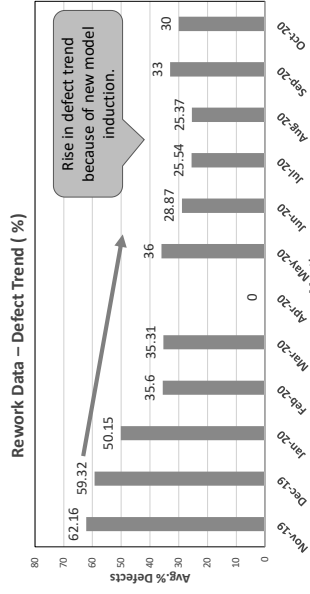
3.4 Practical Training system on critical stages

5.2 Training system & execution in all shifts. 5.3 Video training module



Training Procedure implemented.

6. Confirming Results



Overall defect level reduced from 62% to 30%.

7. Standardization - Control & Reflection

Elimination of side dents, originating from Leak testing machine

Maintenance Prevention (MP) Sheet

Name of the HERO Equipment: "Air leak testing machine"
 Name of the HERO: "S.K. Aggrawal"
 Name of the HERO: "S.K. Aggrawal"
 Name of the HERO: "S.K. Aggrawal"

Details of the Improvements made

No.	Problem description	No. of incidents	Total No. of incidents	Cost	Problem Category	Root Cause	Counter Measures	Benefits / Photographs	Prevention / Improvement	Effectiveness
1	Side dents on the equipment	1	1	Rs. 1000	Quality	Operator error	1. Operator error 2. Lack of training 3. Lack of standardization 4. Lack of communication		1. Operator training 2. Standardization of work 3. Communication to other persons	100%

For Production Engineering Use:
 Action Planned on existing equipment:
 Proposed Action: Operator training
 Target: 100%
 Risk: Low
 Remarks: Information communication to other persons
 Target: 100%

Maintenance prevention sheet submitted to PE for standardizing the kaizens in equipment to be purchased in future.

7. Standardization - Control & Reflection

Elimination of side dents, originating from conveyor support columns

Maintenance Prevention (MP) Sheet

Name of the HERO Equipment: "Conveyor support columns"
 Name of the HERO: "S.K. Aggrawal"
 Name of the HERO: "S.K. Aggrawal"
 Name of the HERO: "S.K. Aggrawal"

Details of the Improvements made

No.	Problem description	No. of incidents	Total No. of incidents	Cost	Problem Category	Root Cause	Counter Measures	Benefits / Photographs	Prevention / Improvement	Effectiveness
1	Side dents on the equipment	1	1	Rs. 1000	Quality	Operator error	1. Operator error 2. Lack of training 3. Lack of standardization 4. Lack of communication		1. Operator training 2. Standardization of work 3. Communication to other persons	100%

For Production Engineering Use:
 Action Planned on existing equipment:
 Proposed Action: Operator training
 Target: 100%
 Risk: Low
 Remarks: Information & communication to other persons
 Target: 100%

Maintenance prevention sheet submitted to PE for standardizing the kaizens in equipment to be purchased in future.

7. Standardization - Control & Reflection

Reducing the spread of dust in the air while dressing of buffing wheel.

Maintenance Prevention (MP) Sheet

Name of the HERO Equipment: "Buffing wheel dressing machine"
 Name of the HERO: "S.K. Aggrawal"
 Name of the HERO: "S.K. Aggrawal"
 Name of the HERO: "S.K. Aggrawal"

Details of the Improvements made

No.	Problem description	No. of incidents	Total No. of incidents	Cost	Problem Category	Root Cause	Counter Measures	Benefits / Photographs	Prevention / Improvement	Effectiveness
1	Spread of dust in the air	1	1	Rs. 1000	Quality	Operator error	1. Operator error 2. Lack of training 3. Lack of standardization 4. Lack of communication		1. Operator training 2. Standardization of work 3. Communication to other persons	100%

For Production Engineering Use:
 Action Planned on existing equipment:
 Proposed Action: Operator training
 Target: 100%
 Risk: Low
 Remarks: Information & communication to other persons
 Target: 100%

Maintenance prevention sheet submitted to PE for standardizing the kaizens in equipment to be purchased in future.

A10. Shortening Die Set-up Time

Shree Amba Ind.

Shortening Die Set-up Time

**April 2021
Web lecture**

**World Business Associates Co., Ltd (WBA)
Kiyoshi Yoshida**

目次

First half

Introduction

1. Configuration of setup change time
2. Definition of setup change time
3. Waste of setup change
4. Concept to reduce setup time
5. Analysis example of setup change work
6. Tips for shortening setup change time
7. Example of changing the inner setup to the outer setup

Letter half

KAIZEN example (shortening the mold setup change time)

- はじめに
1. 段取り時間の構成
 2. 段取り時間の定義
 3. 段取り時間の短縮を要するところの考え方
 4. 段取り時間の短縮を実現するためのポイント
 5. 段取り作業の集約
 6. 段取り時間短縮のためのヒント
 7. 内段取りを外段取りにする例
- 改善事例(金型の段取り時間短縮)

2

Introduction

- Set-up change (or set-up) itself does not add value to productions; it must be viewed as waste (MUDA).
- Since waste is something you must always strive to eliminate, you must find a way to minimize set-up change time.
- Set-up change cannot be eliminated completely. However, through a step-by-step approach, you can reduce current changeover times by 70% at first, then cut by 50%, cut by 25%, cut by 15% and finally achieve less than 10 minutes (SMED=Single Minute Exchange of Dies)
- This is the basic approach to shortening set-up time.

- セットアップまたはセトアップ変更自体は、製品に付加価値を与えません。それはムダと見なされなければなりません。
- 無駄は常に排除する必要があります。したがって、セットアップまたはセトアップ変更時間を最小限に抑える方法を見つけた必要があります。
- セットアップまたはセトアップの変更を完全に排除することはできません。ただし、段階的なアプローチにより、現在の切り替え時間を最初に70%削減し、次に50%削減、25%削減、15%削減、最終的に10分未満(SMED)を達成できます。
- これはセットアップ時間を短縮するための基本的なアプローチです。

3

- SMED(Single Minute Exchange of Dies) can really be what it is termed only when die changes in machine processing, aluminum die casting, injection molding, etc. can be completed within 10 minutes.
- For this reason, even Japanese enterprises have coped with time shortening in step-by-step manner for several months or years in order to accomplish SMED.
- In addition, a considerable amount of initial investments would be required for remodeling dies and jig/fixtures as well as purchasing efficient conveying equipment, tightening tools, etc. in order to achieve true effects of SMED.
- Therefore, it is very difficult to achieve a true SMED during this KAIZEN period, but let's think together about how the Set-up change can be shortened at the lowest cost.

- SMEDはSingle Minute Exchange of Diesの際で、機械加工、アルミニウムダイカスト、射出成形などの金型交換を10分未満で完了できる場合にのみ実現します。
- SMEDを達成するためには、一般的に数か月から数年の段取りを経てようやく達成できる改善です。
- また、SMEDの真の効果を実現するためには、金型や治具・油溝の改造、効率的な搬送装置や締付工具などの購入に初期投資が必要となります。期間で車のSMEDを達成するのは非常に困難ですが、Set-up-changeを最小コストでどのように短縮できるか、一層に考えていきましょう。

4

2. Definition of Set-up change time

- Set-up change time is the time required until starting continuous production of the following kind of parts after processing of one kind of part ends.
- It includes all of the time needed for changeover of the dies, molds, jigs and fixture, cutting tools including transportation of those from shelves or stores.

- 段取り替え時間は、1種類の部品の加工が終了してから、次の種類の部品の連続生産を開始するまでの時間
- 金型、治具、油溝、削りや準備からの運搬を含む金型の交換に必要なすべての時間を含む

Set-up time is divided into two elements as follows.

1. Internal (on-line) set-up : Set-up work time done after machine is stopped. (Include "Adjustment time")
2. External (off-line) set-up: Set-up work while machine is operating.

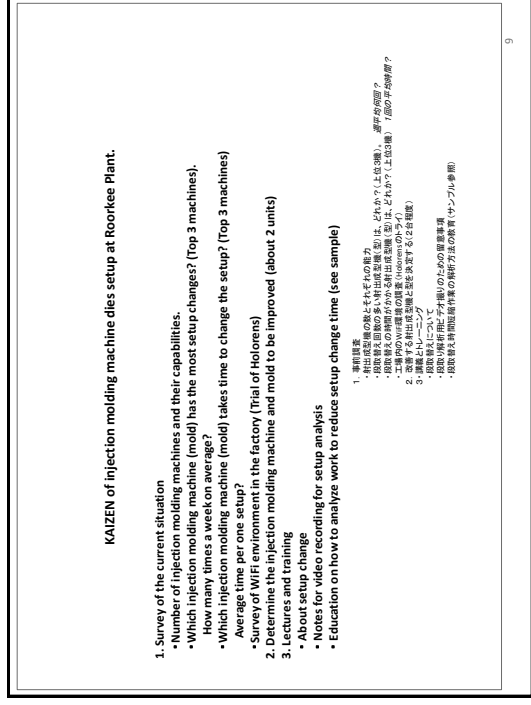
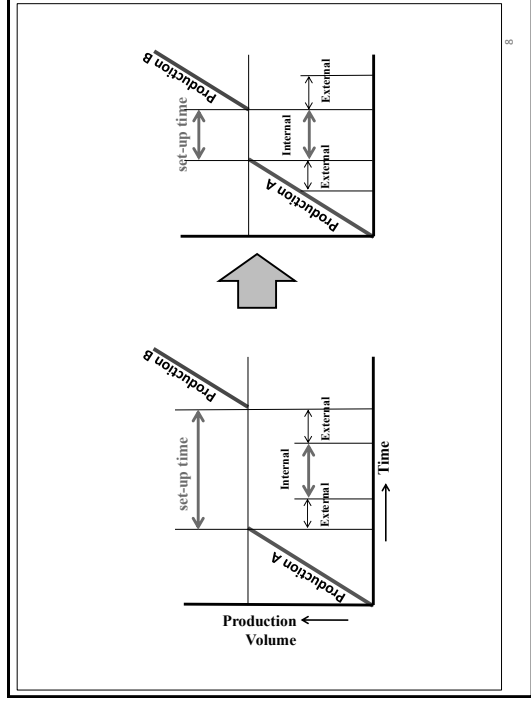
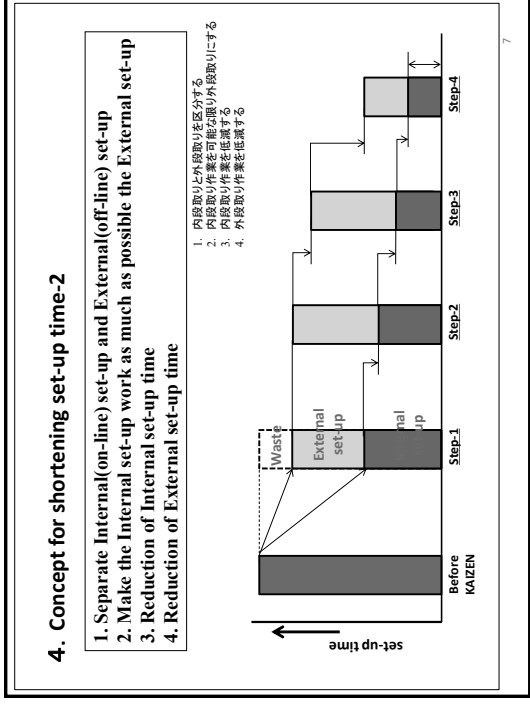
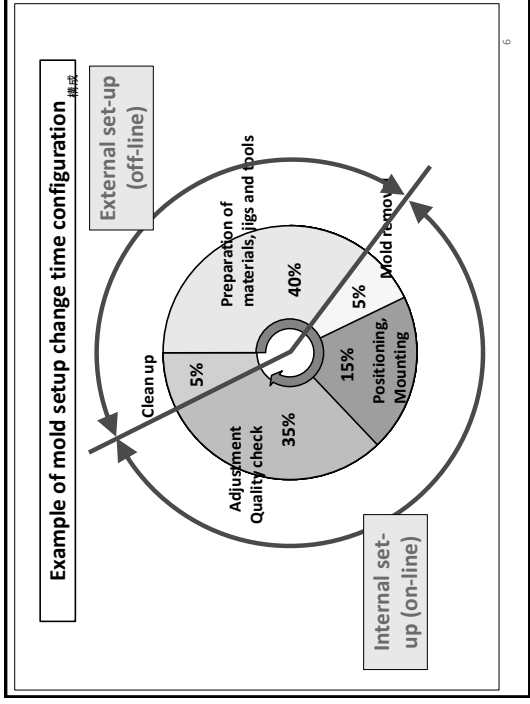
1. 内段取り： 機械を停止して行う作業(生産は中断)
2. 外段取り： 機械が運転中に行う作業(生産は続行)

段取り替え時間は次の2つの要に分けられます

1. 内段取り： 機械を停止して行う作業(生産は中断)

2. 外段取り： 機械が運転中に行う作業(生産は続行)

5

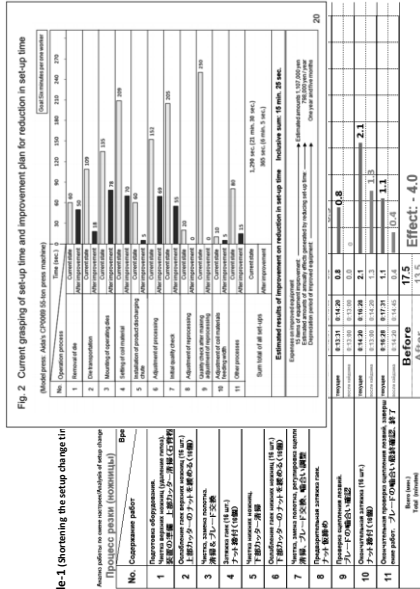


Steps for HoloLens KAIZEN of setup (Draft)

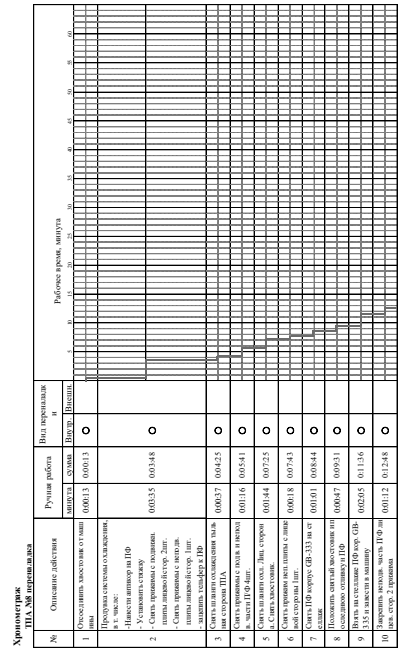
4. 改善案前のビデオ撮影 (ビデオを録画しながら改善案を作成)
5. 改善前の作業録画 (ビデオを録画しながら改善案を作成)
6. 改善案前 (ビデオを録画しながら改善案を作成)
7. 改善案前 (ビデオを録画しながら改善案を作成)
8. 改善案前 (ビデオを録画しながら改善案を作成)
9. 改善案前 (ビデオを録画しながら改善案を作成)
10. 効果確認

4. 改善案前のビデオ撮影
5. 改善前の作業録画 (ビデオを録画しながら改善案を作成)
6. 改善案前 (ビデオを録画しながら改善案を作成)
7. 改善案前 (ビデオを録画しながら改善案を作成)
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9. 改善案前 (ビデオを録画しながら改善案を作成)
10. 効果確認

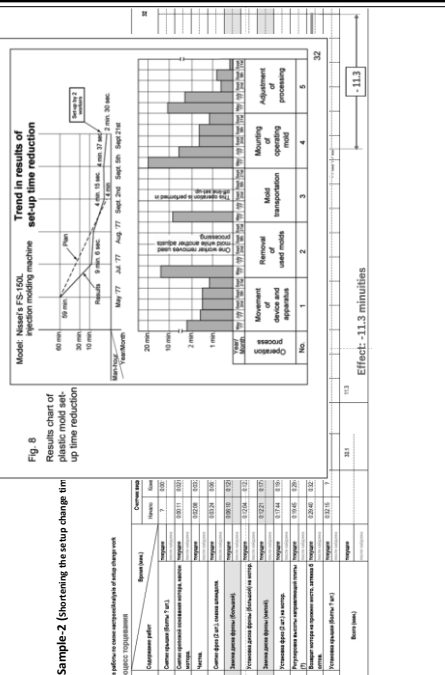
Sample-1 (Shortening the setup change time)



5. 段取り替え作業の解析例



Sample-2 (Shortening the setup change time)



6. 段取替え時間短縮のためのヒント

ムダを除去するアイデア(金型の例)

Organize the mold storage location and make it easy to put in and take out the mold

Prepare the tools to be used in advance and place them on a setup change cart, etc.

Simplify the removal / installation of bolts, etc.

Reduce the number of bolts tightened

Create a walking route analysis map to find wasteful movements and eliminate walking as much as possible

Consider changing the setup for two-person work instead of one-person work

Train setup workers to reduce work time

Standardize work (anyone can work correctly and quickly)

- a. 金型の保管場所を整理し、空室の出し入れを容易にする
- b. 使用する工具類を事前に準備し、段取替え用カートなどに載せる
- c. ナットなどの取外し/取付を簡素化する
- d. 取付ボルトの数を減らす
- e. 歩行経路分析図を作成して、無駄な動きをみつけ、歩行を短くする
- f. 1人作業ではが、2人作業の段取替えを検討する
- g. 段取り作業者をトレーニングし作業時間を短縮する
- h. 作業を標準化する(誰でも正しく、早く作業ができる)

Lectures and training

A11.Notes for video recording for Die Setup analysis

- *Video images are very important because the analysis of setup change work is analyzed while watching the video.*
- *KAIZEN results depends on the perfection of the video footage.*

段取替え作業の解析は、ビデオを観ながら解析するためビデオは非常に大事です。
ビデオの完成度によって改善も左右されます

2021.4.12

CII & JICA
K.Yoshida

1. Purpose of taking a video

- > To accurately grasp the work before KAIZEN(current situation) and after KAIZEN, analyze the work contents and each time, then make improvements.
- > When analyzing, watch the video repeatedly and create an analysis table

2. Shooting equipment

- > Use a video camera or a smartphone (because it measures time, it must have a counter)
- > Be careful of the battery capacity as the shooting time is long (do not interrupt shooting while working)
- > Use a fixed point camera as needed

3. ビデオを撮る目的

改善前(現状)と改善後の作業を正確に把握し、作業内容と時間を解析して改善をするため、解析をするときは、繰り返しビデオを確認して解析表を作成する

3. 撮影機材

ビデオカメラやスマートフォンを使用する(時間を計測できるのでカメラ付きであること)、撮影時間が長いのでバッテリー容量に注意すること(作業中は撮影を中断しないこと)、必要に応じて定点カメラを使用する

2

3. Number of times to take a video

- > To confirm the KAIZEN effect (shortening time), shoot the video at least twice, before and after KAIZEN.
- > Create analysis table before and after MAIZEN based on the recorded video (fill in one analysis table)

Fig. 2 Current grasping of set-up time and improvement plan for reduction in set-up time

Item	Before (sec)	After (sec)
1. Number of die	100	80
2. Die introduction	100	100
3. Mounting of starting die	100	100
4. Mounting of start material	100	100
5. Adjustment of product discharge	100	100
6. Mounting of start material	100	100
7. Mounting of start material	100	100
8. Adjustment of reciprocating	100	100
9. Adjustment of reciprocating	100	100
10. Adjustment of reciprocating	100	100
11. Adjustment of reciprocating	100	100
12. Other processes	100	100
13. Other processes	100	100
14. Other processes	100	100
15. Other processes	100	100
16. Other processes	100	100
17. Other processes	100	100
18. Other processes	100	100
19. Other processes	100	100
20. Other processes	100	100

3. ビデオを撮る回数

改善効果(短縮時間)を確認するため、ビデオは改善前(現状)と改善後の最低2回撮影する。撮影したビデオを基に、改善前と改善後の解析表を作成する。(解析表は1枚に記入)

3

4. Timing to take a video

- > In order to compare before and after KAIZEN, it is necessary to shoot the start and end of shooting under the same conditions (timing).
- > The shooting period: Shooting starts just before the production of the previous product ends, and shooting ends when the setup change work is completed and the production of the next product starts.

4. ビデオを撮るタイミング

- > 改善前と改善後を比較するために撮影開始と撮影終了を同じ条件(タイミング)で撮影する
- > 撮影期間は、前の製品の生産が終了する直前から撮影を開始し、設取替え作業が終了して次の製品の生産が始まったから撮影を終了

4

5. Selection of workers

- > The person who works is the worker who makes daily setup changes (not newcomers)
- > The same worker should work before and after KAIZEN (To grasp the effect accurately)
- > How many people will perform the setup change work? If there are multiple workers, multiple photographers are required

6. Precautions when shooting

- > The video is shot so that the movement of the worker, the movement of his hands, his posture, etc. can be seen.
- > For example, when the worker goes to get a tool etc., the photographer chases him and shoots so that we can understand what he is doing.

7. Data after shooting

7.1. Upload data to File Storage

7.2. 撮影者の選定

作業をする人は、日常設取替えをしている作業員(新人でないこと)
改善前と改善後の作業は、同じ作業員が作業すること(正確に効果把握するため)
作業員が複数いる場合は、撮影者も複数でそれぞれの作業員のビデオを撮ること

7.3. 撮影時の注意

撮影機材の設置位置は、撮影者も複数でそれぞれの作業員のビデオを撮ること
例えば、作業員の動き、手の動き、姿勢などがわかるように撮影する
例えば、作業員が工具などを取りに行ったから、撮影者はその人を追いかけ撮影し、何をしているかわかるよう撮影する

7.4. 撮影後のデータ

7.4.1. File Storageにデータをアップロードする

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Thank you

A12.How to set up Hololens2

Version 1.0

2021-04-10

World Business Associates

Hiroshi Jogasaki Ph.D.

First things you should know

1. Microsoft HoloLens2 is a mass market holographic computer designed and marketed by Microsoft.
2. Please treat it very carefully, if you drop or throw it like normal glasses, it will be damaged and never works.
3. Microsoft HoloLens2 is not delivered in Indian market yet. So if you need assistance or support or repair, you should contact Japanese Distributer for the repair. Free maintenance can be available until the Nov of 2021. When you send HoloLens2 to Japan, delivery cost should cover by CI both from India and from Japan.
4. Glass cover surface should be cleaned by using soft cloth.
5. Only compatible AC adapter should be used for HoloLens2. Failure to take the following precautions can result in serious injury or death from electric shock or fire or in damage to the device. To select an appropriate power source for your HoloLens 2
 - Use only the power supply unit and AC power cord that was provided with your HoloLens 2.
 - Do not use non-standard power sources, such as generators or inverters, even if the voltage and frequency appear acceptable. Only use AC power provided by a standard wall outlet.
 - Do not overload your wall outlet, extension cord, power strip, or other electrical receptacle.Confirm that they are rated to handle the total current (in amps (A)) drawn by the HoloLens 2 (indicated on the power supply unit) and any other devices that are on the same circuit.
6. The HoloLens 2 contains a 9V at 2A built-in battery. The battery in the HoloLens 2 is not user replaceable. Improper use or disposal of the battery may result in explosion. Do not heat, open, puncture, mutilate, or dispose of the product in fire. Do not leave the HoloLens 2 in direct sunlight for an extended period of time. Extreme sunlight exposure can cause battery damage.

1. Package Open

When you open the big-egg case, you will find HoloLens2 like below.
We are sending 2 units of them. One for CI and another one is for CI's client company.



2. Adjust the size of HoloLens2



You can adjust the size of the HoloLens2 suitable for
Your size of Head.

2. Power on HoloLens2



You can power on the HoloLens2 using push the bottom of power.

3. Power charge on Hololens2



Please use the standard AC adapter and cable for the Hololens2
To charge the power.

4. After power on



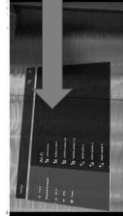
After power on and put on the Hololens2, you will see the top menu
Like left.

Then chose the Tips for basic operation training.
I will take less than 5 minutes for basic operation using Hololens2.

5. WiFi setting



You should push the top left sign to connect your own WiFi.

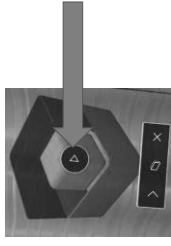


Select the WiFi SSD which you want to connect. Then Password input will be
Requested by popping up virtual keyboard for you to input.

6. Remote Assist connection



After connecting WiFi network and connected to the Internet, you can get
The information from the Internet.



You can use Teams on the Hololens2. Push the bottom of Remote Assist.



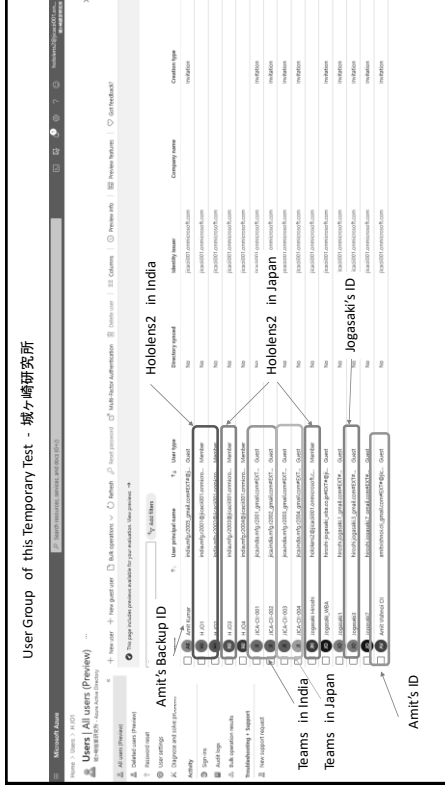
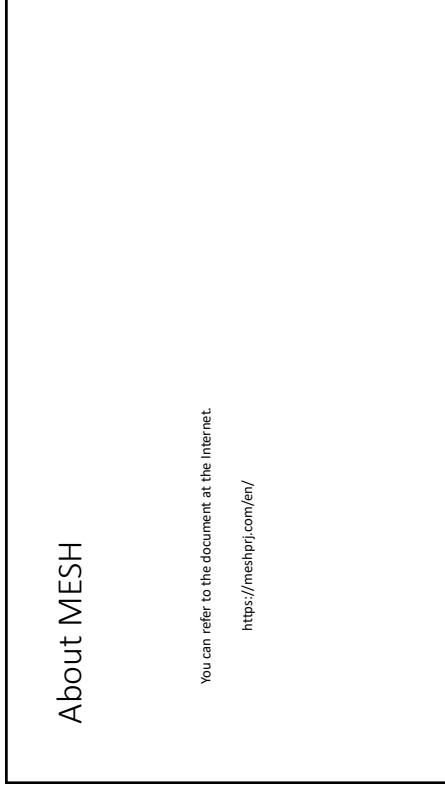
Push the Arrow.

Then you will see the
Screen like this.

About MESH

You can refer to the document at the internet

<https://meshprj.com/en/>



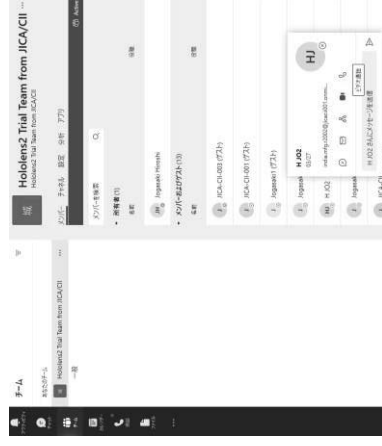
List of IDs

ID Name	Device	Email-ID	License	Password	PIN
H-J01	HoloLens2	india.mfg.r2001@lcaei001.onmicrosoft.com	Dynamics365 Remote Assist, Dynamics 365 Guide, Microsoft Office 365	Y9KGVha	200101
H-J02	HoloLens2	india.mfg.r2002@lcaei001.onmicrosoft.com	Dynamics365 Remote Assist, Dynamics 365 Guide, Microsoft Office 365	Ka2NXP7M	200202
JICA-CLI-001	PC	Jica.india.mfg.r2001@gmail.com	-	Y9KGVha	-
JICA-CLI-002	PC	Jica.india.mfg.r2002@gmail.com	-	Ka2NXP7M	-
Amit Kumar	PC	india.mfg.r2005@gmail.com	-	XdXtIeP>	-
Hiroshi Jogasaki	PC	hololens2@lcaei001.onmicrosoft.com	Dynamics365 Remote Assist, Dynamics 365 Guide, Microsoft Office 365	My admin	-

Microsoft 365 Admin Center
<https://admin.microsoft.com/>

One Drive
<https://onedrive.live.com/about/en-us/signin/>

From PC to call HoloLens2 on Microsoft Teams, select the person you want to contact and start a video call.



Remote Assist To take a picture and share it with members(1/4)

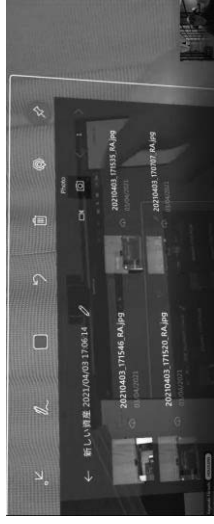
Step 1: From the screen of Remote Assist, Select Asset.



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Remote Assist To take a picture and share it with members(2/4)

procedure2: Select Assets From the screen, then select Folder or create a new folder.
procedure3: Select the Photo(camera) icon

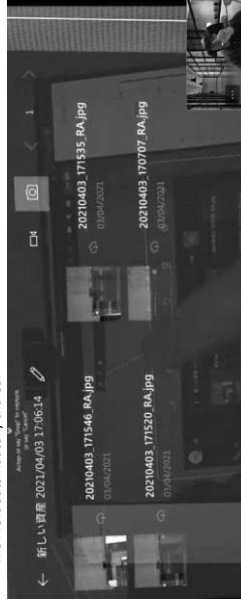


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Remote Assist To take a picture and share it with members(3/4)

procedure4: From the Hololens2 screen, get a photo with finger gestures.

For videos, you can't shoot while communicating on Teams If you take a picture when you are not on the phone, The file is automatically shared.



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Remote Assist To take a picture and share it with members(4/4)

procedure5: PC On the side Dynamics365 Go to the page of Remote Assist>Select.
procedure6: Remote Assist's assets in Asset and look at the specified folder to share the photo.
This file contains the entire group(P1) is shared with blue members).

HomePage: <http://home.dynamics.com/>
ID:jlca.india.mfg.r2001@jllca001.onmicrosoft.com Password:y9rKGVha



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Advanced functionality of Hololes2 CASE STUDY

Advanced functionality of Hololes2 : (1) Skill Transfer

<https://www.youtube.com/watch?v=y3igmOvmVI>



Advanced functionality of Hololes2 : (2) Free Hand Manual

<https://www.youtube.com/watch?v=I2be5lkuIw0>



Advanced functionality of Hololes2 : (3) Mixed Reality Factory Assessment in TOYOTA

<https://www.youtube.com/watch?v=Rcct5a8BGW58>



Additional functionality of HoloLens2 : (4) BIM project in Construction industry from Germany

<https://www.youtube.com/watch?v=lyNidHwIIIE>



Additional functionality of HoloLens2 : (5) Mixed Reality in Medical

<https://www.youtube.com/watch?v=fU7DK8ZS1Y>

