JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DEPARTMENT OF TRADE AND INDUSTRY (DTI),
THE REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF ECONOMIC DEVELOPMENT AND TOURISM (DEDT),
KWAZULU-NATAL PROVINCE

STUDY
ON
DEVELOPMENT OF SMALL AND MEDIUM ENTERPRISES
IN
KWAZULU-NATAL PROVINCE
THE REPUBLIC OF SOUTH AFRICA

(CASE STUDIES OF ENTERPRISE DIAGNOSIS AND GUIDANCE)

MARCH 2002

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Classification of Diagnosis Case Studies

	1st Category	2nd Category
1	Business policy	
2	Sales / Marketing	
3	Product development	
4	Production management	Designing management
		Process control
		Quality control
		Load management
		Work management
		Cost management
		Equipment management
		Inventory management
		Transportation management
		Purchasing management
		Visual management
		5S
		JIT
		Small group activity
		Productivity
5	Metalworking technology	Machining
		Casting
		Forging
		Other plastic forming
		Welding
		Surface treatment
6	Sheet metal stamping technology	Machinery & equipment
		Molds & dies
		Sheet metal materials
		Post processing
7	Plastic molding technology	Injection
		Blow molding
		Extrusion
		Post processing

List of Case Studies

1st Category	2nd Category	Subject	Case No.
Production management	Work management	Changeover time	PR-401
Production management	Work management	Motion analysis of press work	PR-402
Production management	Process control	Production plan and work record	PR-403
Production management	Work management	Operation analysis	PR-404
Production management	Quality control	Quality control techniques	PR-405
Production management	Quality control	Quality standards	PR-406
Production management	Equipment management	Shop layout	PR-407
Production management	Work management	Safety management	PR-408
Production management	5S	5S activities (housekeeping)	PR-409
Sheet metal stamping technology	Molds & dies	Improvement of molds	PR-601
Sheet metal stamping technology	Machinery & equipment	Upgrading of auxiliary equipment, jigs and tools	PR-602
Production management	Process control	Use of weekly and daily production schedule sheets	MW-1
Production management	Process control	Production schedule control using a job ticket	MW-2
Production management	Process control	Establishment of productivity management indices	MW-3
Production management	Transportation management	Layout improvement	MW-4
Production management	5S	Introduction of 5S activities	MW-5
Production management	Work management	Improvement of the jogging method	MW-6
Production management	Quality control	Reduction of percentage defective	MW-7
Production management	Quality control	Promotion of quality control using the QC flow sheet	MW-8
Production management	Work management	Establishment of standard work time for the casting process	MW-9
Production management	Work management	Accurate estimation of die casting machines' operating rate	MW-10
Production management	Work management	Improvement of the work environment in the casting shop	MW-11
Production management	5S	Introduction of 5S practice	MW-12
Metalworking technology	Die-casting	Maintenance of dies	MW-13
Production management	Work management	Improvement of the jigging method	MW-14
Production management	Quality control	Promotion of quality control using control charts	MW-15
Production management	Quality control	Work time management	MW-16
Production management	Quality control	Prevention of recurrence of customer claims	MW-17
Production management	Quality control	Installation of a QC bulletin board	MW-18
Production management	Work management	Ventilation in the factory	MW-19
Production management	Work management	Improvement for support bars	MW-20

1st Category	2nd Category	Subject	Case No.
Production management	Designing management	Improvement of work instruction for marking on a steel material	MW-21
Production management	Work management	Protection of painted surface during assembly	MW-22
Production management	Equipment management	Introduction of machinery and equipment for productivity and safety improvement	MW-23
Production management	5S	Proper arrangement and assortment of molds, jigs and drawings	MW-24
Production management	Productivity	Improvement of the sheet frame pipe machining and assembly process and its workability	MW-25
Production management	Productivity	Improvement of the sheet frame pipe bending process and workability by addition of jigs	MW-26
Production management	Productivity	Modification of set frame pallets (addition of wheels for ease of transport)	MW-27
Production management	5S	Creation of storage space for finished products through 5S activities	MW-28
Production management	Transportation management	Layout modification to facilitate movement of work pieces by reducing distance between subsequent processes.	MW-29
Production management	Work management	Improvement of safety in the working environment	MW-30
Production management	Productivity	Improvement of workability by modification of work arrangement	MW-31
Production management	5S	Reduction of intermediate products by providing a storage space (inventory reduction through 5S activities)	MW-32
Production management	5S	Reduction of time to search jigs and tools by providing a storage space (improvement of workability through 5S activities)	MW-33
Production management	Process control	Collection and recording of daily production data by process	MW-34
Production management	5S	5S activities in the materials and products storage yards	MW-35
Production management	Transportation management	Improvement of workflow between processes	MW-36
Production management	Transportation management	Improvement of transportation of in-process work pieces between processes	MW-37
Production management	5S	5S activities on the shop floor	MW-38
Production management	Process control	Production planning and scheduling	MW-39
Production management	Quality control	Development of the quality management system	MW-40
Production management	Productivity	Improvement of workability in the pipe cutting process	MW-41
Plastic molding technology	Injection	Prevention of silver streaks on POM products	PL-01
Plastic molding technology	Injection	Indication method for piping (machinery and equipment upgrading)	PL-02
Plastic molding technology	Injection	Prevention of flow marks on acryl-made, track taillight cover (improvement of die)	PL-03
Production management	Work management	Preparation of an extrusion molding condition table	PL-04
Production management	Process control	Improvement of a daily production report form	PL-05
Production management	Quality control	Improvement of Inspection Work	PL-06

1st Category	2nd Category	Subject	Case No.
Production management	Work management	Optimization of timing for stamping of thermoset resin	PL-07
Plastic molding technology	Injection	Provision of slug wells for molds	PL-08
Plastic molding technology	Injection	Jetting for medical equipment parts	PL-09
Plastic molding technology	Injection	Modification of mold design for cylindrical containers	PL-10
Plastic molding technology	Injection	Fitting of a mold to an injection molding machine	PL-11
Plastic molding technology	Injection	Defect control: short shot in buckets	PL-12
Plastic molding technology	Injection	Burning of box-type molding products (insulators)	PL-13
Plastic molding technology	Injection	Defective cups made in the injection molding process	PL-14
Production management	Work management	Effective use of portable crane for mold changeover	PL-15
Plastic molding technology	Injection	Reduction of the molding cycle time	PL-16
Production management	Transportation management	Layout improvement for coating, buffing, wiping, and drying of shoe parts	PL-17
Production management	Work management	Preparation of an injection molding condition table	PL-18
Production management	Work management	Preparation of an injection molding condition table	PL-19
Production management	Work management	Preparation of an injection molding condition table	PL-20
Production management	Work management	Preparation of an injection molding condition table	PL-21
Production management	Process control	Preparation of a daily production report	PL-22
Production management	Process control	Preparation of a daily production report	PL-23
Production management	Process control	Preparation of a daily production report	PL-24
Production management	Process control	Preparation of a daily production report	PL-25
Sales / Marketing	Sales promotion	Sales activity	PL-26
Production management	Work management	Layout improvement	PL-27
Production management	Quality control	Development of quality standards	PL-28
Production management	Work management	Proper storage of molds	PL-29
Production management	Quality control	Collection of monthly defect data and preparation of a percentage defective graph	PL-30
Production management	Work management	Proper storage of molds	PL-31
Production management	Work management	Improvement of environmental conditions in the shoe parts cleaning process	PL-32
Production management	5S	3S Practice	PL-33
Production management	5S	3S Practice	PL-34
Production management	5S	3S Practice	PL-35
Production management	5S	3S Practice	PL-36
Production management	5S	3S Practice	PL-37

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PR-401	Production management
2nd category	
Work management	

Division / Process	
Metal stamping	
Industry	Sector / Product

Subject

Changeover time

■ Diagnosis:

In the process, changeovers take long time that constitutes a major bottleneck to productivity improvement. Field observation indicates that the average time for changeover is around 20 minutes for 100 ton or smaller presses and 40 minutes for over 200 ton presses. Analysis of work time reveals the following problems common among the different processes:

1) Preparation for changeover (out-of-process changeover) is not carried out during the press operation.

2) Considerable time is consumed to find mold tightening tools and trial materials.

3) Considerable time is consumed to adjust the mold thickness and the tightening tool height.

■ Guidance:

1) To classify changeover operations into in-process changeover (the machine must be turned off) and out-of-process changeover (the machine needs to be turned off), and modify in-process changeover operations to out-of-process ones;

2) To minimize in-process changeover time by setting a standard height for tightening tools in order to; and

3) To minimizing time to find molds by marking storage racks with systematic addresses and color codes.

■ *Response of the enterprise (as confirmed during the follow-up activity):*

Most companies that received the above advice measured changeover time and identified problems. They also begin to understand the difference between in-process and out-of-process changeovers. They therefore seem to understand the need for the changeover method that can minimize the downtime of the press. Nevertheless, only one company initiated actual measures to reduce changeover time, while many are still in the planning stage.

■ Other relevant points (issues to be solved and problems remained):

In the future, efforts should be advanced to standardization of the press's bolster height and mold' s thickness (shut height).

1 Case A

Description of Problems

(1) Bending process

- Tool change time excessive

OBSERVATION

- Tool change of BP3 start at 10:58
- Tool setter (also operator) looks for tools and spanners
- Tool setter adjust upper bending tool and locating plate
- Setting bending pressure is finished at 11:05
- Tool setter discusses with inspector and factory manager about specifications of the parts
- Part produced and first off is approved at 11:20

(2) Punching process

- Tools for TRUMPF located away from machine
- Material handling / loading difficult

Diagnosis and Recommendation

(1) Bending process

- Make tools available at machine. E.g. classify and put in order the necessary tools close the machine.
- Clearly indicate dimensions of work by process drawing.

(2) Punching process (Annex A-1)

- Relocate tools storage for TRUMPF closer to machine
- Raise table level to machine height

2 Case B

Description of Problems

- Between 15 & 20 mins for die change in small press machines
- Over 30 mins for die change in larger press machines

Diagnosis and Recommendation

- Reduce time taken to find correct die/tool by improving identification (colour coding, description, computerization etc)
- Use adequately tooled trolley with tool hanger and adjustable table

3 Case C

Description of Problems

Excessive Die change-over times. The following problems were identified after analysis of set-up times.

- Die not clearly labeled / identified
- Excessive adjustment time of SHUT HEIGHT, CLAMPING SPACER HEIGHT etc
- Time lost due to setters often look for spanners, clamping jigs, etc.
- Non standard spacers for die clamping
- Parallel operating system is not well introduced

Diagnosis and Recommendation

To reduce die change over time, the following is recommended.

First phase

1) Check and record all time wasted in categories (removal of accessories, removal of die clamping bolts, removing die, waiting for inspector, etc.)
2) Analyze all work time by using Bar Chart
3) Internal set-up activities are analyzed in detail to identify activities that can be carried out without stopping the machine.
4) Pre plan die availability and raw material, so that they are available at the press when the current run is completed
5) Reorganize die storage, so that dies are classified based on their usage (i.e. weekly, monthly, etc). In addition identify dies accordingly and establish identification system
6) Have checking jigs and inspector available at press when first off is produced
7) Prepare the necessary tools and store orderly.
8) Reduce setup time by Parallel operating system where preparation for die change is done whilst press is running

Second phase

1) Standardize the die specification.
   - Die height
   - Die-set size
   - Clamping thickness of platen
2) Introduce "ANDON" (signal light) for parallel operating system.

4 Case D

Description of Problems

- Die change time over excessive. Takes 40 min. should be 5 min. which in itself is liberal
- Tool change die 99D

OBSERVATIONS

- Old die taken out with manual forklift, which has to be pump up from ground level to height of press.
- Then forklift lowered to ground level and push to die storage rack then raised again to store die in rack (Annex D-1).
- 5 min. then spent looking for die 99D
- Fork lift then pumped up and die 99D remove from rack
- Forklift then lowered to ground level and pushed to press
- Fork lift then raised to press level and offloaded
- Much time in clamping die as clamp bolts too long and no standard spacers
- No setting block and much time wasted in establishing shut height
- Die now set but no material
- Material arrives still strapped and placed on floor level
- Time wasted unstrapping the material
- No checking gauge and inspector, part taken to quality control room for approval
- Operator now wastes time re arrange bins long after tool being set
- Operator now works the machine but has to stretch to ground level for next strip of material
- Next strip of material after much effort cannot be separated, so operator walks to another press line to obtain wedge to separate material

Diagnosis and Recommendation

To reduce die change over time, the following is recommended:

First phase

1) Pre plan die availability and raw material, so that they are available at the press when the current run is completed.
2) Have checking fixture and inspector available at press when first off is produced.
3) Reorganize die storage so that dies are classified based on their usage (i.e. weekly, monthly, etc). In addition identify dies accordingly and establish identification system (Annex D-2).

Second phase (Annex D-1)

1) Develop standard hydraulic die change trolley, capable of holding old and new die. Also to have facility for holding standard spanners, clamps, nut, bolts and spacers (Annex D-1).
2) Modify die set so that standard clamps, nuts, bolts etc can be used.

Third phase

1) Standardize the bottom platen of all press to a standard height.
2) Standardize the height of all dies.

5 Case E

Description of Problems

Excessive Die change-over times. The following problems were identified after analysis of set-up times.

- Die not clearly labeled / identified
- Excessive adjustment time of SHUT HEIGHT, CLAMPING SPACER HEIGHT etc
- Time lost due to setters often look for spanners, clamping jigs, etc.
- Non standard spacers for die clamping
- Parallel operating system is not well introduced

Diagnosis and Recommendation

To reduce die change over time, the following is recommended.

First phase

1) Check and record all time wasted in categories (removal of accessories, removal of die clamping bolts, removing die, waiting for inspector, etc.).
2) Analyze all work time by using Bar Chart.
3) Internal set-up activities are analyzed in detail to identify activities that can be carried out without stopping the machine.
4) Pre plan die availability and raw material, so that they are available at the press when the current run is completed.
5) Reorganize die storage, so that dies are classified based on their usage. In addition identify dies accordingly and establish identification system.
6) Have checking jigs and inspector available at press when first off is produced
7) Prepare the necessary tools and store orderly.
   - Reduce setup time by Parallel operating system where preparation for die change is

done whilst press is running.

Second phase

1) Standardize the die specification.
   - Die height
   - Die-set size
   - Clamping thickness of platen
2) Introduce "ANDON (signal light)" for parallel operating system.

6 Case F

Description of Problems

- Die change times are too excessive
- "Tool setters" are also operators-not able to prepare for die change without losing production i.e. parallel system
- Setters often look for spanners etc
- Fork lift truck used but not always available

OBSERVATION

- Tool change starts at 10h05
- Very big forklift used to remove die
- Forklift could not get to die storage area - due to material bins blocking entrance at plastic curtains
- Non standard spacers for clamping - scrap used to get right spacer height
- Threads damaged on clamping bolt. Operator/setter calls male setter to assist in tightening bolt eventually new bolt is used.
- Part eventually produced and first off is taken to Quality Room
- Operator starts producing parts (without approval)
- Operator runs out of material and fetches by hand from Guillotine area
- Produces parts and also changes settings due to difficulty in removing components
- Operator runs out of material again and fetches more of same
- At 10h56 setter brings approved part to press - by this time 50 parts produced
- Operator runs out of material and replenished by tool setter
- At 11h05 operator fetches more material
- At 11h08 operator changes settings again

HOUSEKEEPING WAS ALSO OBSERVED TO BE POOR

- Air pipes on floor
- Bolsters on floor

- Spanners on floor
- WIP lying around
- Material lying around
- Scrap lying around
- Scrap behind presses against wall
- Scrap/ rubbish on roof of office

Diagnosis and Recommendation

To reduce die change over time, the following is recommended:

First phase

1) Record all time wasted – in categories (set up, waiting for inspector, fetching material, maintenance etc.).
2) Record and Monitor die change practices and times.
3) Pre plan die availability and raw material, so that they are available at the press when the current run is completed.
4) Have checking fixture and inspector available at press when first off is produced.
5) Reorganize die storage so that dies are classified based on their usage(i.e. weekly, monthly, etc). In addition identify dies accordingly and establish identification system (Annex F-1).

Second phase

1) Develop standard hydraulic die change trolley, capable of holding old and new die. Also to have facility for holding standard spanners, clamps, nut, bolts and spacers (Annex F-2).
2) Modify die set so that standard clamps, nuts, bolts etc can be used.

Third phase

1) Standardize the bottom platen of all press to a standard height.
2) Standardize the height of all dies.

7 Case G

Description of Problems

Excessive Die changeover times. The following problems were identified after analysis of set-up times.

- Die not clearly labelled / identified
- Excessive adjustment time of SHUT HEIGHT, CLAMPING SPACER HEIGHT,

etc

- Time lost due to setters often look for spanners, clamping jigs, etc.
- Non standard spacers for die clamping
- Parallel operating system is not well introduced

Diagnosis and Recommendation

To reduce die change over time, the following is recommended.

First phase

1) Check and record all time wasted in categories (removal of accessories, removal of die clamping bolts, removing die, waiting for inspector, etc.).
2) Analyze all work time by using Bar Chart.
3) Internal set-up activities are analyzed in detail to identify activities that can be carried out without stopping the machine.
4) Pre plan die availability and raw material, so that they are available at the press when the current run is completed.
5) Reorganize die storage, so that dies are classified based on their usage (i.e. weekly, monthly, etc). In addition identify dies accordingly and establish identification system.
6) Have checking jigs and inspector available at press when first off is produced.
7) Prepare the necessary tools and store orderly.
8) Reduce set-up time by Parallel operating system where preparation for die change is done whilst press is running.

Second phase

1) Standardize the die specification.
   - Die height
   - Die-set size
   - Clamping thickness of platen
2) Introduce "ANDON (signal light)" for parallel operating system.

8 Case H

Description of Problems

- Time lost due to setup being over 30 minutes
- Die not clearly marked / identified (Annex H-1)

Diagnosis and Recommendation

- Reduce setup time by parallel system where preparation for die change is done whilst press is running
- Improve identification to facilitate control

9 Case I

Description of Problems

Excessive Die change-over times. The following problems were identified after analysis of set-up times

- Dies not clearly labeled/identified
- Excessive adjustment time of SHUT HEIGHT, CLAMPING SPACER HEIGHT etc.
- Time lost due to Setters often looking for spanners, clamping jigs, etc.
- Non standard spacers for die clamping
- Parallel operating system is not well introduced

Diagnosis and Recommendation

To reduce die change over time, the following is recommended.

First phase

1) Check and record all time wasted in categories (removal of accessories, removal of die clamping bolts, removing die, waiting for inspector, etc.).
2) Analyze all work time by using Bar Chart.
3) Internal set-up activities are analyzed in detail to identify activities that can be carried out without stopping the machine.
4) Pre plan die availability and raw material, so that they are available at the press when the current run is completed.
5) Reorganize die storage, so that dies are classified based on their usage (i.e. weekly, monthly, etc). In addition identify dies accordingly and establish identification system.
6) Have checking jigs and inspector available at press when first off is produced.
7) Prepare the necessary tools and store orderly.
8) Reduce setup time by Parallel operating system where preparation for die change is done whilst press is running.

Second phase

1) Standardize the die specification.
   - Die height

- Die-set size
- Clamping thickness of platen

2) Introduce "ANDON" (signal light) for Parallel Die Change System.

10 Case J

(Annex J-1 and J-2)

Description of Problems

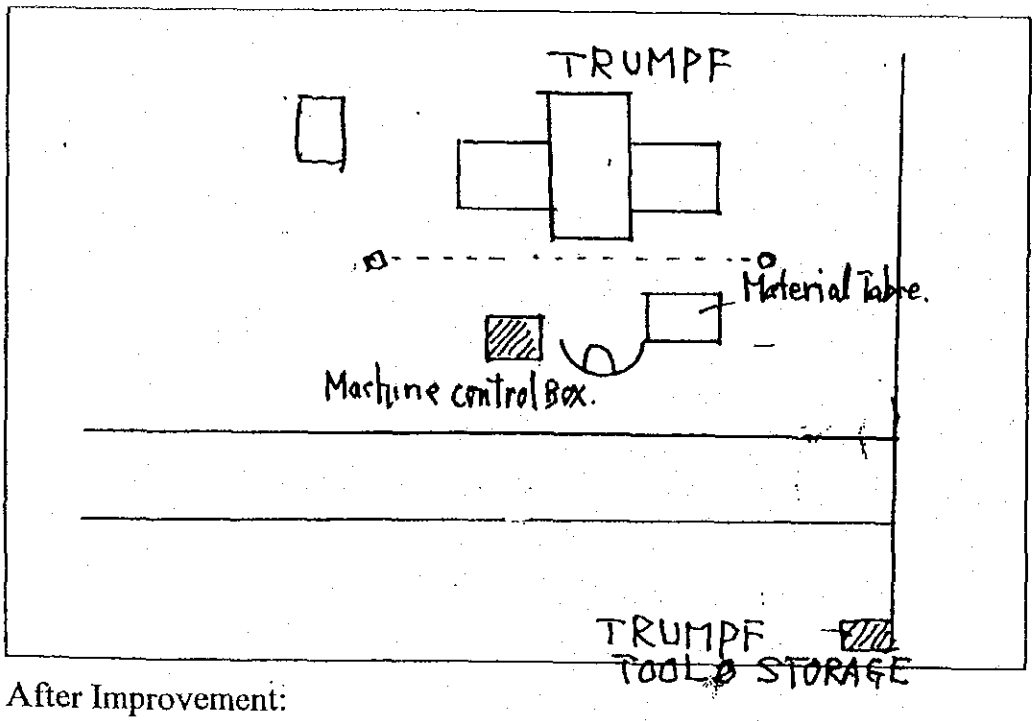
- Long time is needed to setup changeover

Diagnosis and Recommendation

- Use of the die exchange trolley or lifter with tool hanger
- Classification by color code of the mold shelf and stamping die

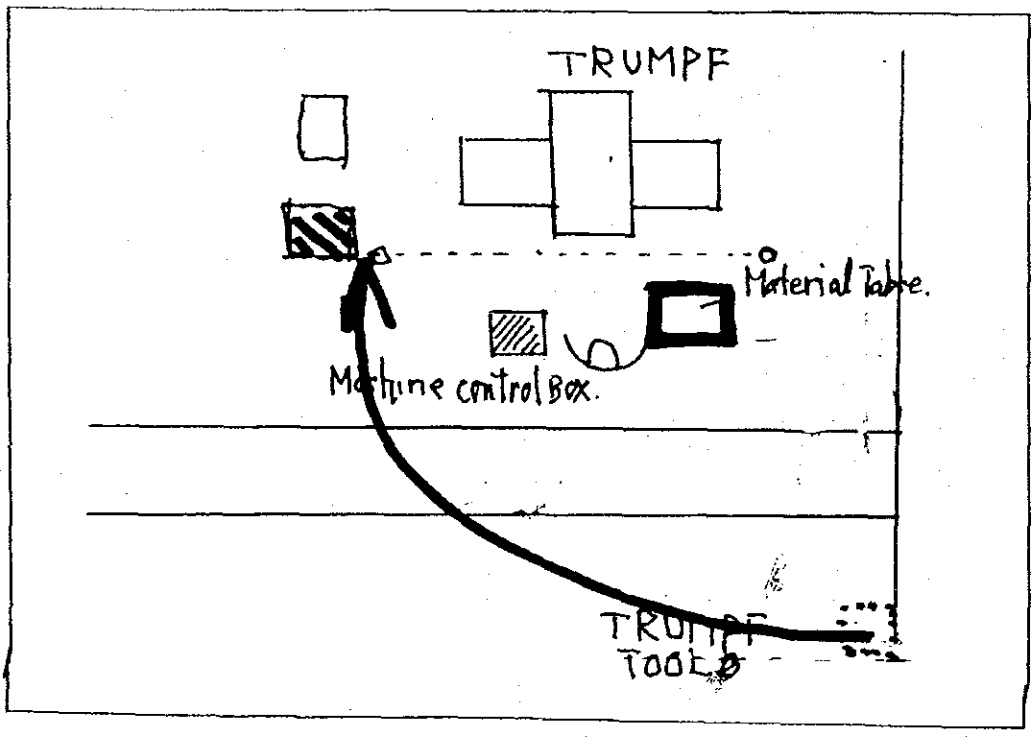
Present situation:

1. TOOL STORAGE AWAY FROM MACHINE
2. MATERIAL TABLE LOW - MATERIAL HANDLING PROBLEMS



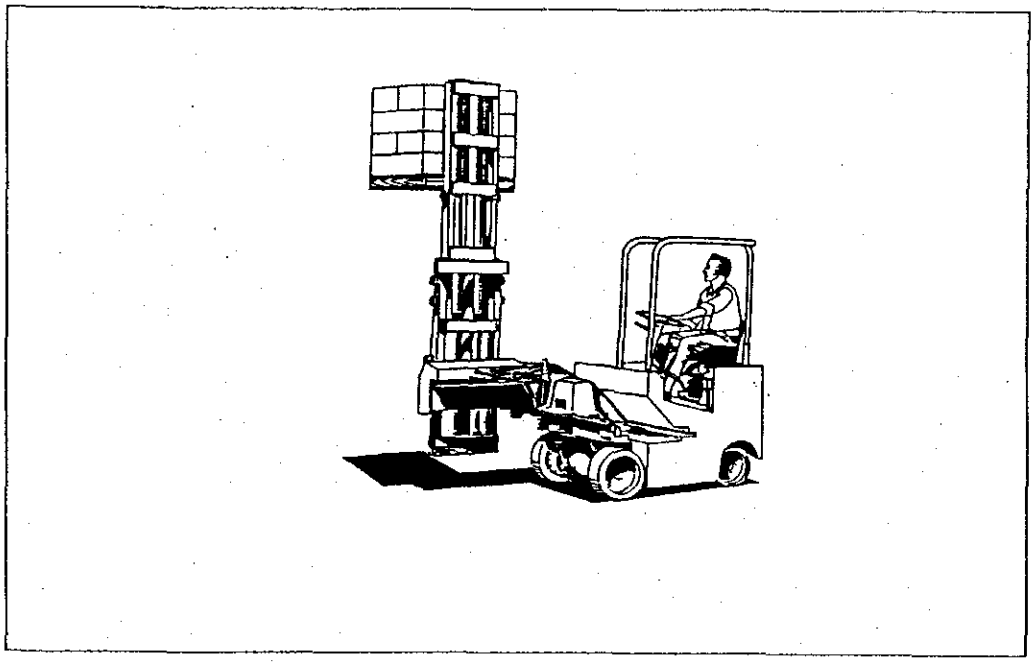
After Improvement:

1. TOOL STORAGE CLOSER TO MACHINE
2. RAISED TABLE TO MACHINE HEIGHT - EASIER MATERIAL HANDLING



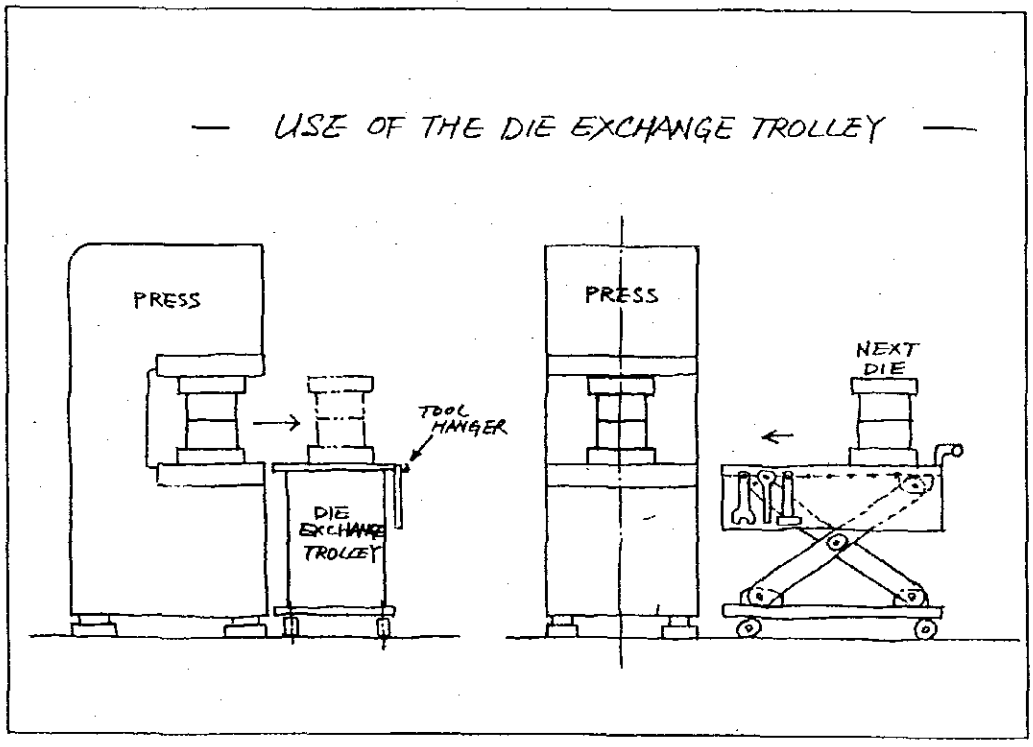
Present situation:

Forklift Truck is used for die change operation



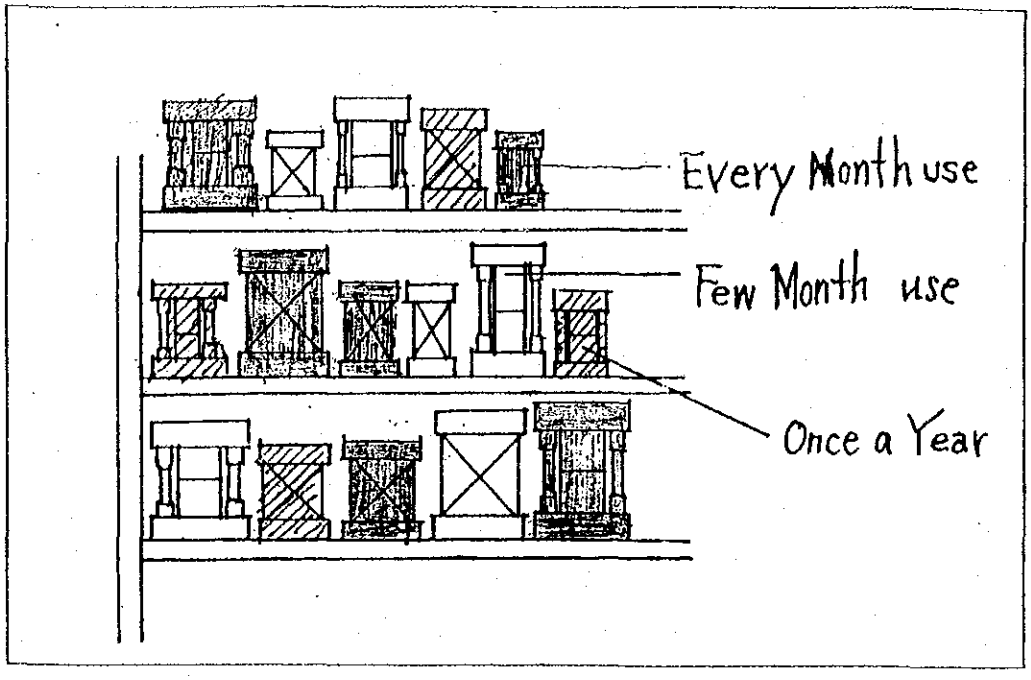
After Improvement:

Use Die Exchange trolley



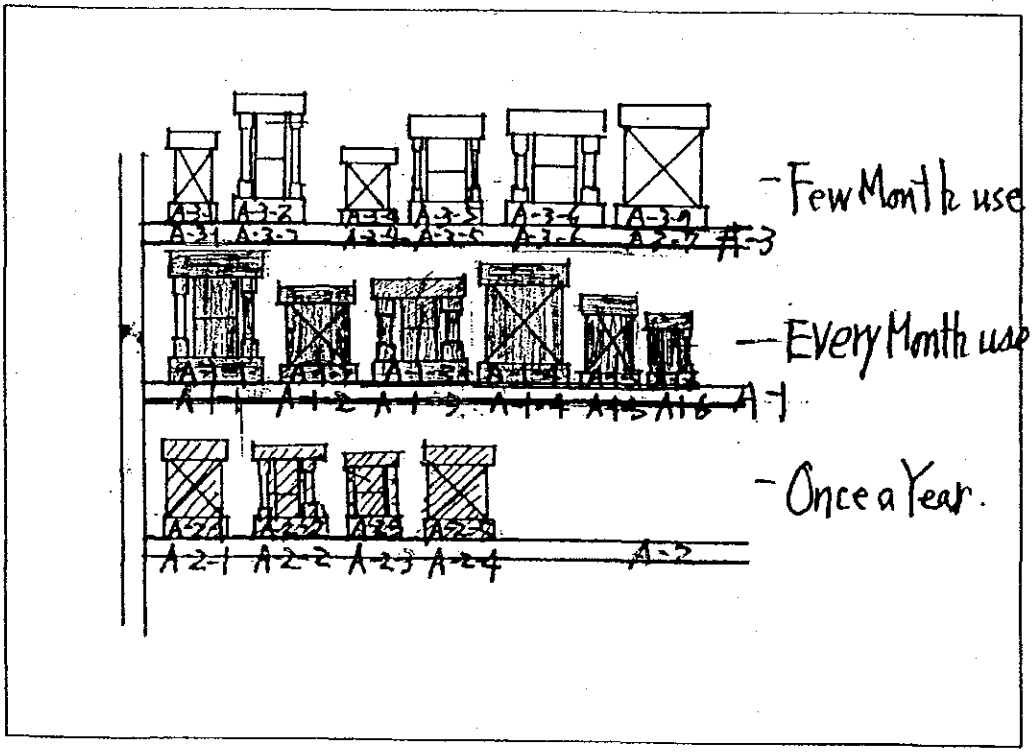
Present situation: Annex D-2

UNPLANNED STORAGE + NO IDENTIFICATION



After Improvement:

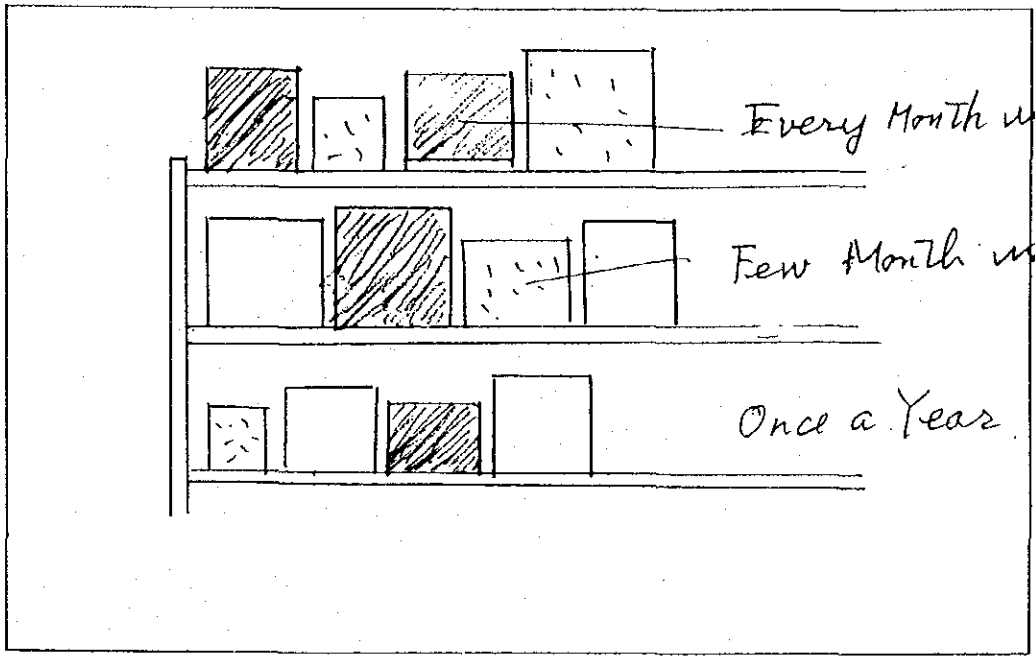
STORAGE PLANNED AND EASY ACCESS FOR REGULARLY USED DIES + IDENTIFIED



Annex F-1

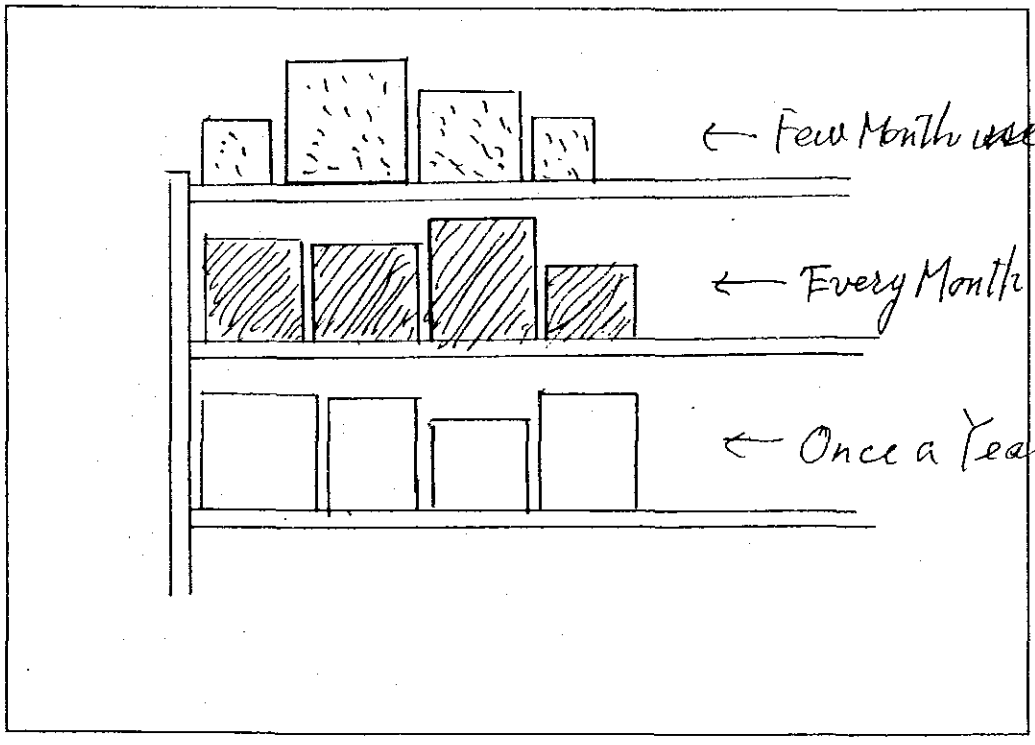
Present situation:

Random storage



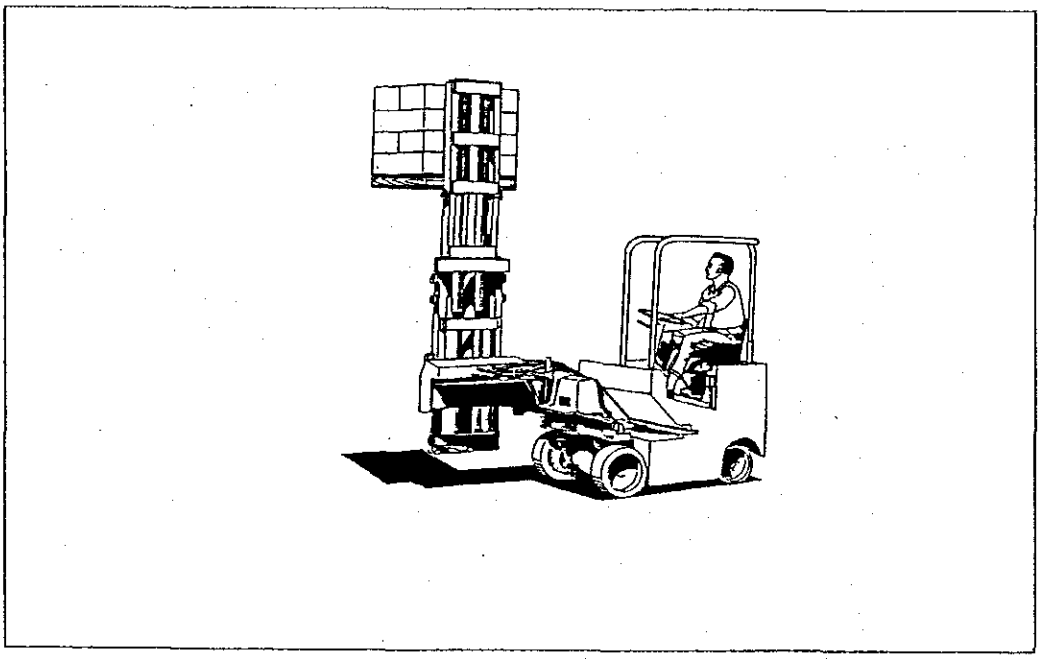
After Improvement:

Stock as per usage for easy access



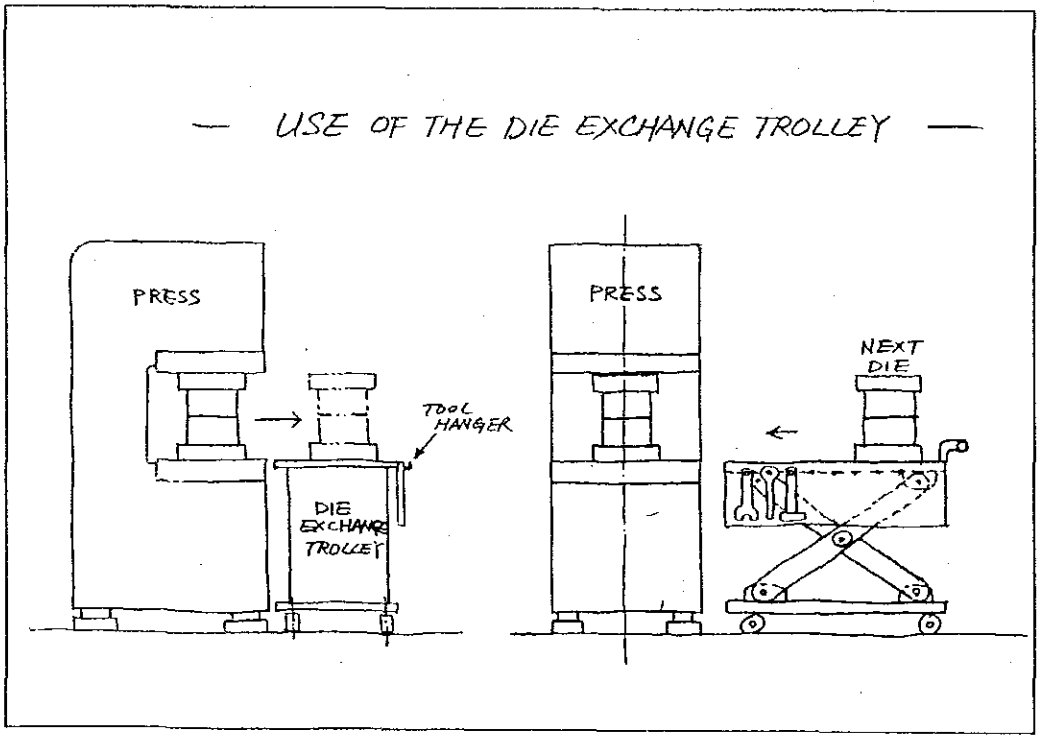
Present situation:

Forklift Truck is used for die change operation



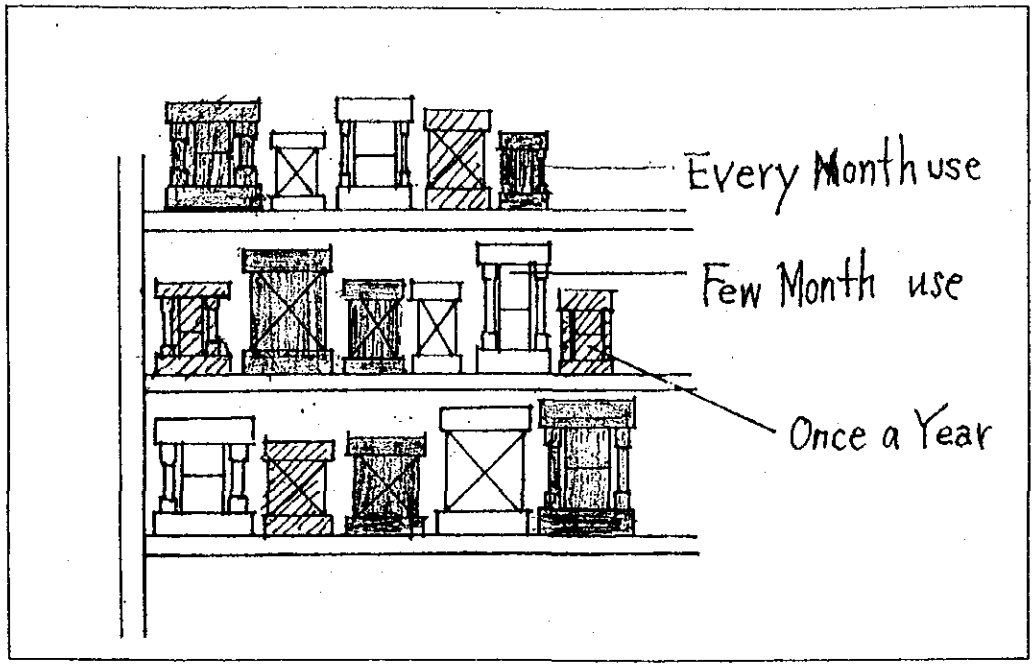
After Improvement:

Use die Exchange trolley



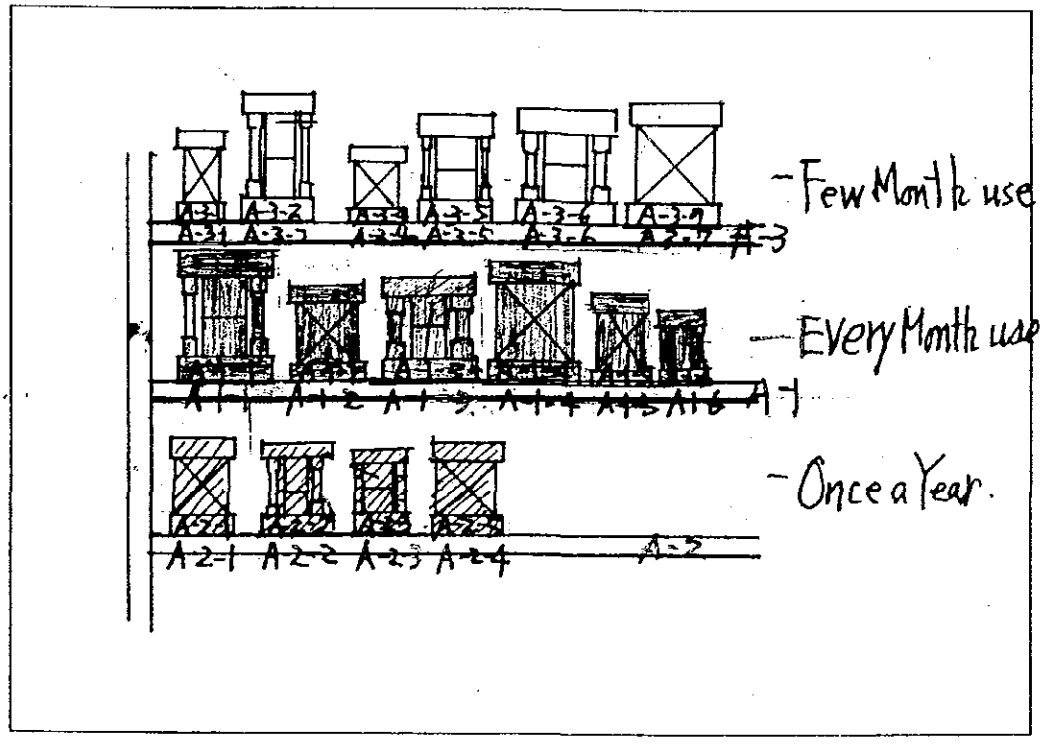
Present situation: Annex H-1

UNPLANNED STORAGE + NO IDENTIFICATION



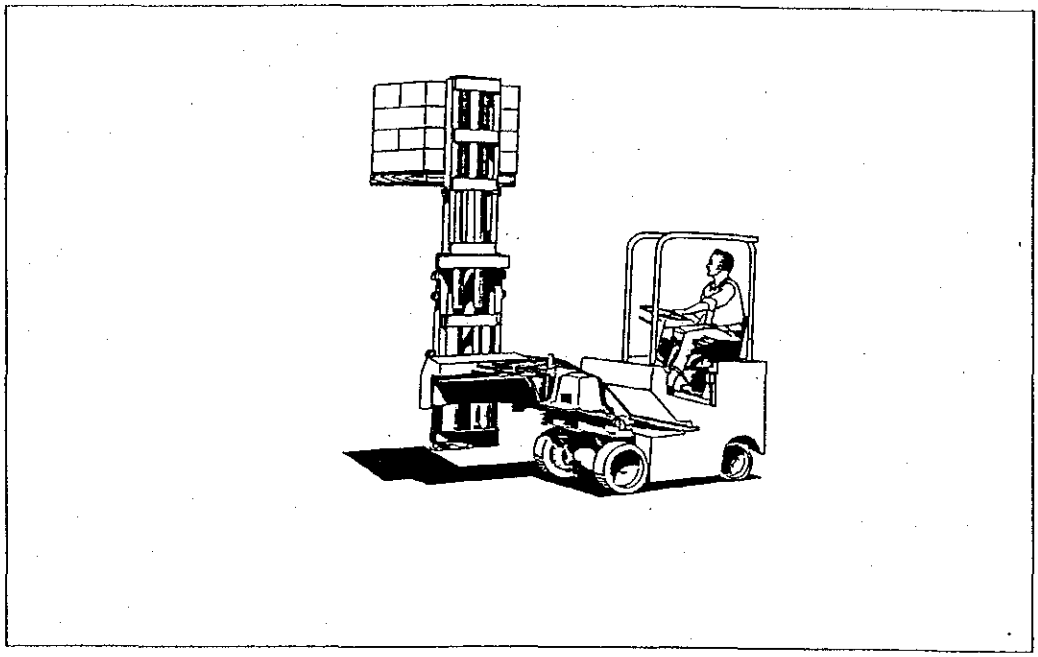
After Improvement:

STORAGE PLANNED AND EASY ACCESS FOR REGULARLY USED DIES + IDENTIFIED



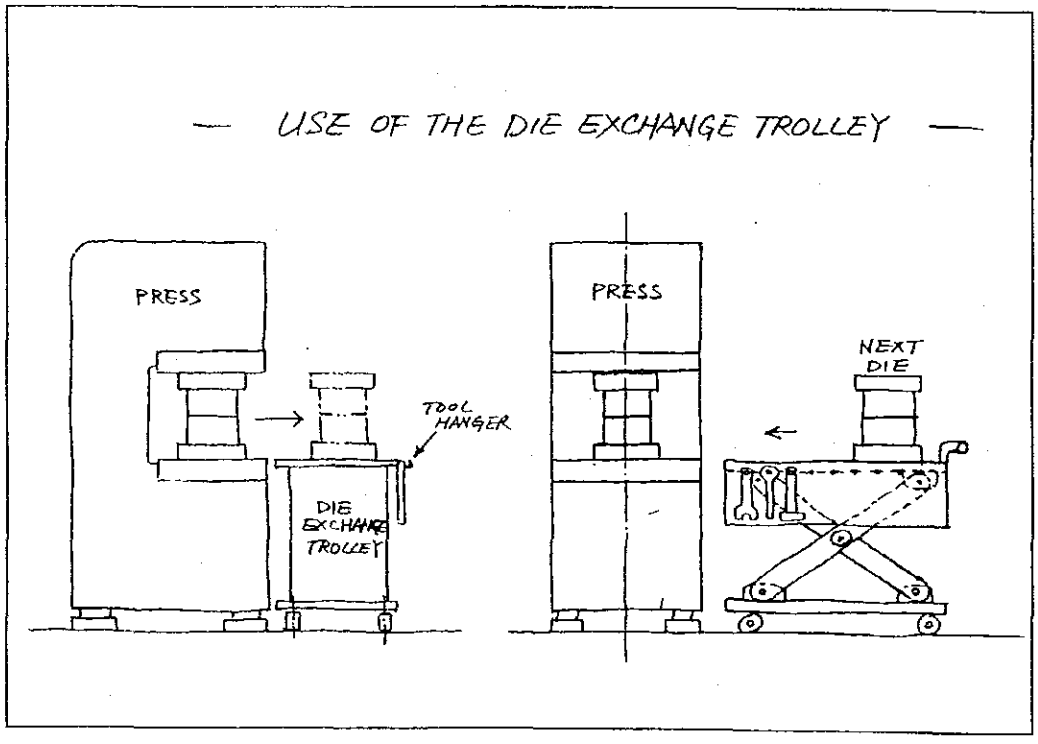
Present situation:

Forklift Truck is used for die change operation



After Improvement:

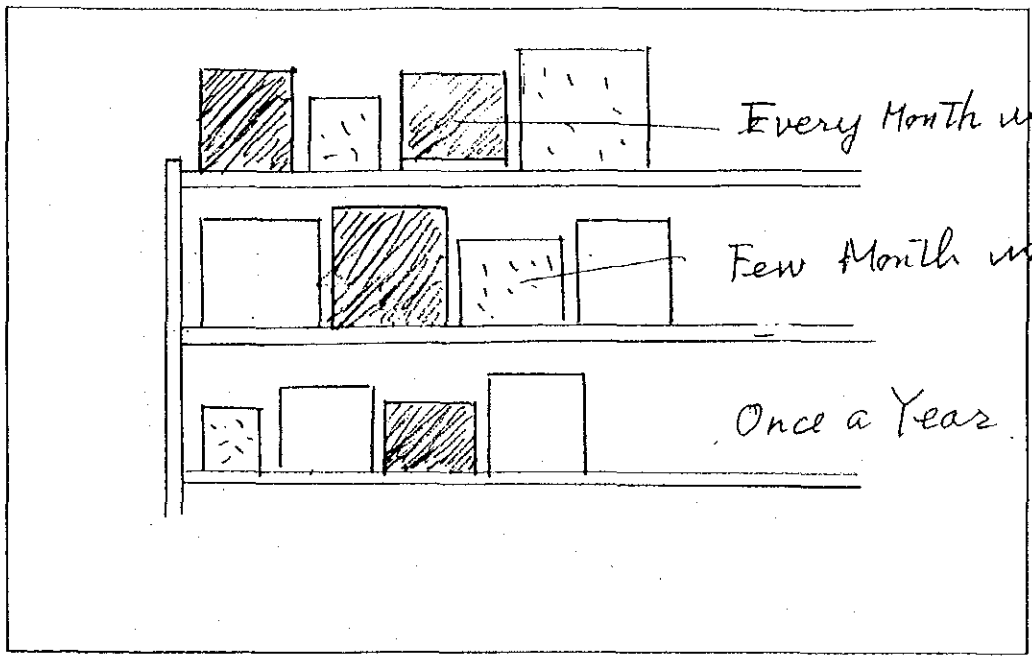
Use Die Exchange trolley



Annex J-2

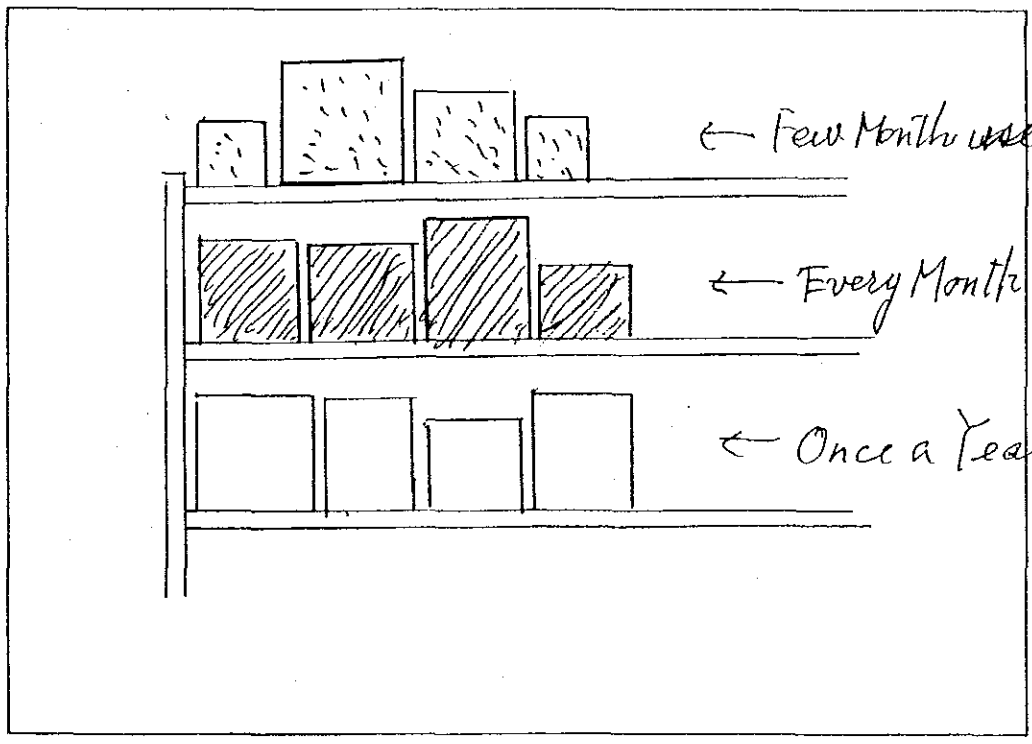
Present situation:

Random storage



After Improvement:

Stock as per usage for easy access



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PR-402	Production management	Metal stamping	
2nd category		Industry	Sector / Product
Work management			

Subject

Motion analysis of press work

■ Diagnosis:

Detailed analysis of movements during the press work reveals the following problems that are commonly observed:
1) As a mold is located relatively far from a work piece to require additional time for setup and removal.
2) Large boxes to accommodate raw materials and finished products disturb with work.
3) Many workers are required to take unnatural position and lose concentration, resulting in an uneven work cycle and lower productivity.

■ Guidance:

The following improvements were recommended to help raise productivity in press work:
1) To provide a small stand or rack near the worker to help set a material or a semi-finished product to a mold smoothly;
2) To use a smaller box to store raw materials and work-in-process; and
3) To use an air blower or a knock-out device to take a product out of a mold, together with a chute or a mini-conveyor to transport the product to a storage box.

■ Response of the enterprise (as confirmed during the follow-up activity):

One company has made its own stand for work-in-process and has improved work efficiency. Other companies are also considering or introducing similar measures.

■ Other relevant points (issues to be solved and problems remained):

In addition to the above improvements, a mold should be modified or altered to ensure smooth setting and removal of raw materials and semi-finished products.

1 Case A

(Annex A-1 and A-2)

Description of Problems

- Ergonomics not conducive to productivity

Diagnosis and Recommendation

- Introduce methods/equipment to improve material and product handling at comfortable height to increase labour productivity

2 Case B

Description of Problems

- Raw material strip feed not supported during first pass hence second pass difficult to feed because material bent or split (Annex B-1).
- Tool no 73c, operator waste time by removing part by manual scraper. This also results in some parts being scraped onto the floor and not in the bin.
- Part with 8mm diameter bar with shape of sharp Vee. First operation on far side of die, second operation on front of die closest to operator. During press cycle part from first operation falls away from operator who then has to stretch across the die to retrieve the part to put into second operation which is in front of the die (Annex B-2).
- Operator picks up material from the floor to set the die, which takes too much time.

Diagnosis and Recommendation

- Support system should be used to support the material strip during the first pass through the die to prevent the strip from bending thus eliminating the difficulty of feeding the strip into the die during the second pass.
- Modify tool by introducing simple spring loaded injector.
- Modify tool by introducing simple support to prevent part from falling away from the operator during the first operation.
- Introduce simple material handling stands to hold material or bin at operator working height. Introduce roving material handler to support operator with material feed.

3 Case C

Description of Problems

- Raw material strip feed not supported during first pass hence second pass difficult to feed because material bent or split.
- Tool no 73c, operator waste time by removing part by manual scraper. This also results in some parts being scraped onto the floor and not in the bin.
- Part with 8mm diameter bar with shape of sharp Vee. First operation on far side of die, second operation on front of die closest to operator. During press cycle part from first operation falls away from operator who then has to stretch across the die to retrieve the part to put into second operation which is in front of the die.
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Diagnosis and Recommendation

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- Modify tool by introducing simple support to prevent part from falling away from the operator during the first operation.
- Introduce simple material handling stands to hold material or bin at operator working height. Introduce roving material handler to support operator with material feed.

4 Case D

Description of Problems (Annex D-1)

- Raw material strip not parallel i.e. width not the same.

OBSERVATIONS

- Operator on 55T press spent 40 to 50% more time in feeding due to inconsistent width of raw material.
- Products (end caps) and scrap in same bin.

Diagnosis and Recommendation

- More accurate cutting of strips.
- Parallelism of guillotine and dimensions to be checked regularly.
- Separate scrap and products during operation by using chute.

5 Case E

Description of Problems

The company overlooked the following areas of improvement:

(1) Some lost time in press work is due to:

- Raw material (Coil) strip is often jammed in the die.
- Blanking is not a continuous process i.e. Operator stops the press every time and removes the finished product prior to the next blanking.

(2) Material is lost due to:

- Low yield of material strip

Diagnosis and Recommendation

(1) The followings are recommended to insure continuous operation of press.

- Width of raw material strip should be strictly controlled.
- Die design should be changed so that the product automatically comes out from the die (component ejection designed).

(2) Insuring that minimum widths of strips are used should maximize raw material utilization of Strips. The size of material strip should be reduced by 1mm at a time and if there is room for improvement then this should be repeated until the optimum width of strip is achieved (1 mm Reduction Activity).

6 Case F

(Annex F-1)

Description of Problems

- Work methods are not productive – unnecessary material handling

Diagnosis and Recommendation

- Use smaller storage "box" that fits into work area
- Eliminate double handling
- Multi-skilling (Annex F-2)

7 Case G

Description of Problems

- Press workability and material handling is obstructed due to using large bins.

- Material strips and WIP are placed on the bin or die plate.

Diagnosis and Recommendation

- Use smaller storage "box" that fits into work area.
- Introduce simple material handling table to place material or WIP at operator working height.

8 Case H

(Annex H-1 and H-2)

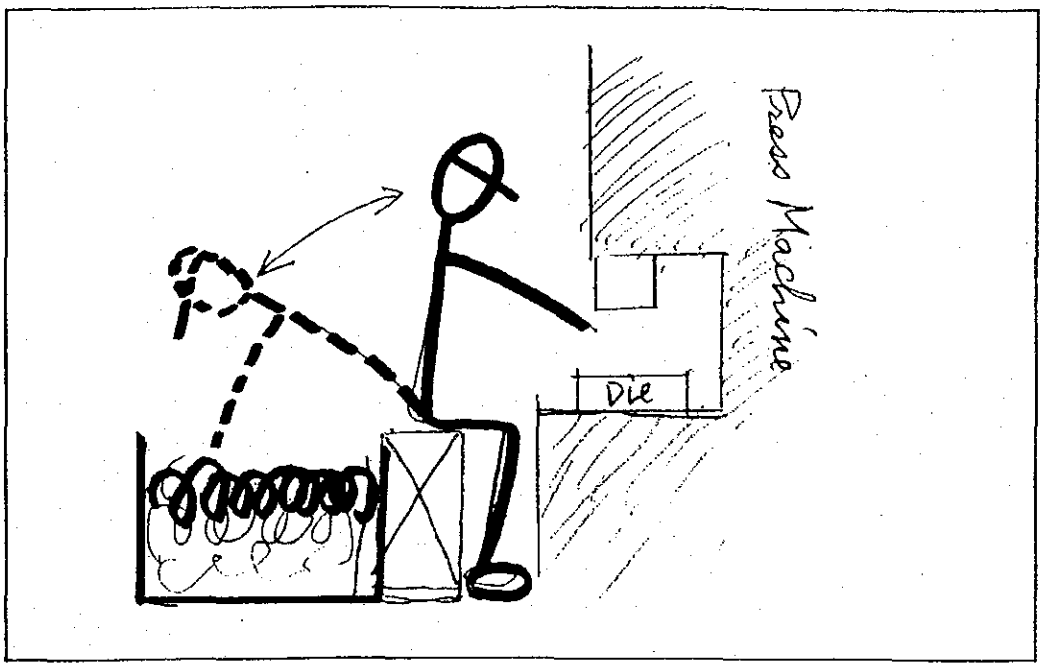
Description of Problems

- Material setting not stable in the die.
- Feed pitch of material strip not constant.

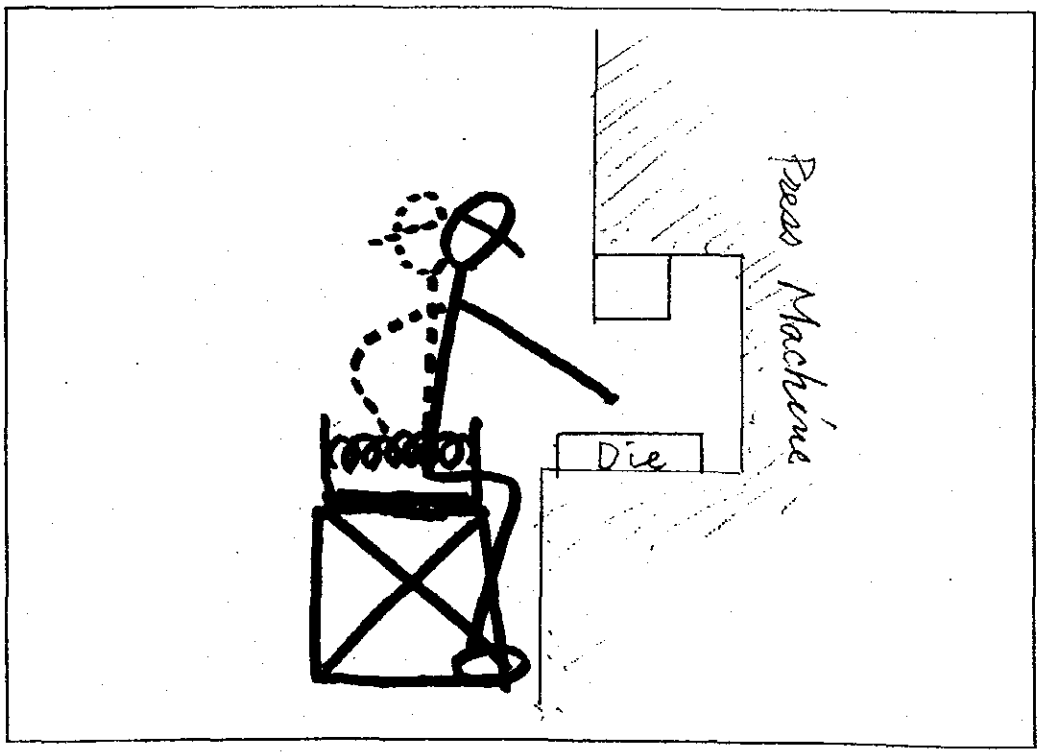
Diagnosis and Recommendation

- Sit material in the die with holding edge.
- Introduce stopper pin so that constant material feeding.

Present situation:

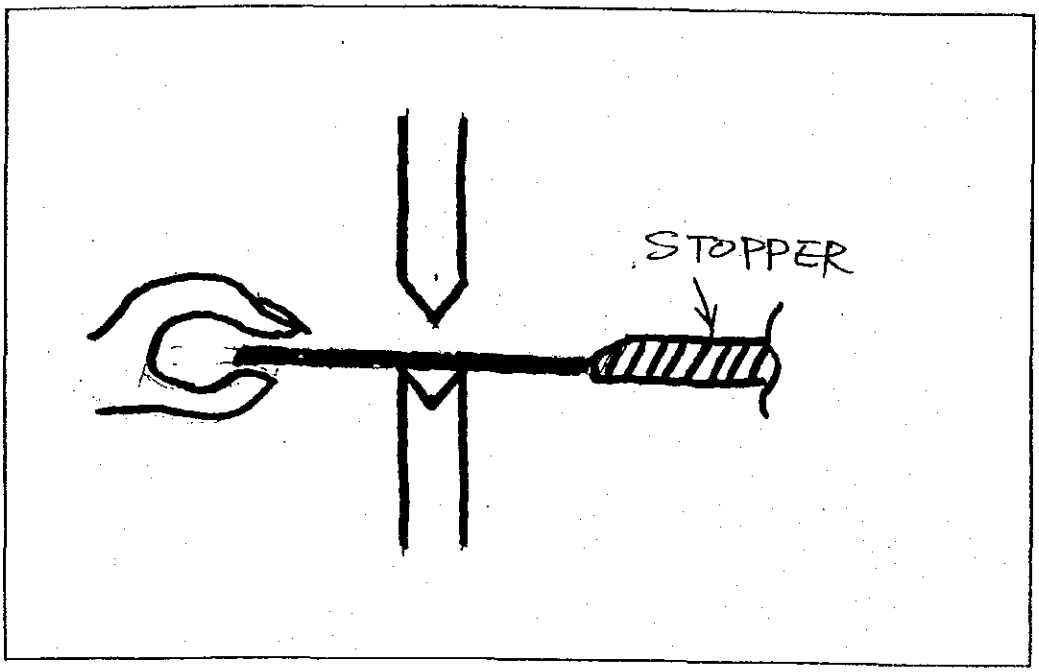


Proposed Improvement:

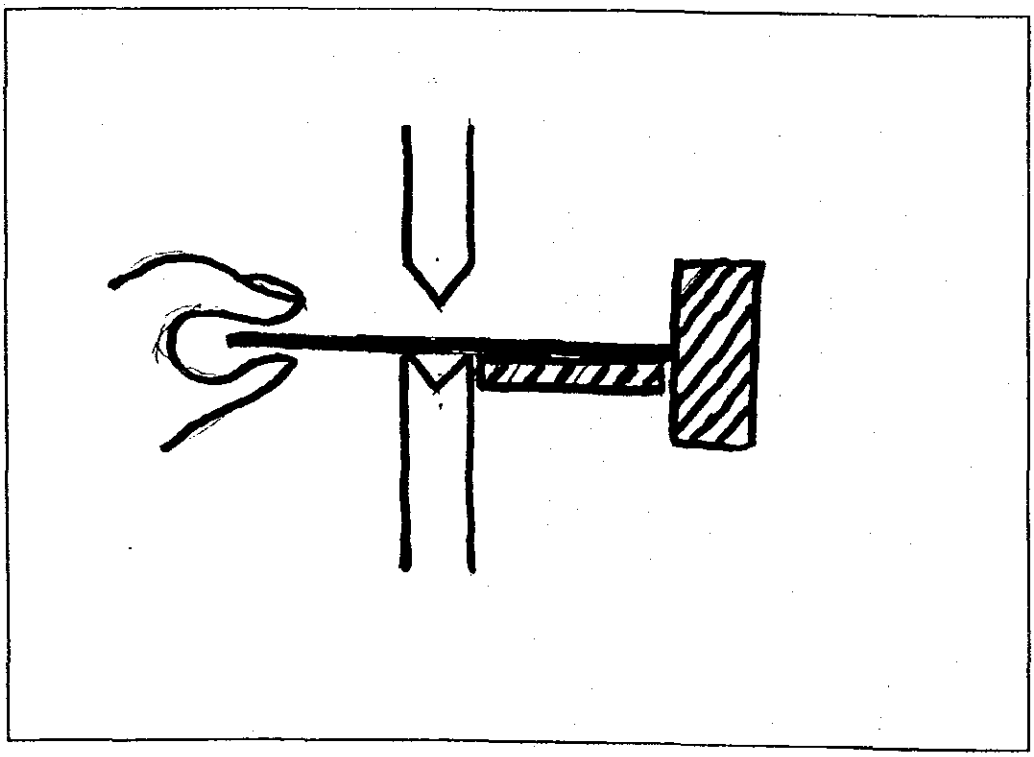


Annex A-2

Present situation:



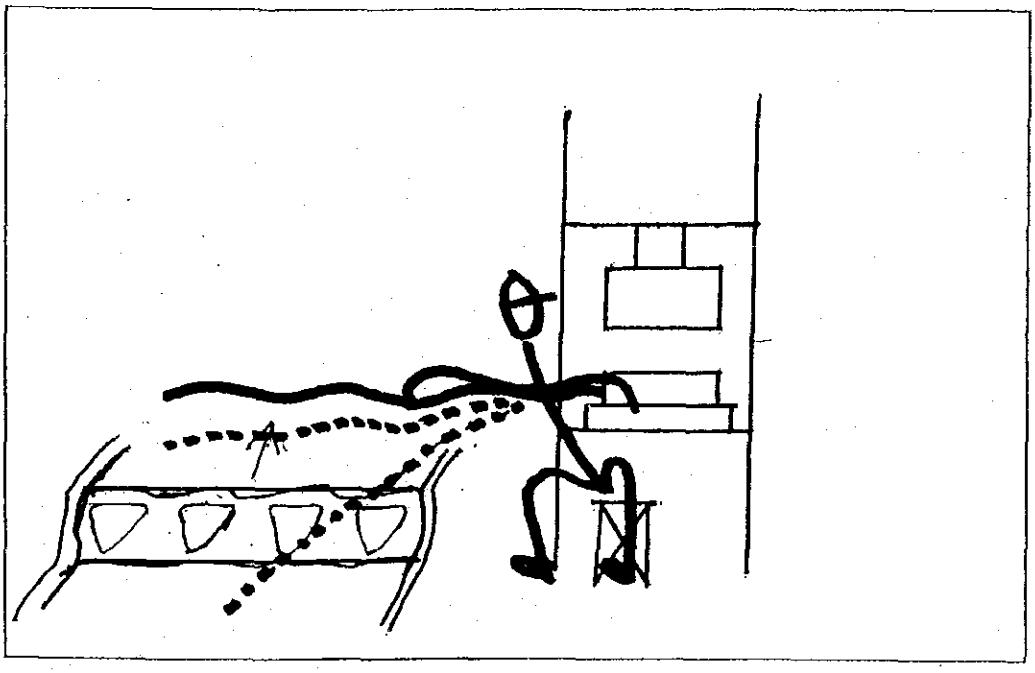
Proposed Improvement:



Present situation:

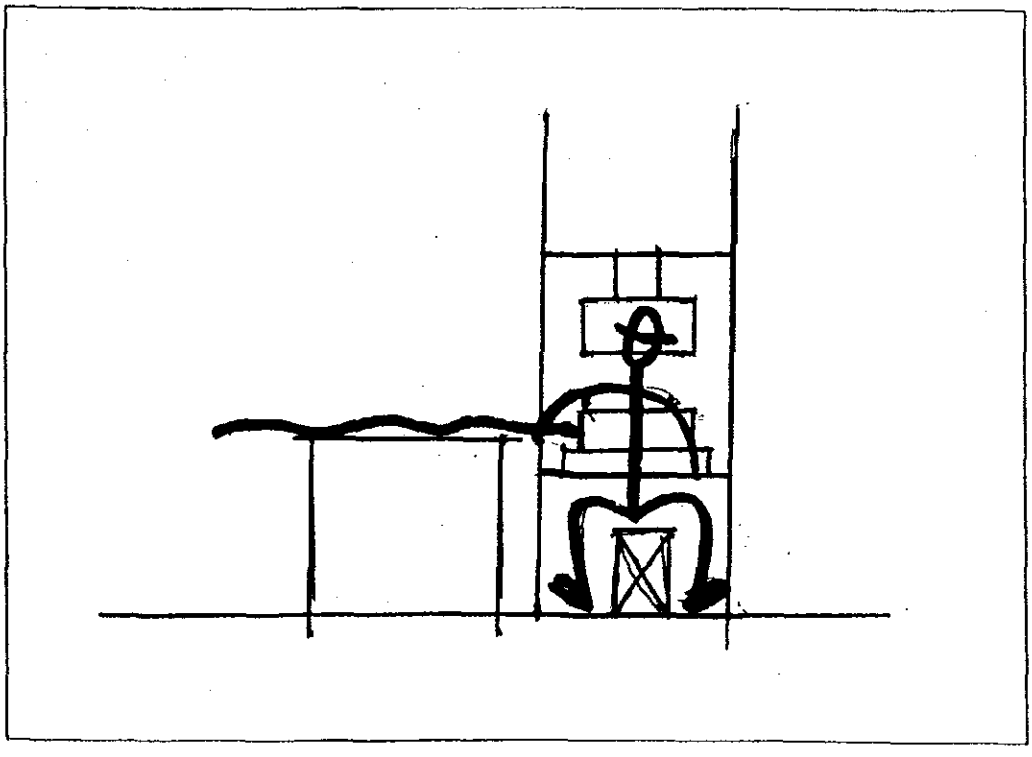
Annex B - 1

Strip not supported in die feed



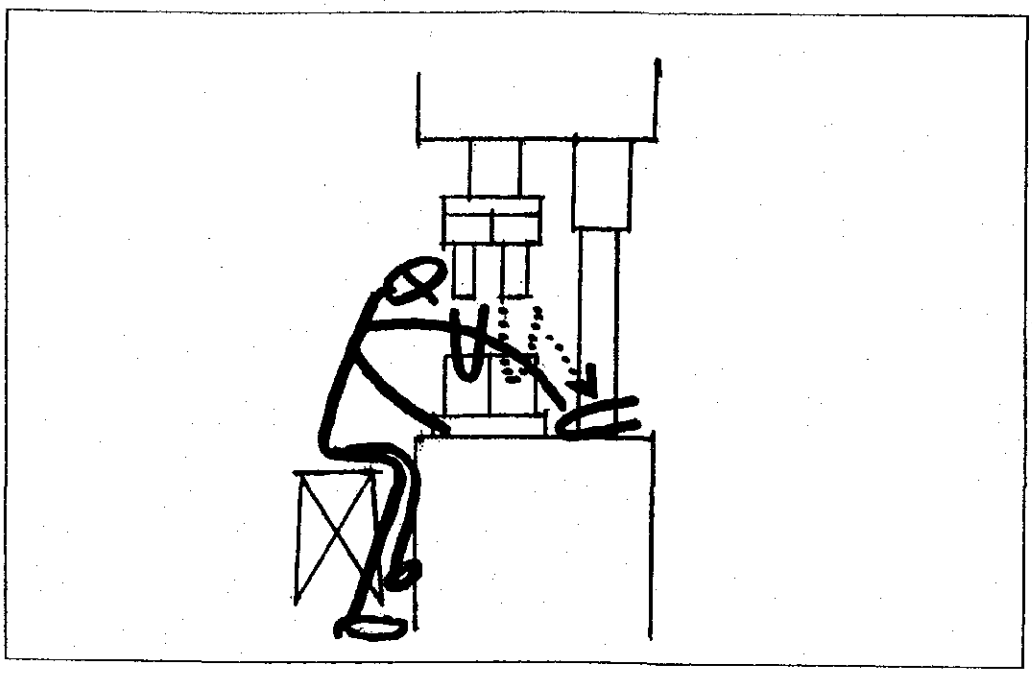
After Improvement:

Strip supported



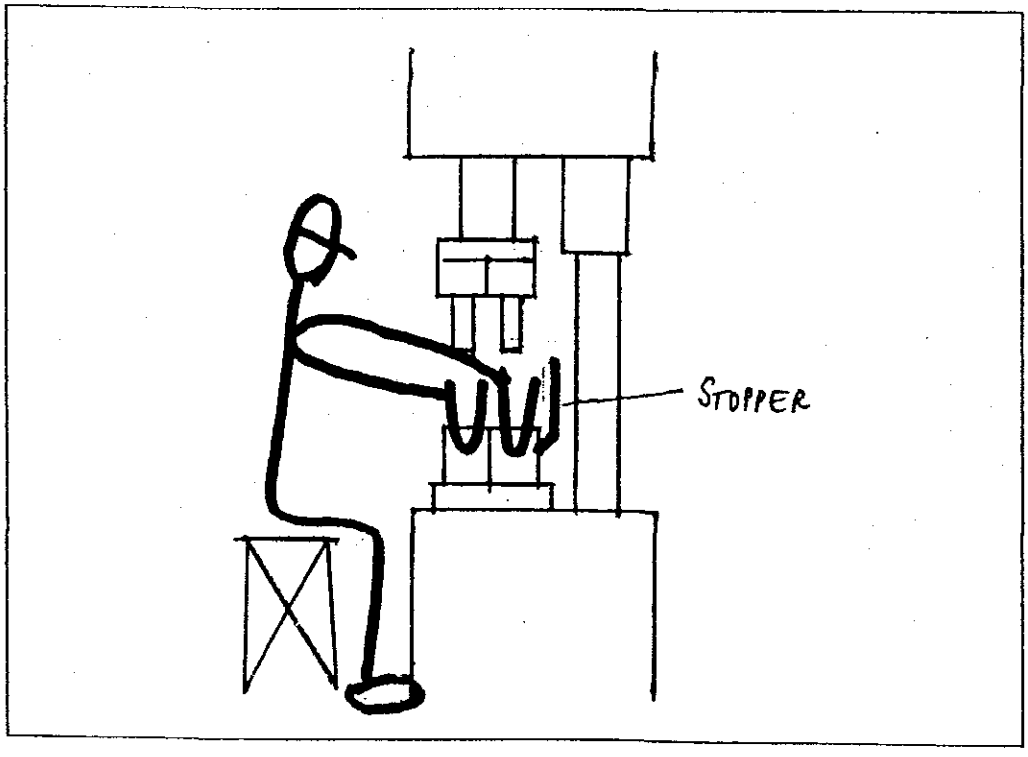
Present situation:

Part ejection not controlled



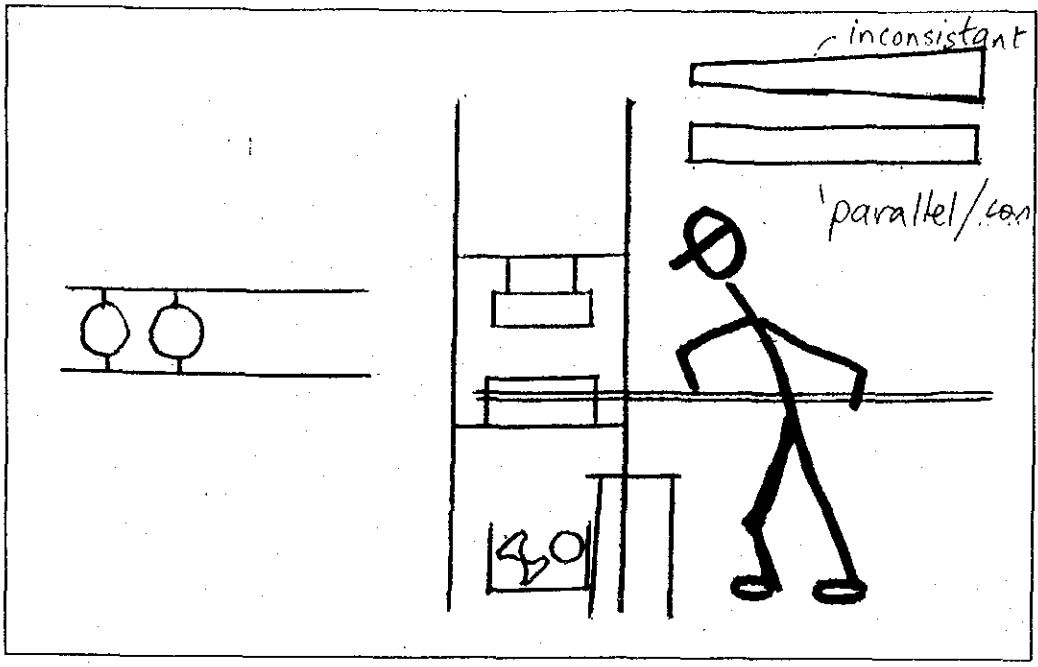
After Improvement:

Part ejection controlled by stopped.



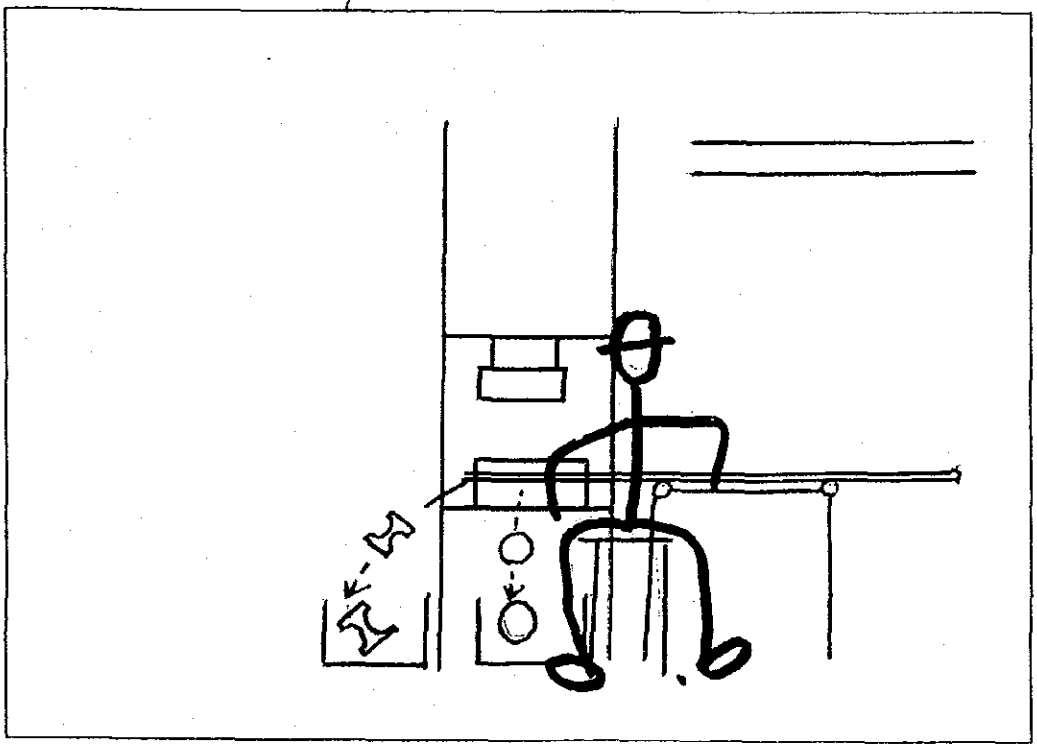
Present situation:

Strip not of consistant width - difficult to feed



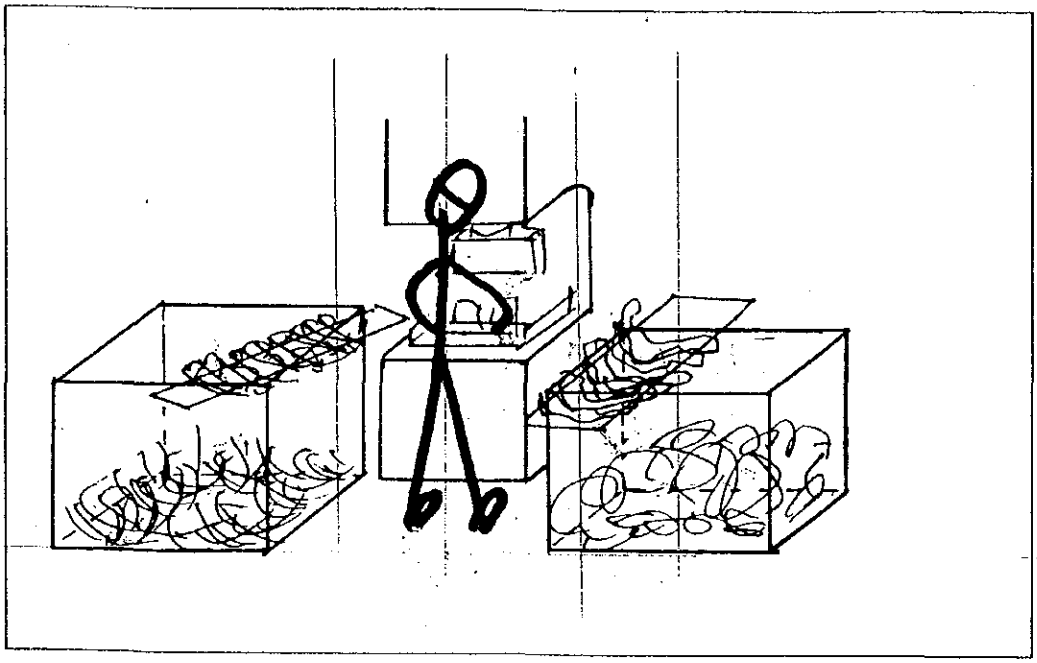
After Improvement:

Strip width correct, consistant and parallel - easy feeding
no unnecessary time lost.



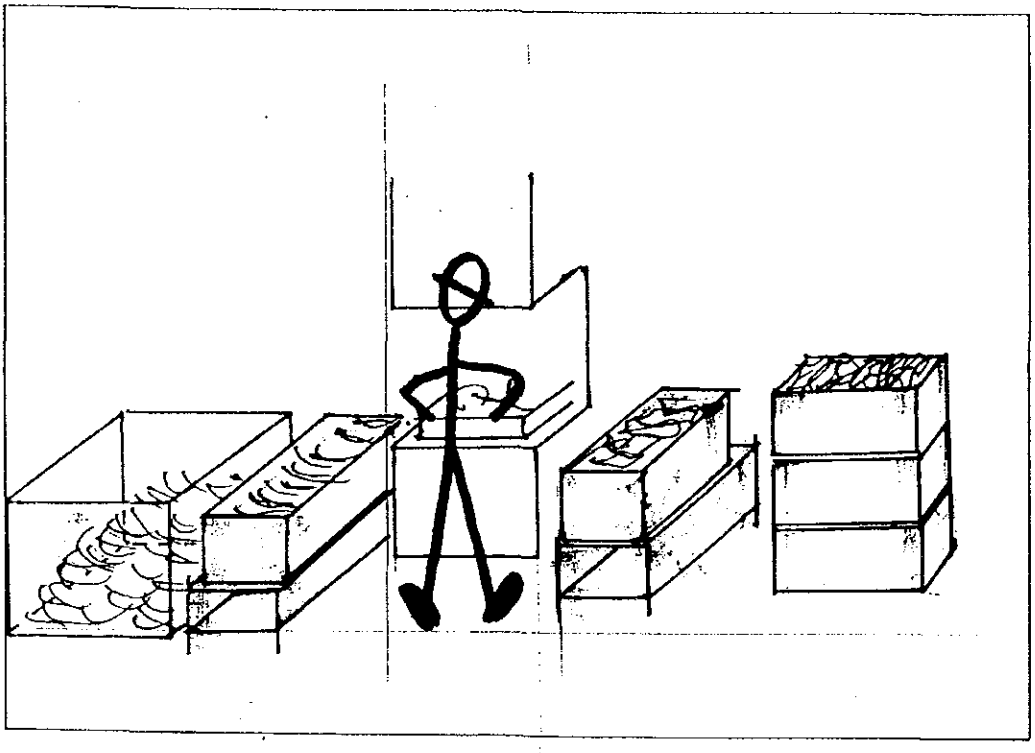
Present situation:

Large storage boxes - takes too much space
- dangerous



After Improvement:

Small box for storage and tables (framework)



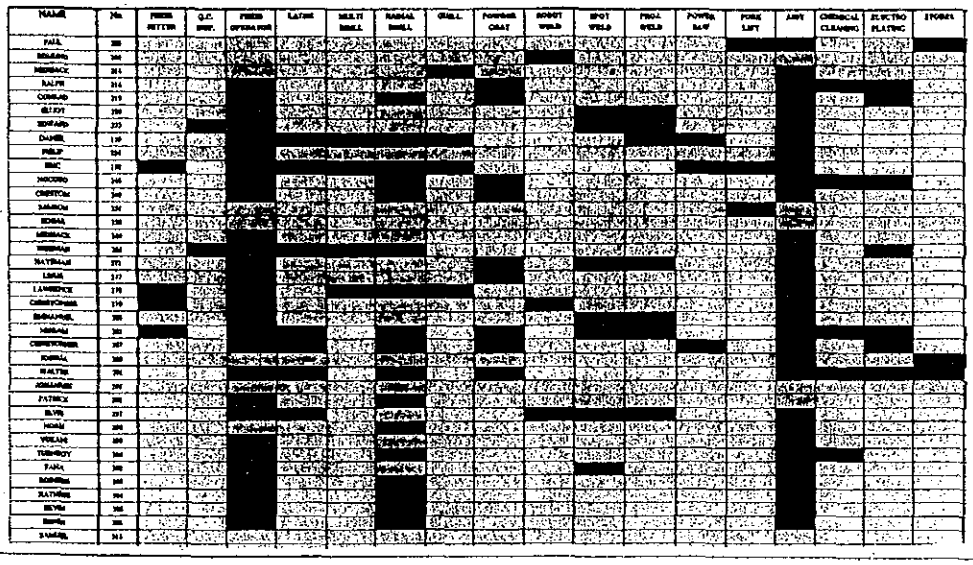
Present situation:

No Plan, No dates of training/assessment

L&J

SKILLS CHART [PRODUCTION]

■ = EXISTING SKILLS ■ = FUTURE SKILLS



After Improvement:

Planned Development and record of training/assessment

L&J

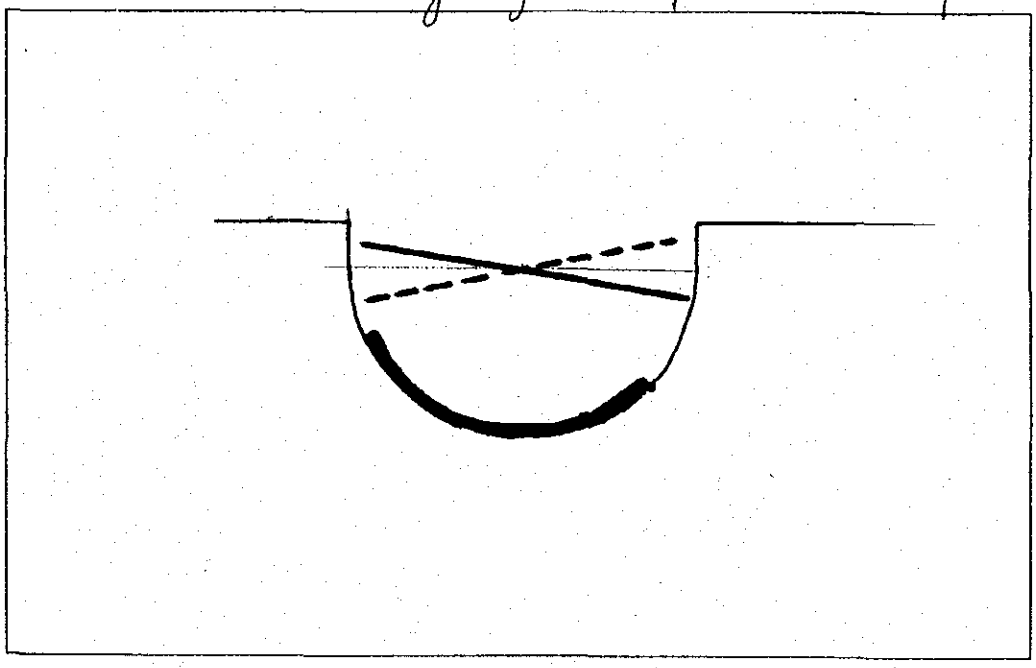
HUMAN RESOURCE DEVELOPMENT PLAN & RECORD.

NAME	No.	TASK PLANNED	TASK ACTUAL	TASK PLANNED	TASK ACTUAL
PAUL	203				
EDMUND	204				
MESHACK	214				
RALPH	216				
CONRAD	219				
ELLIOT	220				
EDWARD	223				
DANIEL	229				
PHILIP	234				
ERIC	238				
NGCOBO	248				
CRESTOM	249				
SAMSON	251				
EDOAR	258				
MESHACK	260				

Annex H-1

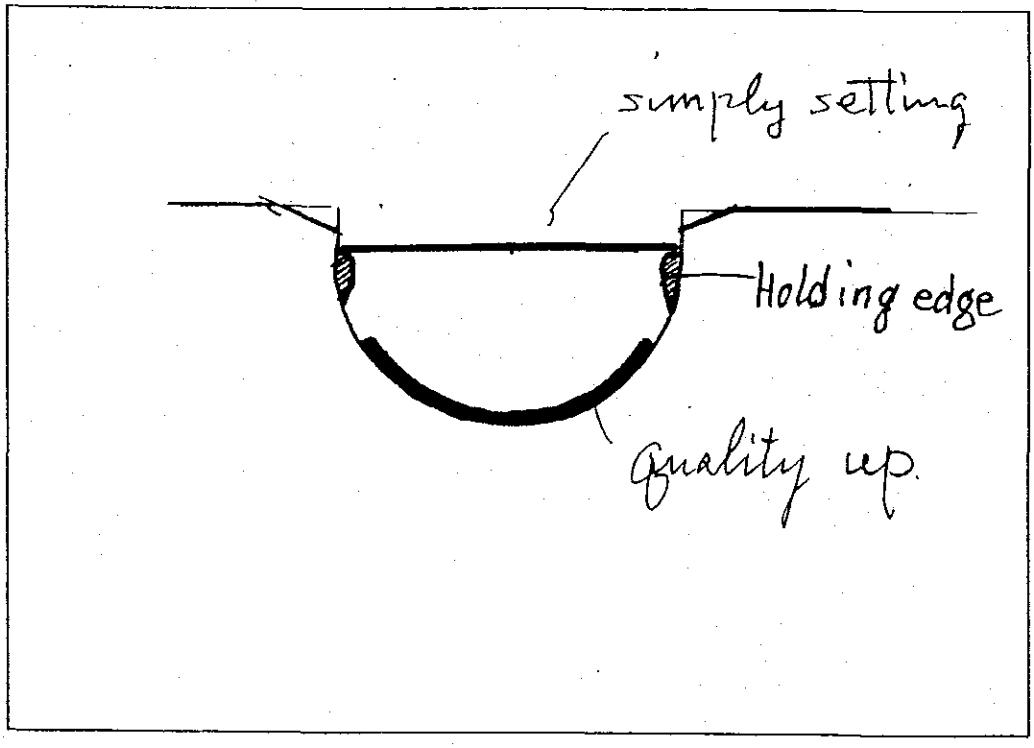
Present situation:

Material is'nt stable in Die, So that worker is always afraid of material's position



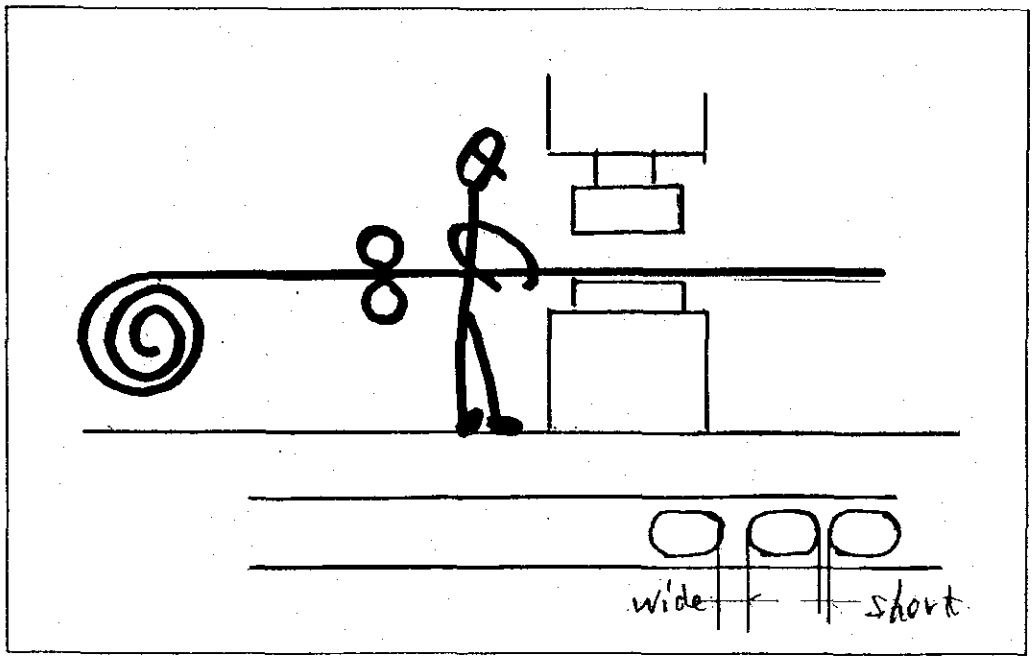
After Improvement:

Make holding edge in the Die



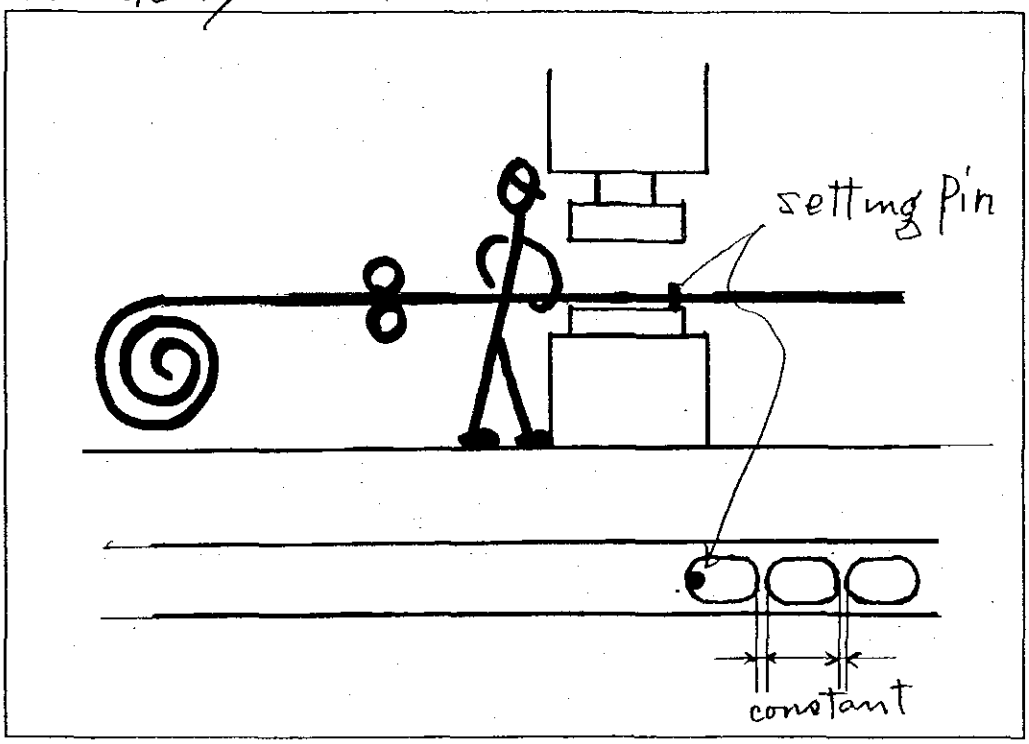
Present situation:

Feeding by pinch roll is no good.



After Improvement:

Make the Setting Pin on die that worker feeds by hands.



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PR-403	Production management	Metal stamping	
2nd category		Industry	Sector / Product
Process control			

Subject

Production plan and work record

■ Diagnosis:

Generally, production management practiced by press molding shops has the following problems:
1) Production targets and actual data are recorded by workers in charge and are not shown in the form of graph.
2) Production targets and actual production records are not posted in the shop floor using a graph or a chart.
3) Production targets and actual production records are not well communicated to individual workers.

■ Guidance:

1) To show production targets and actual production records graphically, such as a bar chart or a line graph;
2) To post the chart or graph on a bulletin board or in a visible place in each shop; and
3) To disseminate production information to individual workers using the above chart or graph.

■ Response of the enterprise (as confirmed during the follow-up activity):

The above advice was given to several companies, which prepare the graph showing production data and post in the shop floor.

■ *Other relevant points (issues to be solved and problems remained):*

The production record should be analyzed to find the ways to improve productivity. In the next step, a productivity management index should be determined from the ratio of operating time (actual hour) to loss time (hour).

1 Case A

Description of Problems

(1) Stock / inventory control
- Recorded quantity numbers not the same as actual
- Stock in stores not controlled

(2) Quality control
- No actual measurements data of roving checks on the inspection sheet

(3) Equipment control
- No check list or records of daily maintenance of machines

Diagnosis and Recommendation

(1) Stock / inventory control (Annex A-1)
- Attach inventory control sheet to the box to control in and out parts

(2) Quality control
- Redesign inspection sheet so that more inspection data can be captured

(3) Equipment control
- Prepare check list of daily maintenance at the machines

2 Case B

(Annex B-1 and B-2)

Description of Problems

- Recording downtime is not functional
- Information is not analysed

Diagnosis and Recommendation

- Use different form with visual impact
- Suggested form includes analysis and allows for measurement

3 Case C

Description of Problems

(1) Production record is done but not visually recorded.

(2) Production data is not well-analyzed and used effectively for productivity improvement.

Diagnosis and Recommendation

(1) Production records should be presented in a visual format including machine and labor productivity for analysis purposes.

(2) The following improvement measures are recommended:

- Analyze production data by using visual chart and various indexes, and use effectively for productivity improvement.
- Lost time should be classified into elements i.e. preparation loss, malfunction loss, defect loss, others loss etc.

Present situation:

NO STOCK CONTROL DOCUMENT DISPLAYED AT LOCATION

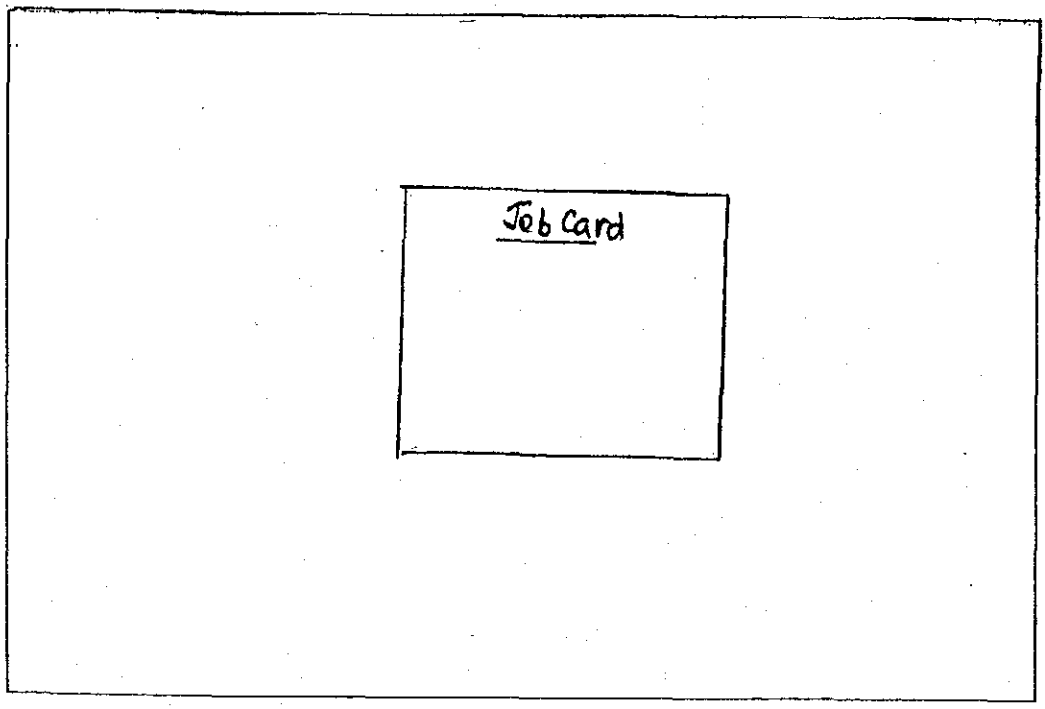
After Improvement:

Implement Stock Control Sheet at various locations (Improved Control)

ITEM	ORDER REF	IN / DATE	OUT / DATE	BALANCE
a				
b				
c				

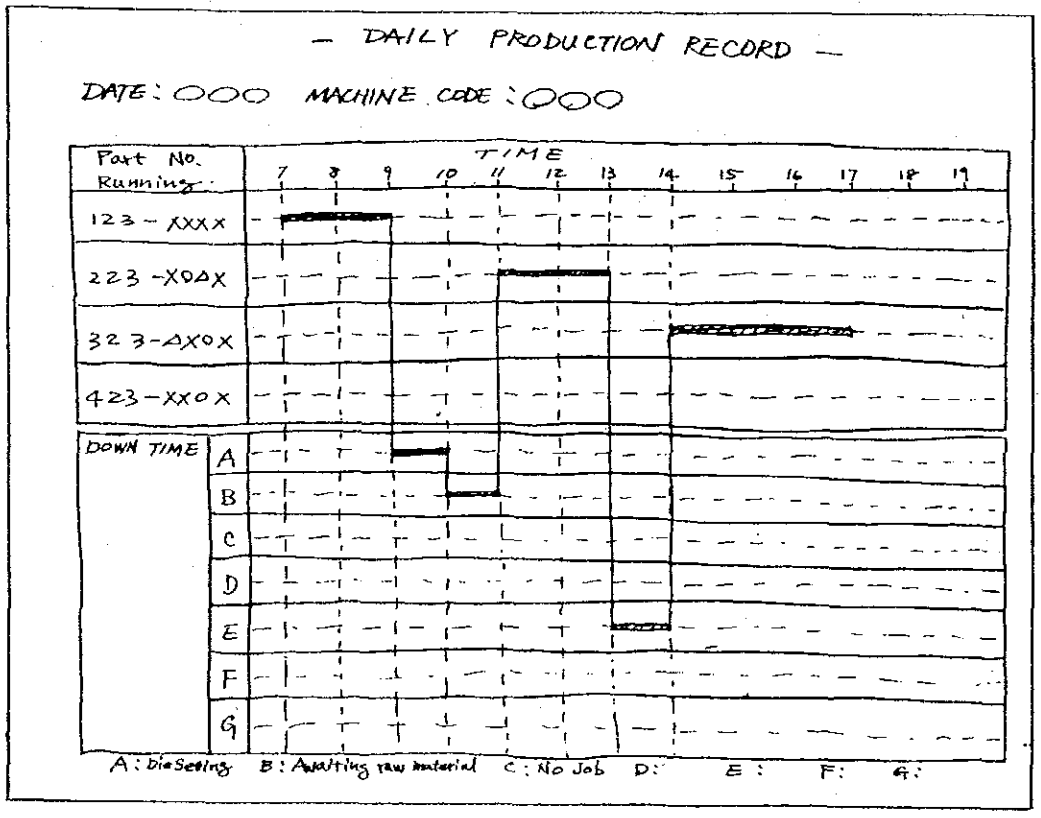
Present situation:

Record on sheet not easily read.



After Improvement:

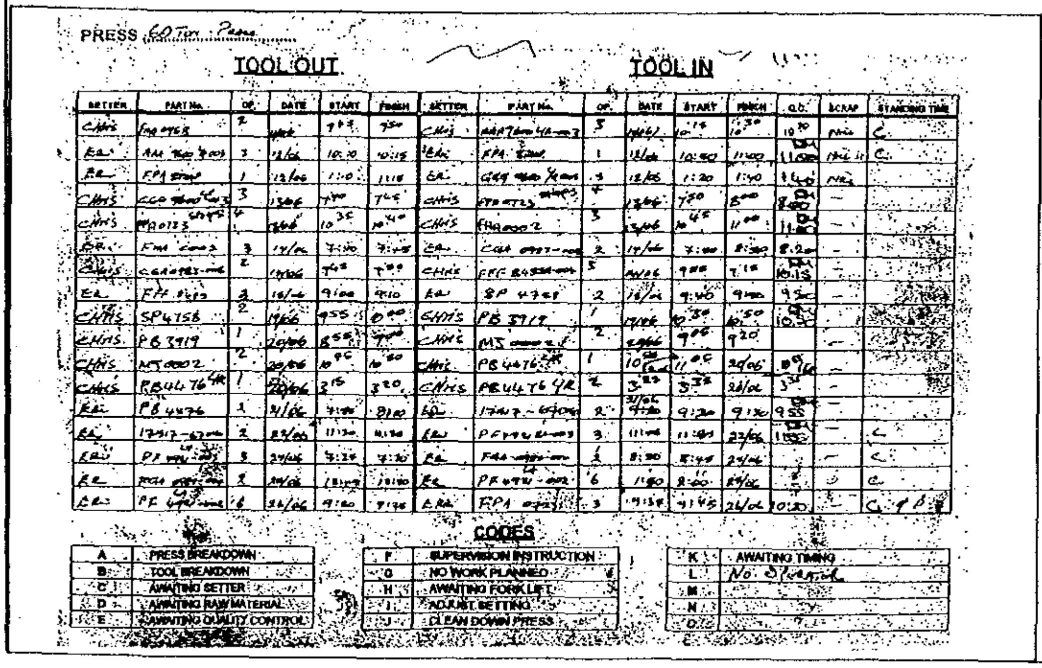
Down-time and running time is visual.



Present situation:

Annex B-2

Information only - no analysis



PRESS 60 Ton Press

TOOL OUT						TOOL IN								
SETTER	PART No.	OP.	DATE	START	FINISH	SETTER	PART No.	OP.	DATE	START	FINISH	Q.C.	SCRAP	STANDING TIME
Chris	[illegible]	2	[illegible]	[illegible]	[illegible]	Chris	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	C
[illegible]	[illegible]	3	12/06	10:10	10:15	[illegible]	FPA [illegible]	1	[illegible]	10:50	11:00	11:00	[illegible]	C
[illegible]	FPA [illegible]	1	12/06	1:10	1:10	[illegible]	[illegible]	3	12/06	1:20	1:40	[illegible]	[illegible]	
Chris	[illegible]	3	13/06	[illegible]	[illegible]	Chris	[illegible]	4	[illegible]	7:50	8:00	[illegible]	–	
Chris	[illegible]	4	[illegible]	10:35	10:40	Chris	[illegible]	3	[illegible]	10:45	11:00	[illegible]	–	
[illegible]	[illegible]	3	14/06	7:30	7:45	[illegible]	[illegible]	2	14/06	[illegible]	8:30	[illegible]	–	
Chris	[illegible]	2	[illegible]	[illegible]	[illegible]	Chris	[illegible]	5	[illegible]	[illegible]	[illegible]	10:15	–	
[illegible]	[illegible]	2	16/06	9:00	9:10	[illegible]	SP [illegible]	2	16/06	9:40	[illegible]	[illegible]	–	
Chris	SP4758	2	19/06	9:55	10:00	Chris	PB 3919	1	19/06	10:30	10:50	[illegible]	–	
Chris	PB 3919	1	20/06	8:55	[illegible]	Chris	MS [illegible]	2	[illegible]	9:05	9:20		–	
Chris	MS 0002	2	20/06	10:05	10:10	Chris	PB 4476 [illegible]	1	[illegible]	11:05	20/06	[illegible]	–	
Chris	PB 4476 4R	1	20/06	3:15	3:20	Chris	PB 4476 4R	2	[illegible]	3:35	21/06	[illegible]	–	
[illegible]	PB 4476	2	21/06	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	9:20	9:30	9:55	–	
[illegible]	[illegible]	2	23/06	[illegible]	[illegible]	[illegible]	[illegible]	3	[illegible]	[illegible]	23/06	[illegible]	–	C
[illegible]	PF [illegible]	3	24/06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8:30	8:45	24/06		–	C
[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	PF [illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	C
[illegible]	PF [illegible]	6	26/06	[illegible]	[illegible]	[illegible]	FPA [illegible]	3	[illegible]	[illegible]	26/06	10:30	–	[illegible]

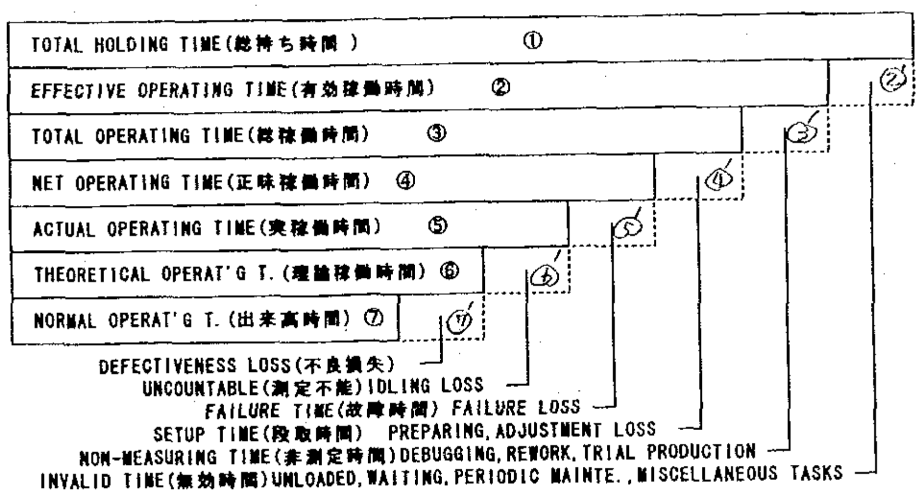
CODES

A	PRESS BREAKDOWN	F	SUPERVISION INSTRUCTION	K	AWAITING TIMING
B	TOOL BREAKDOWN	G	NO WORK PLANNED	L	No [illegible]
C	AWAITING SETTER	H	AWAITING FORK LIFT	M	
D	AWAITING RAW MATERIAL	I	ADJUST SETTING	N	
E	AWAITING QUALITY CONTROL	J	CLEAN DOWN PRESS	O	

After Improvement:

Analysed - also visual

PRODUCTIVITY (EQUIPMENT)



- □ 設備総合生産性(TOTAL EQUIPMENT PRODUCTIVITY): ⑦/①
- □ 設備生産性(EQUIPMENT PRODUCTIVITY): ⑦/③
- □ REALIZATION: ⑦/④
- □ 設備能率(EQUIPMENT EFFICIENCY): ⑦/⑤

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PR-404	Production management	Metal stamping	
2nd category		Industry	Sector / Product
Work management			

Subject

Operation analysis

■ Diagnosis:

Generally, production management practiced by press molding shops has the following problems:
1) Few companies record actual production data (quantity of production and time required for production). Especially, time data are often missing.
2) Companies that record production data do not record loss time.
3) As a result, they fail to estimate productivity accurately.
4) No productivity management index is established and none has been appointed as a person responsible for accomplishing a productivity goal.

■ Guidance:

1) To record daily production data and time spent for production;
2) To divide the time required for production to machine operating time and loss time, as well as to man-hours and loss hours;
3) To subdivide machine loss time and man loss hours to idling time (hours), non-measurement time (hours), downtime (hours), preparation time (hours) and defect loss time (hours);
4) To determine a productivity management index from the ratio of net production time (hours) excluding total loss time (hours) and net operating time (hours) excluding loss time; and
5) To appoint a responsible person for each index.

■ Response of the enterprise (as confirmed during the follow-up activity):

The first step is to record daily production data and plot them into a graph for ease of analysis.

■ Other relevant points (issues to be solved and problems remained):

The productivity management index should be specified as a benchmark value.

1 Case A

(Annex A-1)

Description of Problems

- Downtime not adequately categorized
- Equipment productivity target not set
- Analysis not for different positions (MD, Ops, etc.)

Diagnosis and Recommendation

- Categorise downtime to improve management and control
- Set equipment productivity achievement target
- Analyse and present to different positions using most appropriate method for action

2 Case B

(Annex B-1 and B-2)

Description of Problems

- Recording downtime is not functional
- Information is not analysed

Diagnosis and Recommendation

- Use different form with visual impact
- Suggested form includes analysis and allows for measurement

3 Case C

Description of Problems

(1) Production record is done but not visually recorded

(2) Production data is not well-analyzed and used effectively for productivity improvement

Diagnosis and Recommendation

(1) Production records should be presented in a visual format including machine and labor productivity for analysis purposes

(2) The following improvement measures are recommended:

- Analyze production data by using visual chart and various indexes, and use

effectively for productivity improvement.

- Lost time should be classified into elements i.e. preparation loss, malfunction loss, defect loss, others loss etc.

4 Case D

(Annex D-1 and D-2)

Description of Problems

- Classification and achievement representative in the loss time are not evident
- Record form for lost / downtime time is not functional
- Productivity achievement levels not set

Diagnosis and Recommendation

- To clarify loss time and the achievement target
- To change the operation record into the chart method for visual impact and measurement
- Measuring and controlling production to meet production / productivity targets

5 Case E

Description of Problems

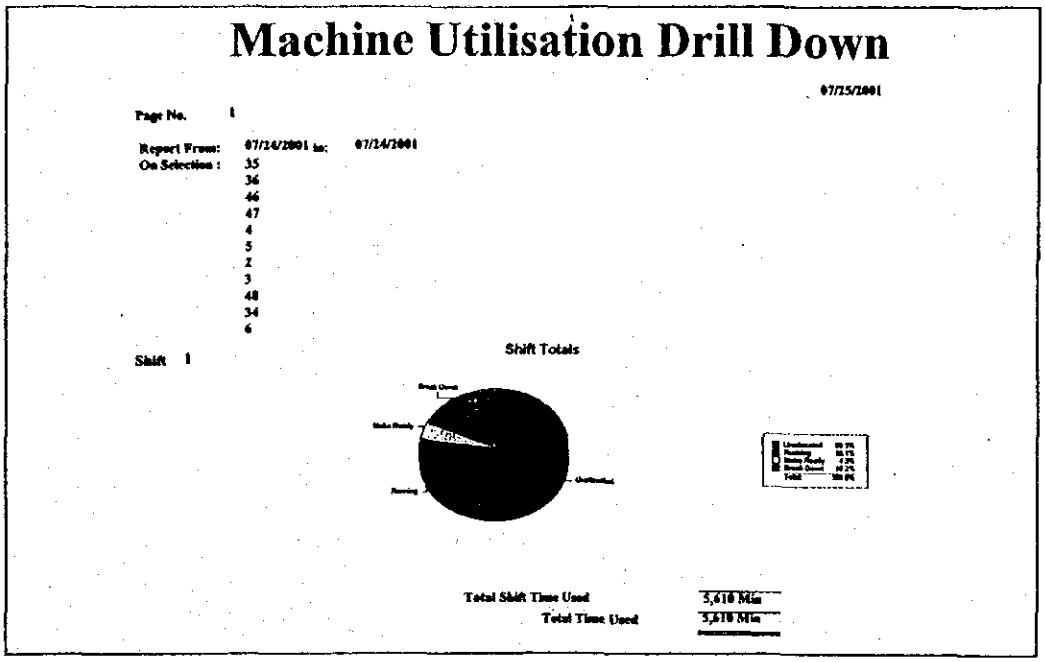
Production data is not well-analyzed and used effectively for productivity improvement.

Diagnosis and Recommendations

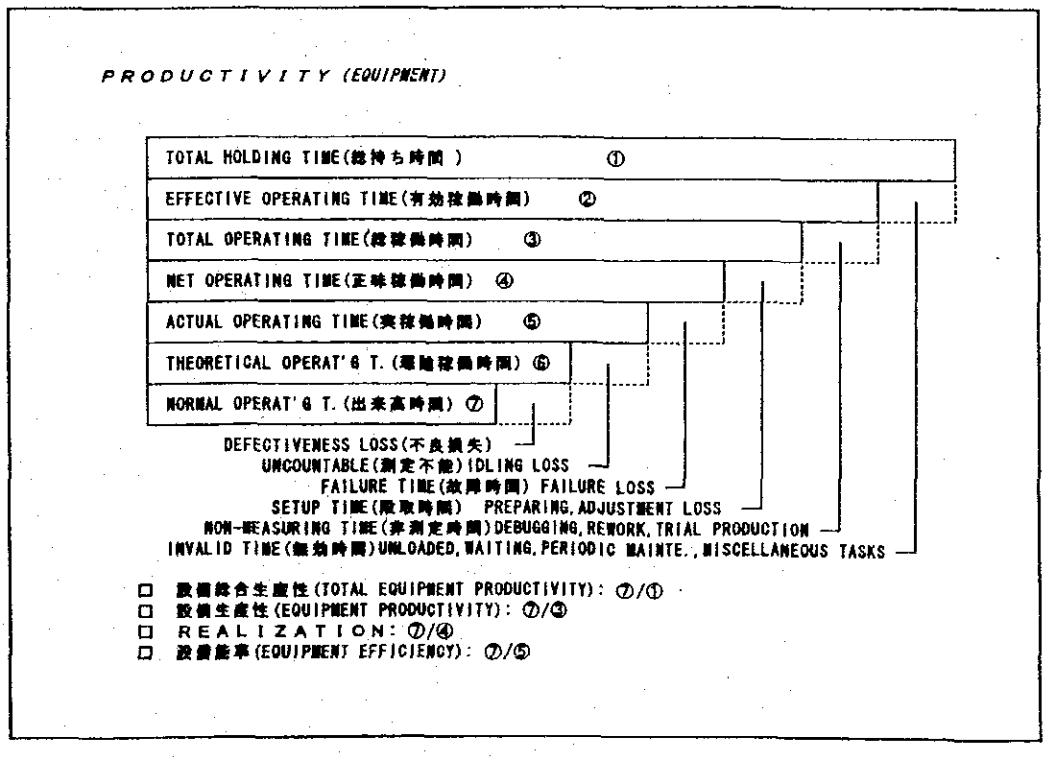
Analyze production data and use effectively for productivity improvement. The following improvement measures are recommended:

- Record daily production data visually so that the problems can be clear.
- The data should be recorded for each operator and machine.
- Lost time should be classified into elements i.e. preparation loss, malfunction loss, defect loss, others loss etc.

Present situation:

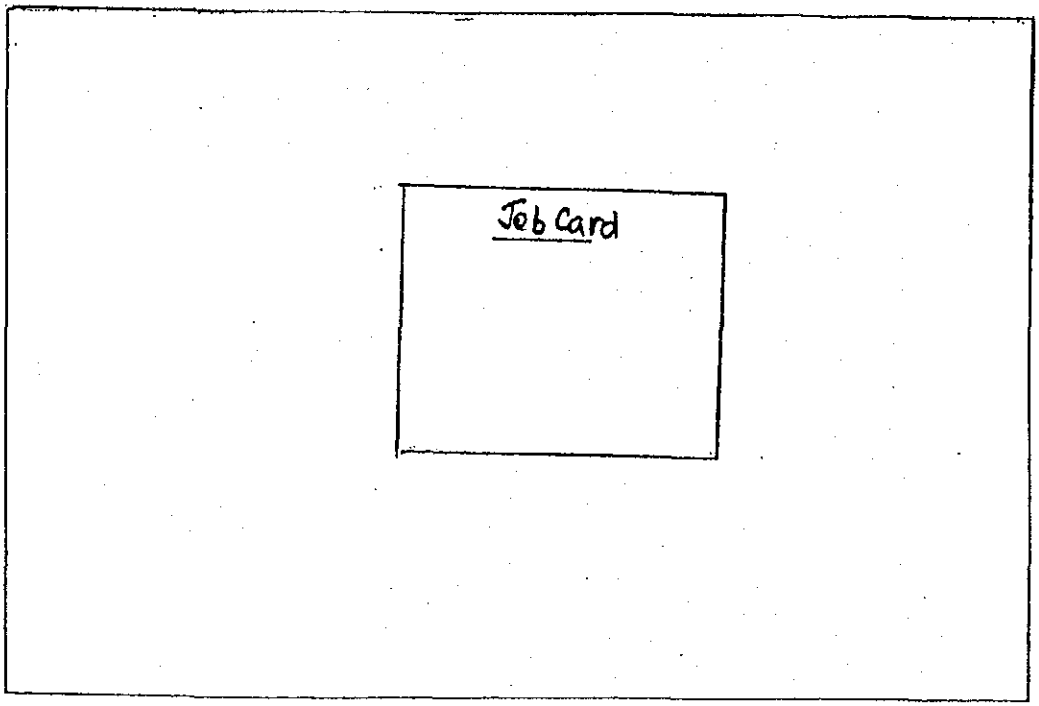


Proposed Improvement:



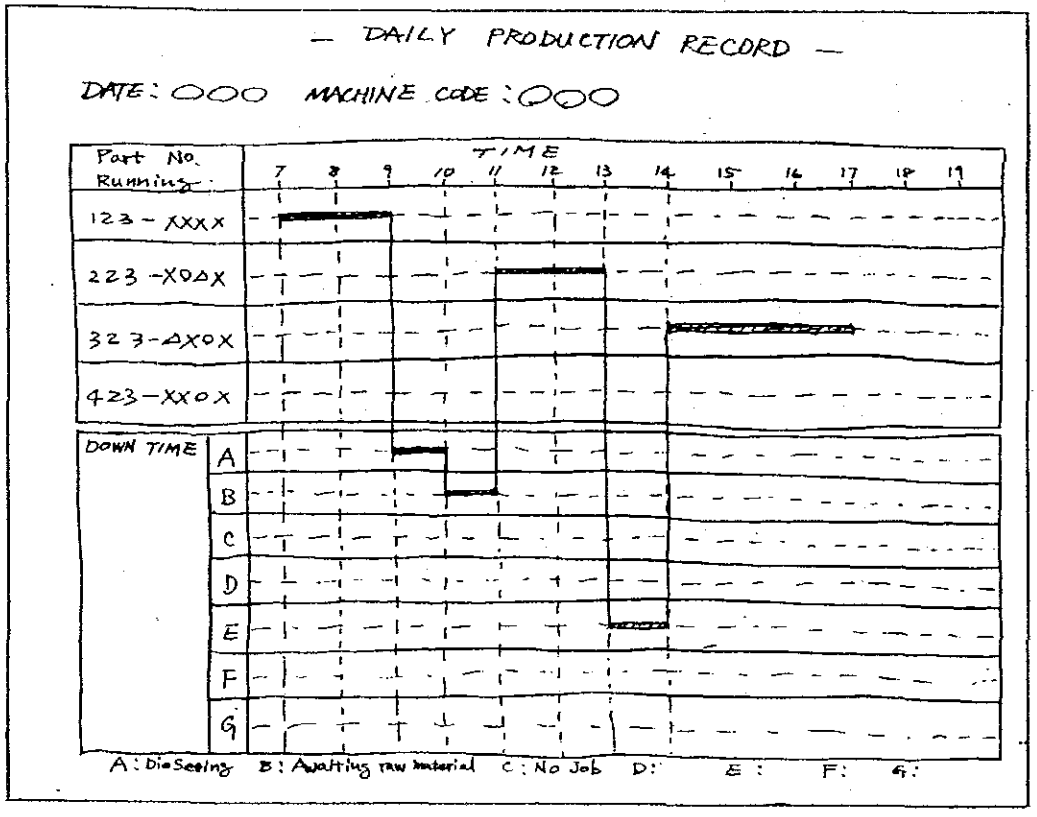
Present situation:

Record on sheet not easily read.



After Improvement:

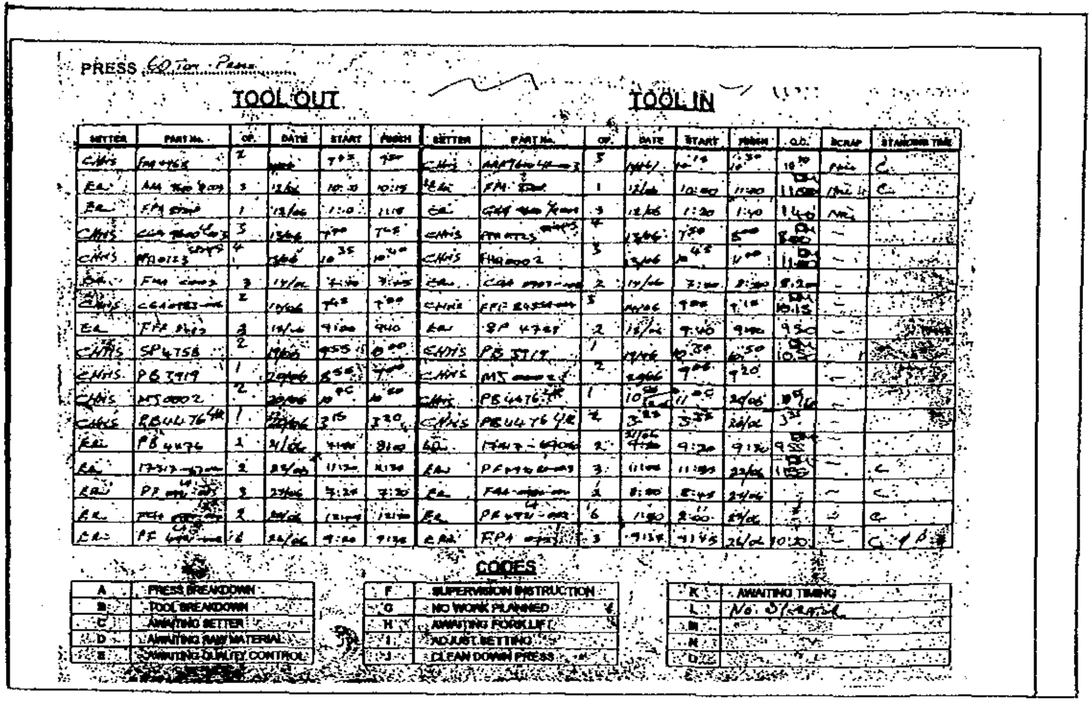
Down-time and running time is visual.



Annex B-2

Present situation:

Information only - no analysis


PRESS 60 Ton Press

TOOL OUT — TOOL IN

SETTER | PART No. | OP. | DATE | START | FINISH | SETTER | PART No. | OP. | DATE | START | FINISH | Q.C. | SCRAP | STANDING TIME

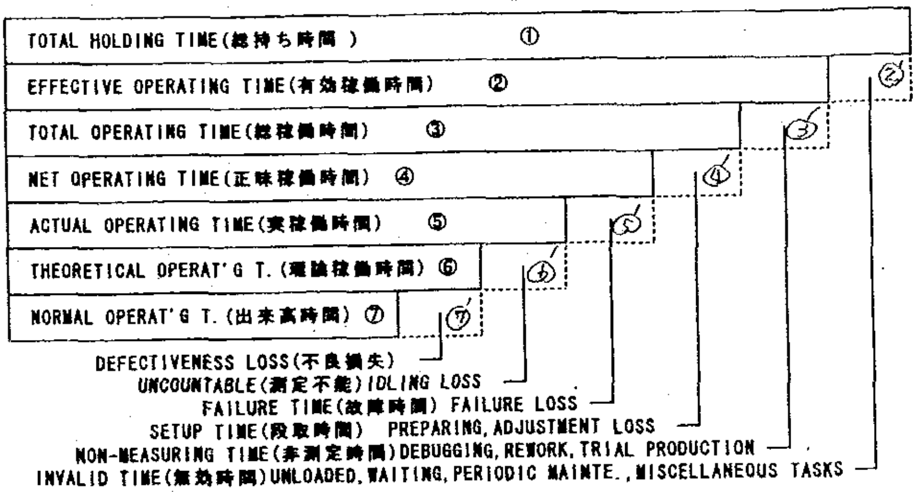
CODES

A PRESS BREAKDOWN
B TOOL BREAKDOWN
C AWAITING SETTER
D AWAITING RAW MATERIAL
E AWAITING QUALITY CONTROL
F SUPERVISION INSTRUCTION
G NO WORK PLANNED
H AWAITING FORKLIFT
I ADJUST SETTING
J CLEAN DOWN PRESS
K AWAITING TIMING
L No Steward

After Improvement:

Analysed - also visual

PRODUCTIVITY (EQUIPMENT)



- ☐ 設備総合生産性(TOTAL EQUIPMENT PRODUCTIVITY): ⑦/①
- ☐ 設備生産性(EQUIPMENT PRODUCTIVITY): ⑦/③
- ☐ R E A L I Z A T I O N: ⑦/④
- ☐ 設備能率(EQUIPMENT EFFICIENCY): ⑦/⑤

Present situation:

Information only - no analysis

BROLEIGH PRODUCTION COMPONENTS

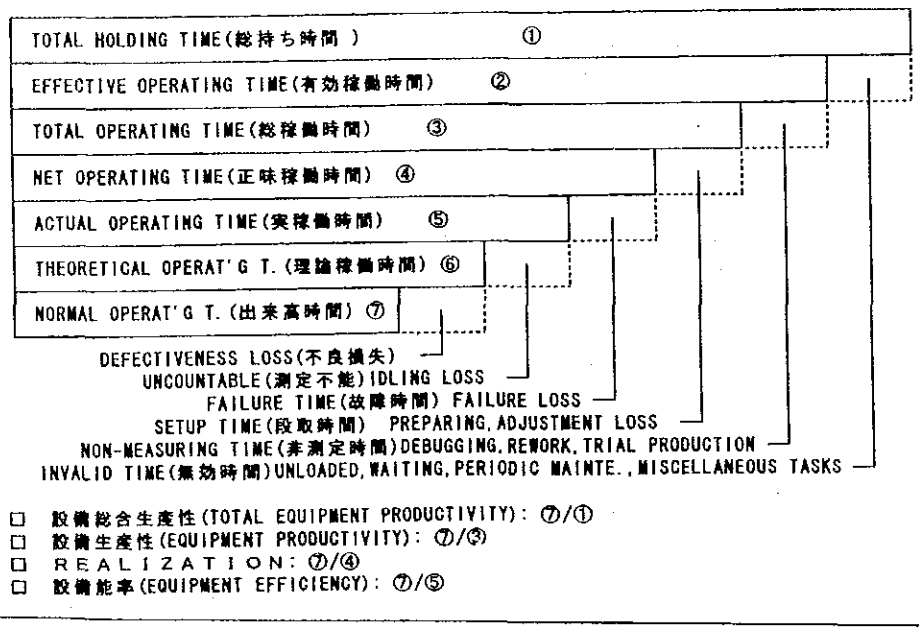
DAILY PRODUCTION STATEMENT			AREA :				DAY:	WEDNESDAY
SCHEDULE OF ORDERS			WORK CENTRE	PUNCHING			DATE:	18-Jul-01
SUPERVISOR'S SIGNATURE:			PRODUCTION MANAGER'S SIGNATURE :				OPERATOR NAME :	

MACH. No	COST CODE	PART DESCRIPTION	JOB No	NEXT W/C	PER UNIT	QTY. REQD.	UNIT STD. SET UP	UNIT STD. RUN	TIME REQD.	QTY PRODUCE	ACTUAL START	ACTUAL FINISH	ACTUAL TIME TAKEN
	257	FAN PLATE 2377 (STRIP)	MARS 31			9			84	Yo			
	329	FRONT RAIL	T146			~~70~~			72	70	7:15	8:10	55
	326	TELE SUPPORT PLATE	T129			266			82	275	8:25	10:00	80
	SAP	PC08-045				50			34				
	SAP	PC04-020				66			165				
	SAP	PC06-007				31			62				
	SAP	PC08-010				84			96				
	SAP	PC04-031				66			66				
	SAP	PC04-008				66			165				
	320	ALLY WASHER (DIA 18X13.5X1.6)	334			3316							
	338	CASTOR SUPPORT BRKT	T157			240			67	274	11:55	1:30	65
	338	SLIDE MTG BRKT (50 RH & 50 LH)	T156			100			67	102	10:30	11:30	60
	335	ENCLOSURE STANDARD AF250/500	TRI001			20			72				
	335	ENCLOSURE S/S AF 150 (SERRA)	TRI003			14			55				
		Back Chasis Mounts				1			10m	1	Rfs	2:05	10
		Cast Paint Single leg - Top Plate				2			10	7	2:30	2:45	5

After Improvement:

Analysed - also visual .

PRODUCTIVITY (EQUIPMENT)



- □ 設備総合生産性(TOTAL EQUIPMENT PRODUCTIVITY): ⑦/①
- □ 設備生産性(EQUIPMENT PRODUCTIVITY): ⑦/③
- □ REALIZATION: ⑦/④
- □ 設備能率(EQUIPMENT EFFICIENCY): ⑦/⑤

Annex D-2

Present situation:

Record on sheet not easily read.

LOST TIME RECORD

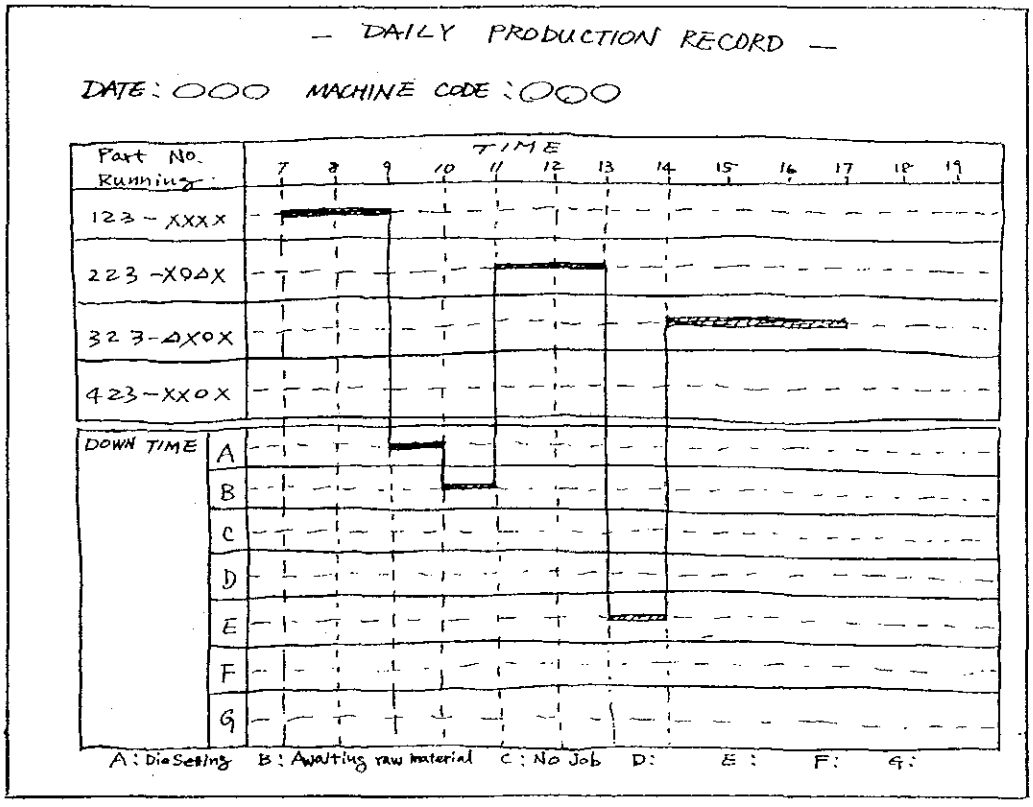
Machine No: _____ Machine Desc _____ Day: _____ Date: _____

TIME	CODE	TIME	CODE	TIME	CODE	TIME	CODE
7.00-7.05		10.00-10.05		1.00-1.05		4.00-4.05	
7.05-7.10		10.05-10.10		1.05-1.10		4.05-4.10	
7.10-7.15		10.10-10.15		1.10-1.15		4.10-4.15	
7.15-7.20		10.15-10.20		1.15-1.20		4.15-4.20	
7.20-7.25		10.20-10.25		1.20-1.25		4.20-4.25	
7.25-7.30		10.25-10.30		1.25-1.30		4.25-4.30	
7.30-7.35		10.30-10.35		1.30-1.35		4.30-4.35	
7.35-7.40		10.35-10.40		1.35-1.40		4.35-4.40	
7.40-7.45		10.40-10.45		1.40-1.45		4.40-4.45	
7.45-7.50		10.45-10.50		1.45-1.50		4.45-4.50	
7.50-7.55		10.50-10.55		1.50-1.55		4.50-4.55	
7.55-8.00		10.55-11.00		1.55-2.00		4.55-5.00	
8.00-8.05		11.00-11.05		2.00-2.05			
8.05-8.10		11.05-11.10		2.05-2.10			
8.10-8.15		11.10-11.15		2.10-2.15			
8.15-8.20		11.15-11.20		2.15-2.20			
8.20-8.25		11.20-11.25		2.20-2.25			
8.25-8.30		11.25-11.30		2.25-2.30	Tea Break		
8.30-8.35		11.30-11.35		2.30-2.35			
8.35-8.40		11.35-11.40		2.35-2.40			
8.40-8.45		11.40-11.45		2.40-2.45			
8.45-8.50		11.45-11.50		2.45-2.50			
8.50-8.55		11.50-11.55		2.50-2.55			
8.55-9.00		11.55-12.00		2.55-3.00			
9.00-9.05		12.00-12.05		3.00-3.05			
9.05-9.10		12.05-12.10		3.05-3.10			
9.10-9.15		12.10-12.15		3.10-3.15			
9.15-9.20		12.15-12.20		3.15-3.20			
9.20-9.25		12.20-12.25		3.20-3.25			
9.25-9.30	Tea Break	12.25-12.30	Lunch Break	3.25-3.30			
9.30-9.35		12.30-12.35		3.30-3.35			
9.35-9.40		12.35-12.40		3.35-3.40			
9.40-9.45		12.40-12.45		3.40-3.45			
9.45-9.50		12.45-12.50		3.45-3.50			
9.50-9.55		12.50-12.55		3.50-3.55			
9.55-10.00		12.55-1.00		3.55-4.00			

REMARKS	BREAKDOWN CODES			
	Unavoidable		Avoidable	
	01	Setup	07	No Operator
	02	Mechanical	08	No Work
	03	Electrical	09	No Planned Work
	04	Routine Maintenance	10	Awaiting Material
	05	Cleaning	11	Awaiting Setter
	06	Other	12	Waste Removal

After Improvement:

Down-time and running time is visual.



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PR-405	Production management	Metal stamping	
2nd category		Industry	Sector / Product
Quality control			

Subject

Quality control techniques

■ Diagnosis:

Generally, quality control practiced by press molding shops has the following problems:
1) Inspection data are not accurately recorded.
2) Recorded data are not arranged in time series nor presented in a graphical from.
3) QC tools, useful for data analysis and quality improvement, are not used.

■ Guidance:

1) To record data obtained during inspection, including acceptance inspection and in-process sample inspection;
2) To monitor critical control dimensions using a Bar X-R Chart, identify signs of defect beforehand, and take necessary preventive measures; and
3) To fully utilize QC tools according to each purpose, e.g., a cause and effect diagram for causal analysis, and a histogram and a Cpk index for assessment of reliability.

■ Response of the enterprise (as confirmed during the follow-up activity):

Several companies introduced a Bar X-R Chart for acceptance and in-process sampling inspections.

■ Other relevant points (issues to be solved and problems remained):

Before teaching the use of the seven QC tools – statistical quality control techniques, it is important that the recording and graphic representation of inspection data are carried out as daily practice.

1 Case A

Description of Problems

(1) Stock / inventory control
- Recorded quantity numbers not the same as actual
- Stock in stores not controlled

(2) Quality control
- No actual measurements data of roving checks on the inspection sheet

(3) Equipment control
- No check list or records of daily maintenance of machines

Diagnosis and Recommendation

(1) Stock / inventory control (Annex A-1)
- Attach inventory control sheet to the box to control in and out parts

(2) Quality control
- Redesign inspection sheet so that more inspection data can be captured

(3) Equipment control
- Prepare check list of daily maintenance at the machines

2 Case B

Description of Problems

- Quality statistics are not in place.
- Quality inspection sheets not always retrieved

Diagnosis and Recommendation

- Fully implement quality system
- Display statistics in visual format (graphs, sketches etc)

3 Case C

Description of Problems

- No visible quality standard available at press (drawings, pictures, critical dimensions)
- No boundary samples are introduced for visual inspection
- Check jigs and gauges are not well utilized

Diagnosis and Recommendation

- Establish visible quality standard and clearly identify important quality points
- Establish boundary samples for visual inspection
- Provide operator with necessary gauges or inspection devices

4 Case D

Description of Problems

- Quality statistics (i.e. Bar X-R Chart, Cp index) are not utilized in stamping process
- Weak production engineering such as trouble shooting

Diagnosis and Recommendation

- Introduce Quality statistics (i.e. Bar X-R Chart, Cp index) for critical dimensions of stamping products for defect prevention
- Production engineering such as trouble shooting should be strengthen

5 Case E

Description of Problems

- No specification available at press (drawings, pictures, critical dimensions)
- Checking devices not close at hand

Diagnosis and Recommendations

- Establish inspection sheets and clearly identify critical dimensions.
- Establish operator inspection frequencies.
- Provide operator with necessary gauges or inspection devices.
- Operator to record critical dimension results on bar x-r charts.
- Roving inspector to verify this results at predetermined frequencies.

6 Case F

Description of Problems

- No visible quality standard available at press (drawings, pictures etc).
- No boundary samples have been introduced for visual inspection.
- Check jigs and gauges are not well utilized.
- Defect prevention such as "Quality statistics" is not introduced.

Diagnosis and Recommendation

- Establish visible quality standard and clearly identify important quality point.
- Introduce boundary samples beside the operator not at the quality control room for visual inspection.
- Provide operator with necessary gauges or inspection devices.
- Introduce Quality statistics (i.e. Bar X-R Chart, Cp index) for critical dimensions of stamping products for defect prevention.

7 Case G

Descriptions of Problems

- Present in-process quality control system is not effective, analyses and corrective actions are not taken to prevent against defective products
- Quality statistics are not utilised

OBSERVATION

- Assembled products (Anti-loose fastener) are screened by operator and 30 to 40 % of products were needed to be reworked (Annex G-1)

Diagnosis and Recommendation

- Redesign and implement in-process quality control system, so that analyses of defective products and corrective actions can be undertaken
- Utilize quality statistics to improve quality

EXAMPLES

- *Histogram / Bar X-R Chart / Fish bone*

8 Case H

Description of Problems

- No specification available at press (drawings, pictures, critical dimensions).
- Checking devices not close at hand.

Diagnosis and Recommendations

- Establish inspection sheets and clearly identify critical dimensions.
- Establish operator inspection frequencies.
- Provide operator with necessary gauges or inspection devices.

- Operator to record critical dimension results on Bar X-R Charts.
- Roving inspector to verify these results at predetermined frequencies.
- Continue with SPC Charting on a more regular basis after every die change.
- Monitor and improve Process capability for future consideration.

9 Case I

Description of Problems

- Die maintenance is BM (Break-down Maintenance) which is carried out after the quality defectiveness occurs
- Quality records not up to date (tracking, quality system)

Diagnosis and Recommendation

- Die maintenance is changed to PM (Preventive Maintenance) from BM (Break-down Maintenance)
- Set up Quality Management System

Present situation:

NO STOCK CONTROL DOCUMENT DISPLAYED AT LOCATION

After Improvement:

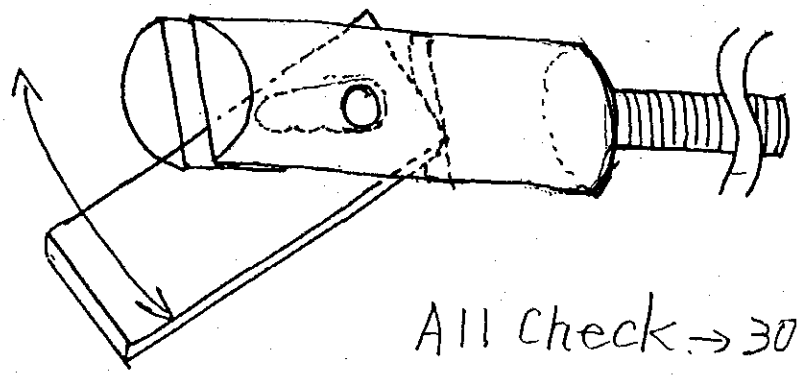
Implement Stock Control Sheet at various locations (Improved Control)

ITEM	ORDER REF	IN / DATE	OUT / DATE	BALANCE
a.....				
b.....				
c.....				

Present situation:

Unnecessary rework on fastener

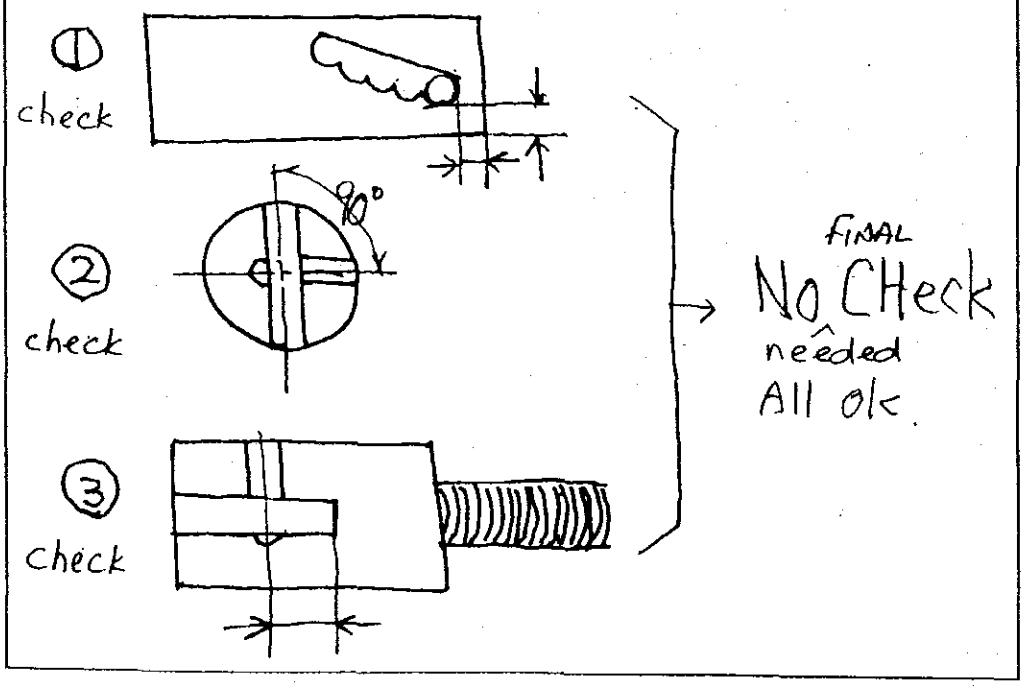
Loose Fastener



All Check → 30% Bad
(no turnable)

After Improvement:

Each operations are inspected



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PR-406	Production management	Metal stamping	
2nd category		Industry	Sector / Product
Quality control			

Subject

Quality standards

■ Diagnosis:

Generally, quality control practiced by press molding shops has the following problems:
1) Many companies operate without quality standards.
2) Quality standards made by some are not clearly defined.

■ Guidance:

1) To develop a quality standard for each product;
2) To specify checkpoints for workers and inspectors in each quality standard, using graphics, sketches and photos; and
3) To provide education and training for workers on the basis of quality standards.

■ Response of the enterprise (as confirmed during the follow-up activity):

Some companies have prepared quality standards using photos and post them on each press during the work.

■ Other relevant points (issues to be solved and problems remained):

As most press molding shops in the country are engaged in small lot production with a short production schedule, quality standards should use sketches and digital photos for ease of edition and publication.

1 Case A

Description of Problems

- No visible quality standard available at press (drawings, pictures, critical dimensions).
- No boundary samples are introduced for visual inspection.
- Check jigs and gauges are not well utilized.

Diagnosis and Recommendation

- Establish visible quality standard and clearly identify important quality points.
- Establish boundary samples for visual inspection.
- Provide operator with necessary gauges or inspection devices.

2 Case B

Description of Problems

- No visible quality standard available at press (drawings, pictures etc).
- No boundary samples have been introduced for visual inspection.
- Check jigs and gauges are not well utilized.
- Defect prevention such as "Quality statistics" is not introduced.

Diagnosis and Recommendation

- Establish visible quality standard and clearly identify important quality point.
- Introduce boundary samples beside the operator not at the quality control room for visual inspection.
- Provide operator with necessary gauges or inspection devices.
- Introduce Quality statistics (i.e. Bar X-R Chart, Cp index) for critical dimensions of stamping products for defect prevention.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PR-407	Production management
2nd category	
Equipment management	

Division / Process	
Metal stamping	
Industry	Sector / Product

Subject

Shop layout

■ Diagnosis:

The layout generally fails to take into account the production process and movement of goods, resulting in additional time for transportation and handling.

■ *Guidance:*

1) To reconsider and redesign the processing methods for major products and their production processes, and the in-process flow and distribution of raw materials and work in process;
2) To group machinery and equipment to those that should be arranged in proximity to each other because of productivity, working environment and safety, those that do not require proximity, and those that should be placed apart, and to prepare a correlation diagram representing the geographical relationship among them; and
3) To design an overall layout with reference to the correlation diagram.

■ Response of the enterprise (as confirmed during the follow-up activity):

Two companies have already started remodeling work to install a new layout and will start production as of February 2002.

■ Other relevant points (issues to be solved and problems remained):

For a layout change involving relocation of equipment that requires a large cost, cost effectiveness should be carefully assessed before implementation.

1 Case A (Annex A-1)

Description of Problems

- Workflow for components produced was poor.
- Materials and WIP not smoothly carried due to narrow aisle.
- Material handling by operators – time consuming.

Diagnosis and Recommendation

- Redesign layout of whole plant to improve material flow and not haphazard.
- 5S should be done before redesign layout.
- Make tables for easy access and small containers for easy handling.

2 Case B

Description of Problems

- Workflow for components produced was poor.
- Forklift truck not easily used due to narrow aisle and big bins.
- Die storage far away from presses.

Diagnosis and Recommendation

- Redesign layout of press shop to improve material flow from die to die and not haphazard.
- Use manual forklift and smaller bins for material movement.
- Situate die storage in stamping section for easy access.

3 Case C

Description of Problems

- Process-flow for manufactured components require improvements.
- Forklift truck not easily used due to narrow aisle and obstructions (big bins).

Diagnosis and Recommendation

- Redesign layout of press shop to improve material flow from die to die.
- Use small or manual forklift and smaller bins for material movement.

4 Case D (Annex D-1)

Description of Problems

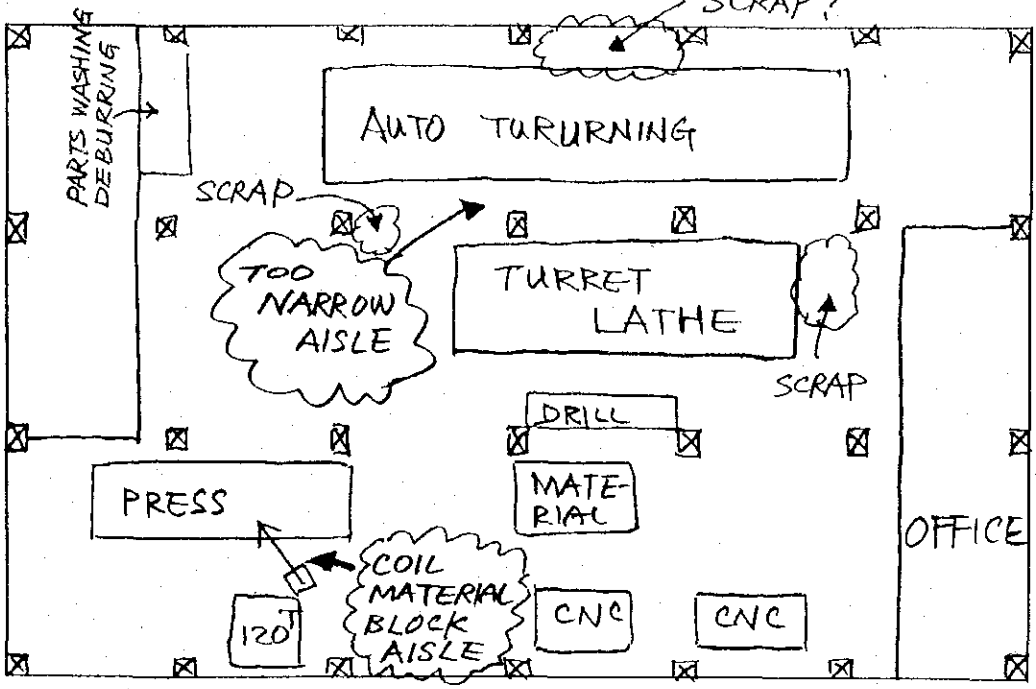
- Production efficiency is not considered in the plant layout.

Diagnosis and Recommendation

- To arrange CNC punching machine and press brake nearby and reduce WIP area.
- Press, spot welding and assembly process are moved on the side of TOOL TECH.

Present situation:

Material and WIP not smothly carried due to narrow aisle



After Improvement:

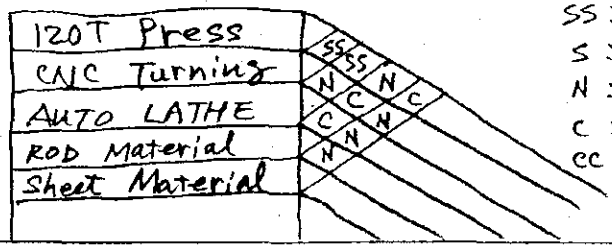
Redesign layout of whole plant to improve material flow and not haphazard

1st Phase

5S should be done

2nd Phase

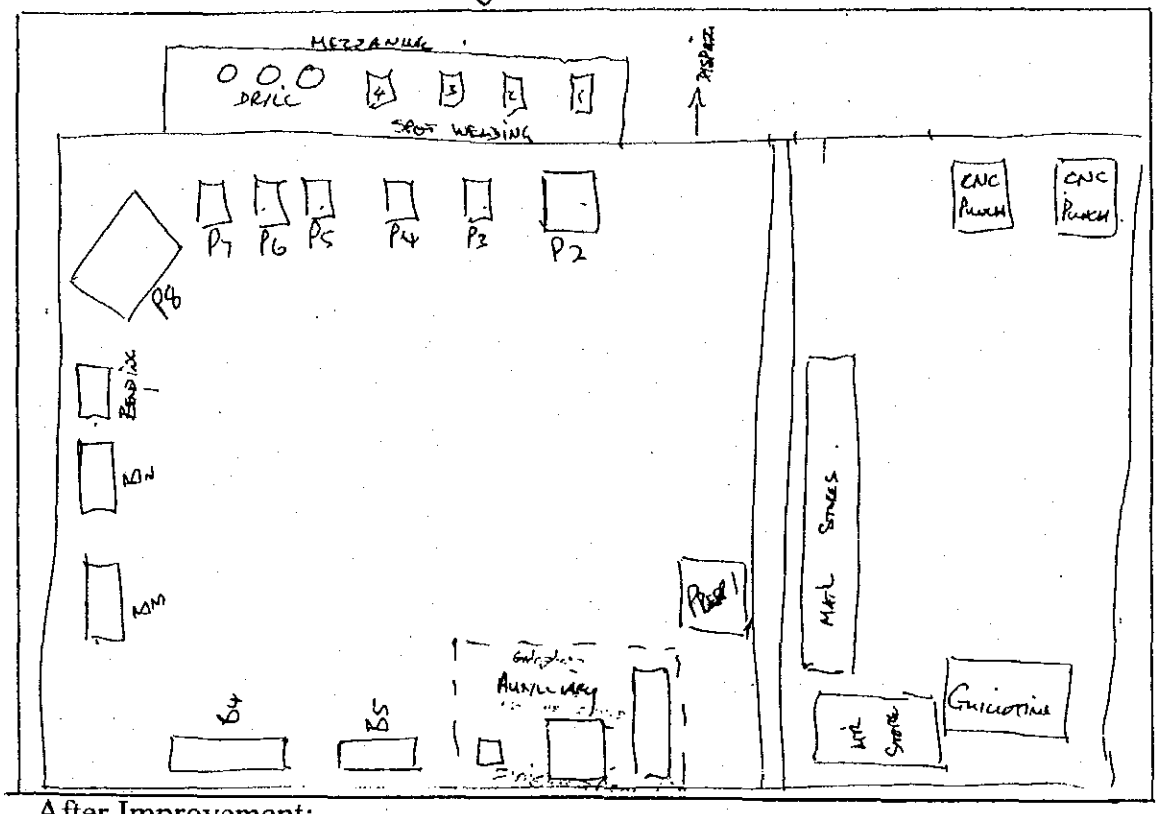
Redesign layout
- Process flow
- Material flow
- Connection.



SS : MUST BE SEPARATE
S : SHOULD BE SEPARATE
N : NO CONNECTION
C : SHOULD BE CLOSE
CC : MUST BE CLOSE

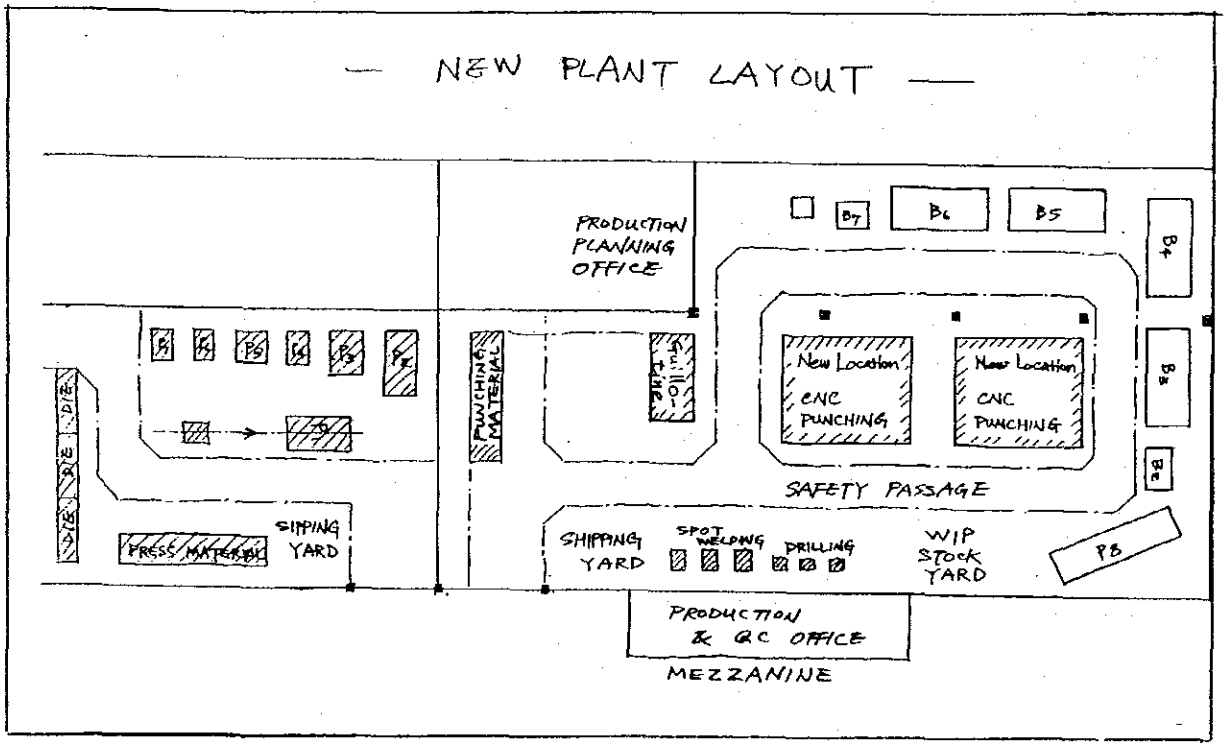
Annex D-1

Present situation: Current layout - distance for material flow



After Improvement:

material flow improved.



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PR-408	Production management
2nd category	
Work management	

Division / Process	
Metal stamping	
Industry	Sector / Product

Subject

Safety management

■ Diagnosis:

When press work is analyzed from the viewpoint of safety, the following problems are commonly identified:

1) Press work is carried out as a worker keeps his hands or fingers in a mold.

2) While blanking operation is carried out using a foot pedal switch, no safety guard is provided for a mold.

■ Guidance:

1) To use adequate safety/protective devices required for press work, allowing the worker to set or remove a product without putting his hands or fingers into the mold; and

2) To provide a safety guard for the mold when blanking operation is conducted using a food pedal switch, thereby to prevent the worker from putting his hands or fingers into the mold.

■ Response of the enterprise (as confirmed during the follow-up activity):

Despite the advice, the above recommendations have not been carried out due to the lack of safety awareness of both management and labor.

■ Other relevant points (issues to be solved and problems remained):

The cost incurred by an accident serves as a major incentive to safety investment. In the country where labor costs are relatively low and thus an industrial accident does not lead to a large amount of compensation as seen in industrialized countries, companies do not have incentive to costly safety investment. Under these circumstances, therefore, significant improvement in work safety must wait until managers are required to assume strict responsibility for safety management by law.

1 Case A

Description of Problem

- Painting area is located close to power source, a potential fire risk.

Diagnosis and Recommendations

- Relocate painting area to reduce risk

2 Case B

Description of Problems

- Not enough safety exercised when loading and unloading components

Diagnosis and Recommendation

- Use tools to load and unload
- Improve design of tool
- Train workers on safe work practices

3 Case C

Description of Problems

- Redundant and scrap material are in the way and inhabits material flow
- No demarcation lines
- Personal protective equipment are not used
- No grinding wheel cover is used for tool grinding machine

Diagnosis and Recommendation

- Allocate scrap bins and storage area
- Defective products are clearly separated on a daily basis
- Paint aisles, working area, storage area and emergency exits
- Provide personal protective equipment
- Install grinding wheel cover for tool grinding machine

4 Case D

Description of Problems

- Manual feeding material strip to the die during progressive operation while using foot pedal switch without safety guards (Annex D-1).

- Hands in die whilst loading and unloading material.
- Stools not available and not adjustable, which leads to fatigue and negatively affects productivity.

Diagnosis and Recommendation

- Design and install safety guards.
- Use tool to load and unloading if possible.
- Introduce adjustable stools to reduce fatigue and increase labour productivity.

5 Case E

Description of Problems

- Without the both hands push button switch and safe guards are operated
- Hearing protection not used by all personnel
- Using Forklift Truck to remove / set machine / tools

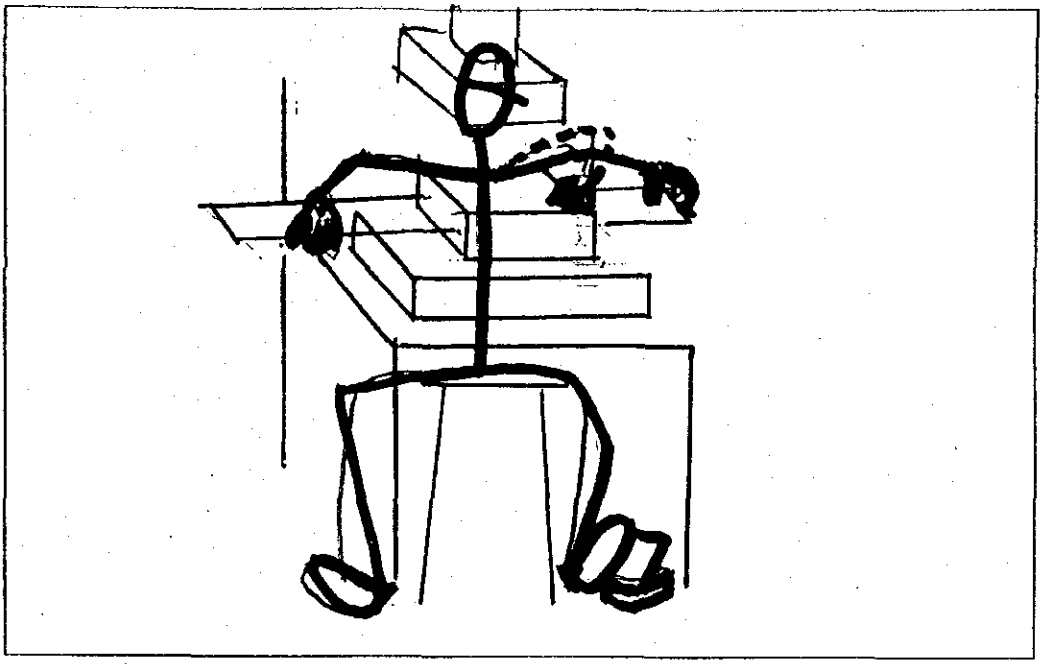
Diagnosis and Recommendation

- To install the both hands push button switch and safe guards to the press machine
- Motivation to use hearing protection (supplied by Company)
- Use Step ladder

Annex D-1

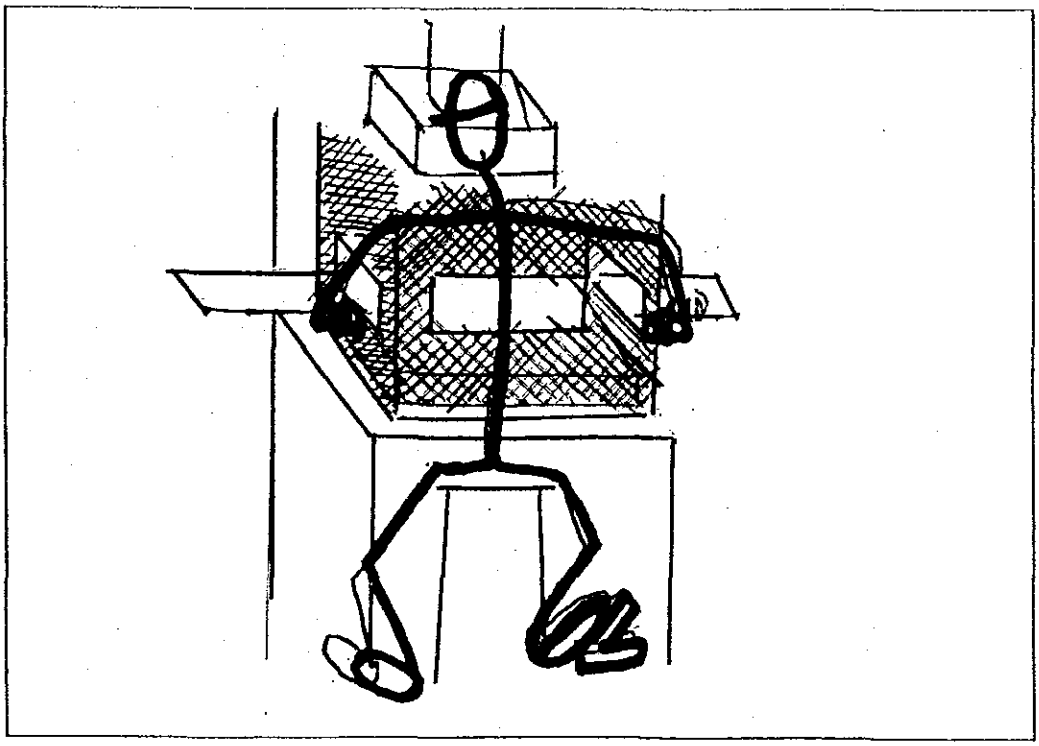
Present situation:

unguarded operation - using foot pedal



After Improvement:

guarded.



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PR-409	Production management	Metal stamping	
2nd category		Industry	Sector / Product
5S			

Subject

5S activities (housekeeping)

■ Diagnosis:

Generally, shops are poorly maintained in terms of arrangement of goods, and the following problems are identified:

1) A work area and a service path are not clearly separated and articles are placed on the service path to disturb with movement of goods.

2) Finished and semi-finished products, and accepted and rejected products are not clearly separated to adversely affect productivity and quality.

■ Guidance:

1) To separate goods in use from those not used and dispose the latter;

2) To assort goods in use and maintain them in good condition;

3) To separate a service path and a work area by yellow line; and

4) To clearly mark finished and semi-finished products and accepted and rejected products by color coding or other means.

■ Response of the enterprise (as confirmed during the follow-up activity):

Many of companies that received the above advice have successfully improved their 5S levels. In particular, a company has introduced 5S activities as part of small group activities, which are expected to produce good results.

■ Other relevant points (issues to be solved and problems remained):

Improvement of 5S levels should be carried out in the form of housekeeping competition among small groups to give prizes for excellence. This will provide good incentive to improved awareness of workers.

1 Case A

Description of Problem

- Painting area is located close to power source, a potential fire risk

Diagnosis and Recommendations

- Relocate painting area to reduce risk

2 Case B

Description of Problems

- Redundant and scrap material are in the way and inhabits material flow
- No demarcation lines
- Personal protective equipment are not used
- No grinding wheel cover is used for tool grinding machine

Diagnosis and Recommendation

- Allocate scrap bins and storage area
- Defective products are clearly separated on a daily basis
- Paint aisles, working area, storage area and emergency exits
- Provide personal protective equipment
- Install grinding wheel cover for tool grinding machine

3 Case C

Description of Problems

- Demarcation of WIP, finished goods, electrical boards and walkways not clear

Diagnosis and Recommendation

- Enforce use of designated areas for WIP etc.
- Inspect for safety compliance

4 Case D

Description of Problems

- Safe passage and work area is not clearly demarcated

Diagnosis and Recommendation

- Demarcate safe passage and work area by yellow paint
- Classification of the material, WIP and the finished goods yards

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PR-601	Sheet metal stamping technology	Metal stamping	
2nd category		Industry	Sector / Product
Molds & dies			

Subject

Improvement of molds

■ Diagnosis:

Many molds used by press molding shops are found to have the following problems:
1) Difficult to determine positioning or remove a stamped product;
2) Strip layout design with poor material yield;
3) Poor process capability; and
4) Safety problems.

■ Guidance:

1) To improve ease of positioning and product removal;
2) To improve a strip layout to maximize material yield;
3) To redesign a mold with poor process capability; and
4) To improve safety by providing an escape path or a safety guard.

■ *Response of the enterprise (as confirmed during the follow-up activity):*

As the redesigning of molds takes time, few companies have implemented the above advice. Nevertheless, a company that received the detailed diagnosis has modified its molds and has successfully improved product quality.

■ Other relevant points (issues to be solved and problems remained):

Most companies do not have high levels of mold design techniques. As a result, when a problem occur, it is often left unsolved because neither mold designer or technician is capable of devising a solution.

1 Case A

(Annex A-1 and A-2)

Description of Problems

- Too much of waste material (cut offs)
- See annexure

Diagnosis and Recommendation

- Change material dimension specification to save on materials

2 Case B

Description of Problems

- Raw material strip feed not supported during first pass hence second pass difficult to feed because material bent or split (Annex B-1).
- Tool no 73c, operator waste time by removing part by manual scraper. This also results in some parts being scraped onto the floor and not in the bin.
- Part with 8mm diameter bar with shape of sharp Vee. First operation on far side of die, second operation on front of die closest to operator. During press cycle part from first operation falls away from operator who then has to stretch across the die to retrieve the part to put into second operation which is in front of the die (Annex B-2).
- Operator picks up material from the floor to set the die, which takes too much time.

Diagnosis and Recommendation

- Support system should be used to support the material strip during the first pass through the die to prevent the strip from bending thus eliminating the difficulty of feeding the strip into the die during the second pass.
- Modify tool by introducing simple spring loaded injector.
- Modify tool by introducing simple support to prevent part from falling away from the operator during the first operation.
- Introduce simple material handling stands to hold material or bin at operator working height. Introduce roving material handler to support operator with material feed.

3 Case C

Description of Problems

- Raw material strip feed not supported during first pass hence second pass difficult to feed because material bent or split.
- Tool no 73c, operator waste time by removing part by manual scraper. This also results in some parts being scraped onto the floor and not in the bin.
- Part with 8mm diameter bar with shape of sharp Vee. First operation on far side of die, second operation on front of die closest to operator. During press cycle part from first operation falls away from operator who then has to stretch across the die to retrieve the part to put into second operation which is in front of the die.
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Diagnosis and Recommendation

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- Modify tool by introducing simple spring loaded injector.
- Modify tool by introducing simple support to prevent part from falling away from the operator during the first operation.
- Introduce simple material handling stands to hold material or bin at operator working height. Introduce roving material handler to support operator with material feed.

4 Case D

Description of Problems

The company overlooked the following areas of improvement:

(1) Some lost time in press work is due to:
- Raw material (Coil) strip is often jammed in the die.
- Blanking is not a continuous process i.e. Operator stops the press every time and removes the finished product prior to the next blanking.

(2) Material is lost due to:
- Low yield of material strip.

Diagnosis and Recommendation

(1) The followings are recommended to insure continuous operation of press.

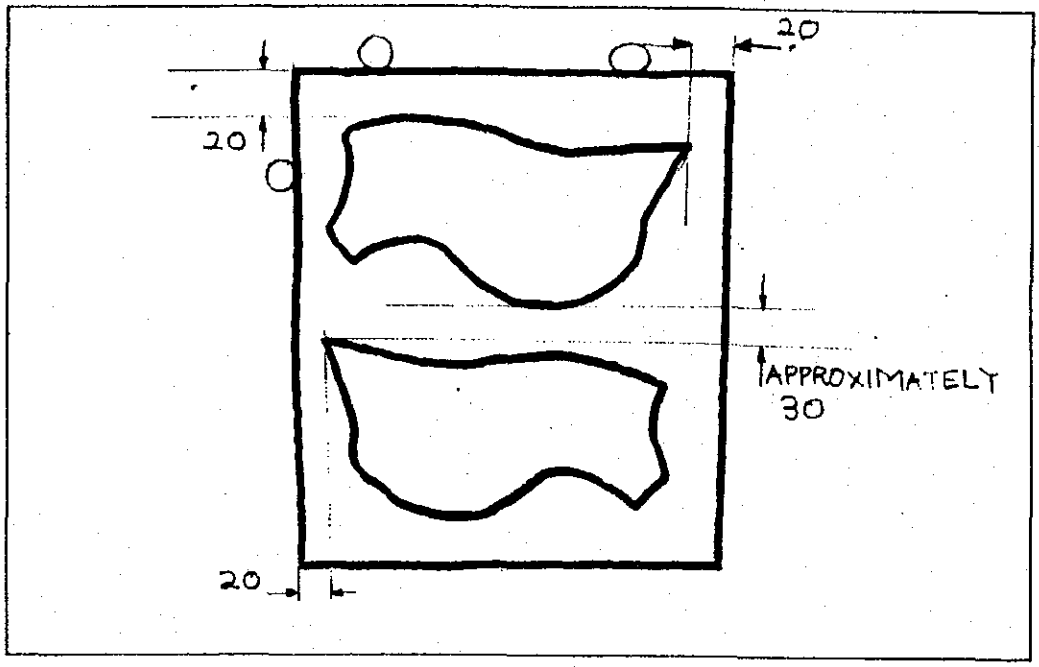
- Width of raw material strip should be strictly controlled.
- Die design should be changed so that the product automatically comes out from the die (component ejection designed).

(2) Insuring that minimum widths of strips are used should maximize raw material utilization of Strips. The size of material strip should be reduced by 1mm at a time and if there is room for improvement then this should be repeated until the optimum width of strip is achieved (1 mm Reduction Activity).

Annex A-1

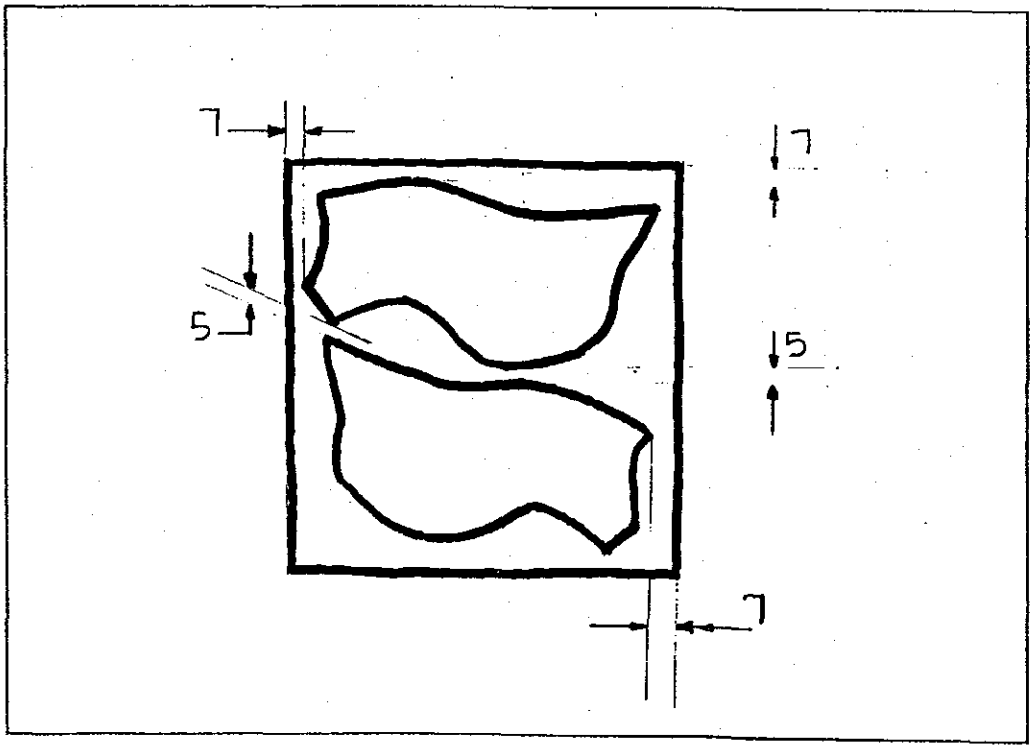
Present situation:

The company generate too much waste Material (OFF-cuts)

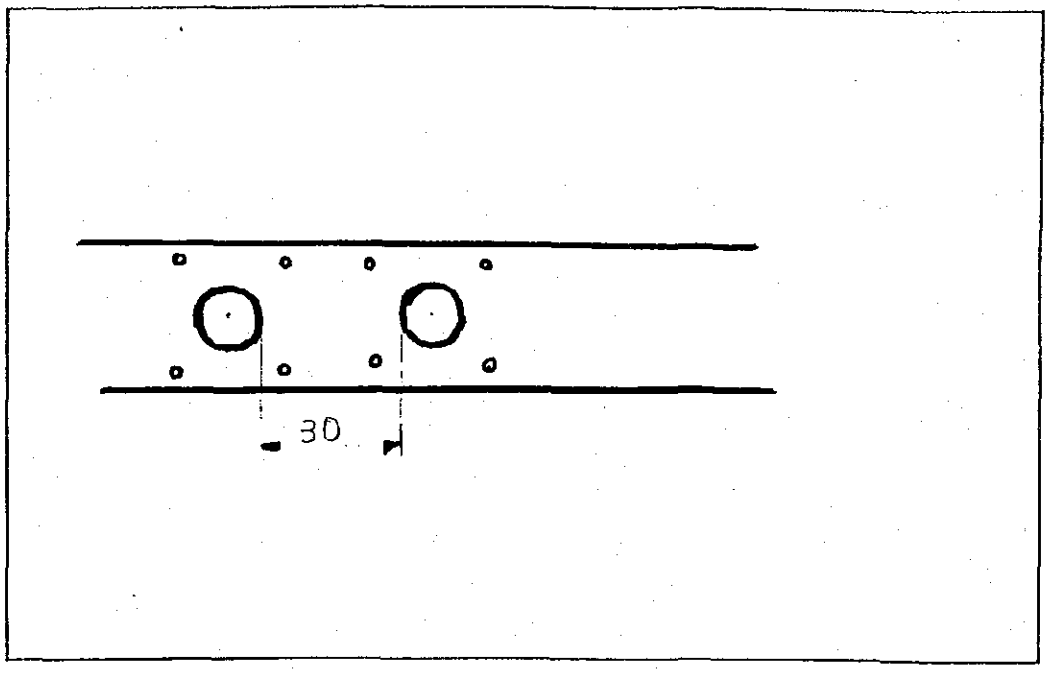


Proposed Improvement:

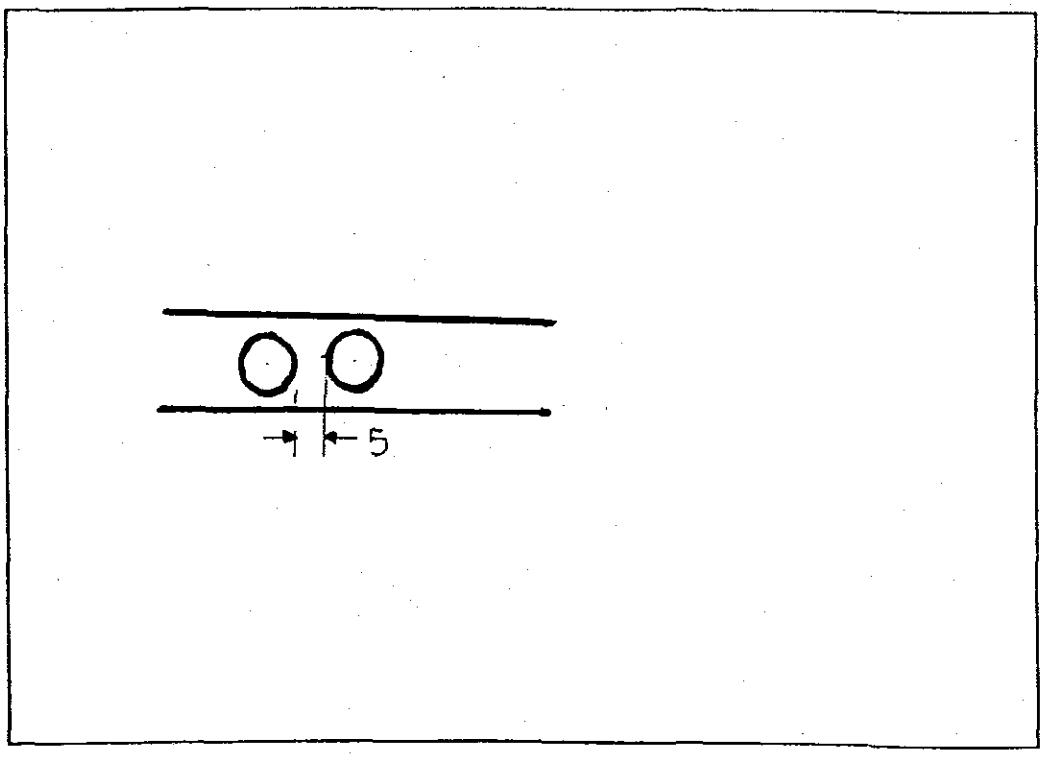
Reduce (OFF-cuts) size



Present situation:



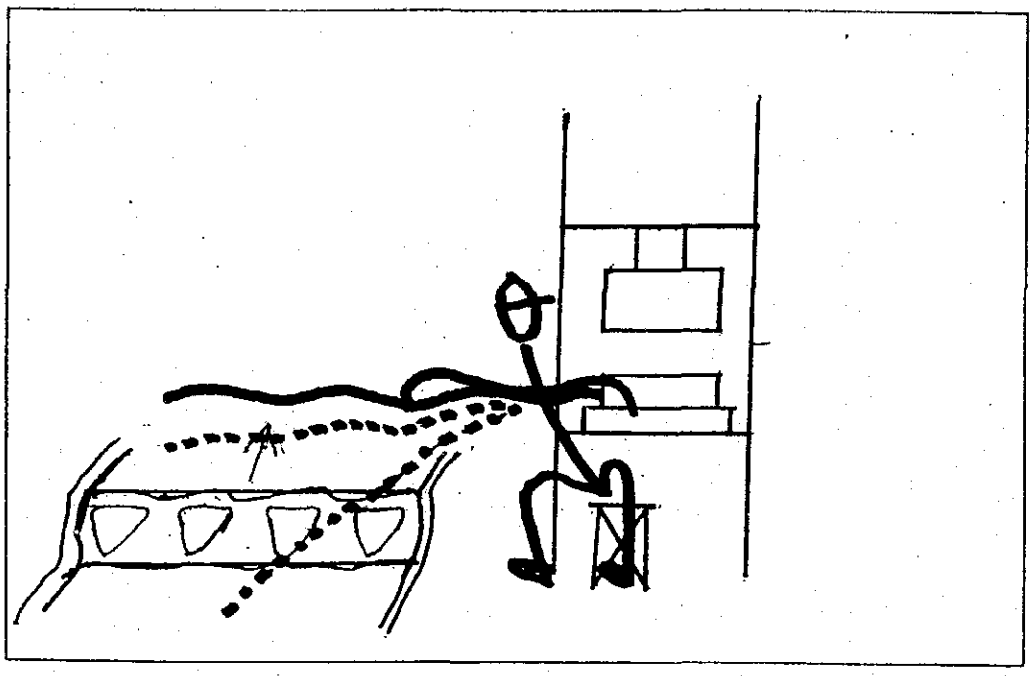
Proposed Improvement:



Annex B-1

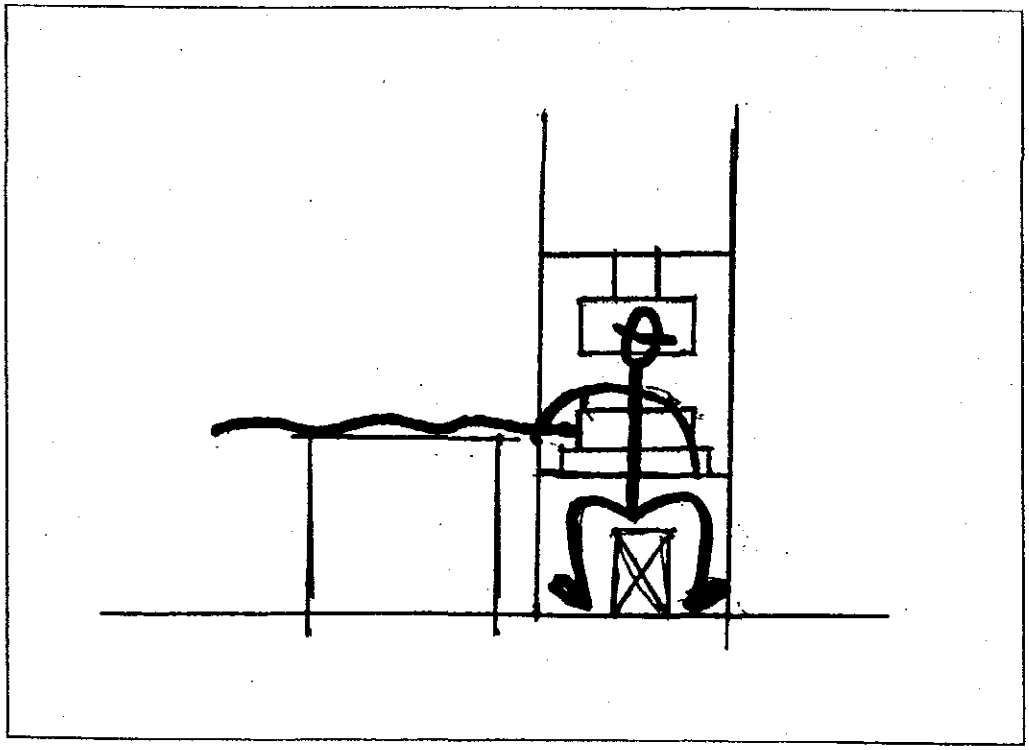
Present situation:

Strip not supported in die feed



After Improvement:

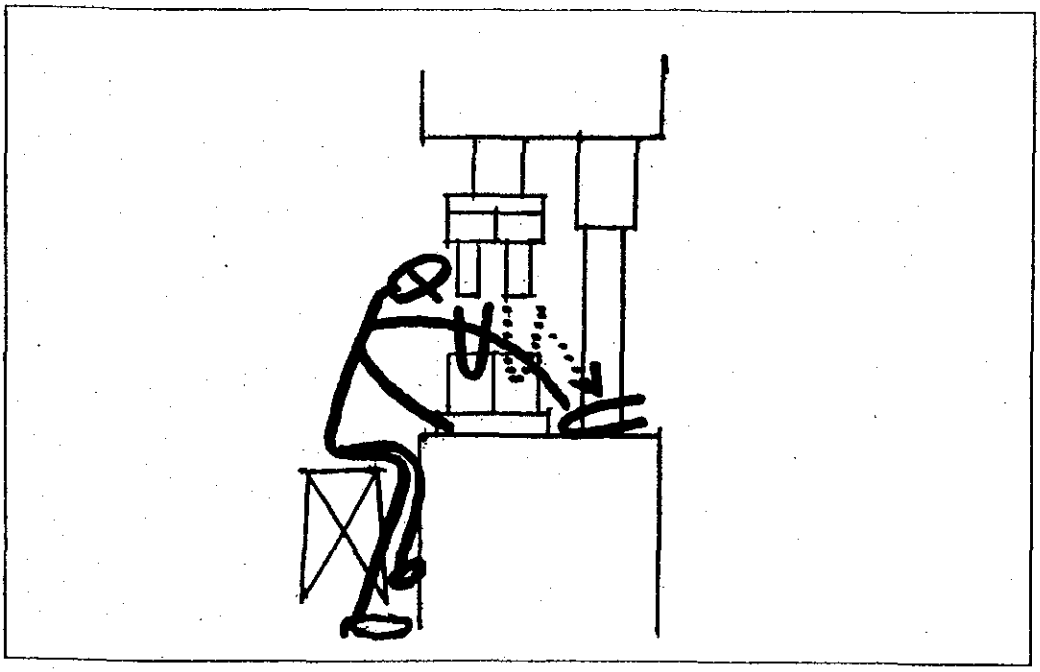
Strip supported.



Annex B-2

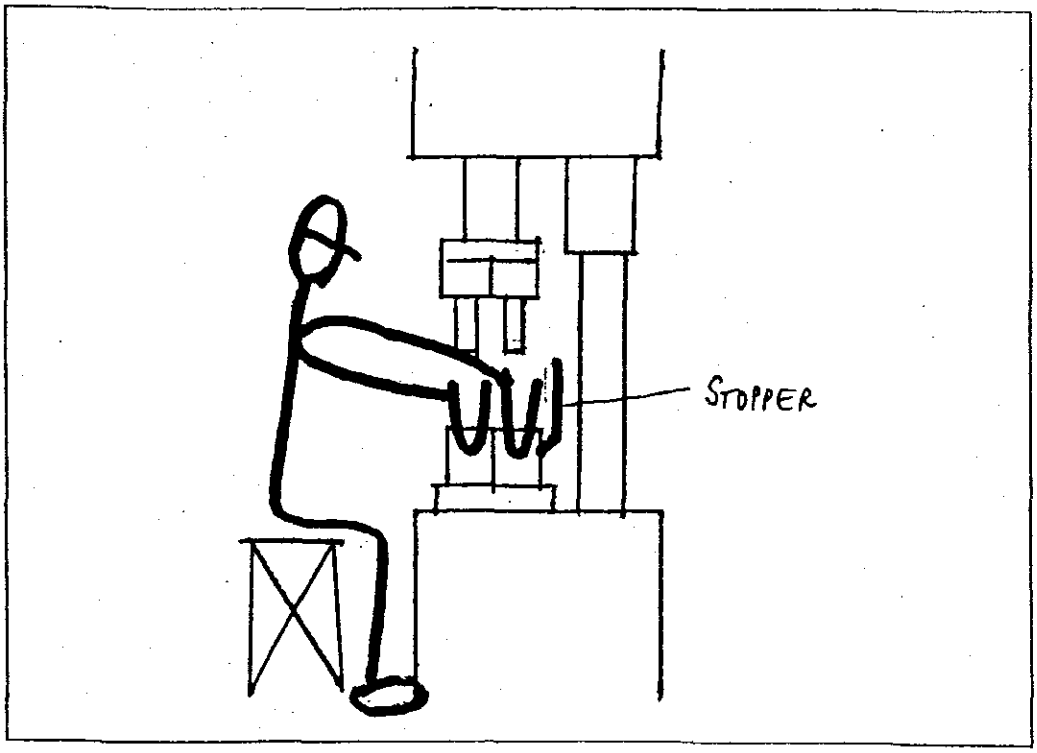
Present situation:

Part ejection not controlled



After Improvement:

Part ejection controlled by stopped.



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PR-602	*Sheet metal stamping technology*	Metal stamping	
2nd category		Industry	Sector / Product
Machinery & equipment			

Subject

Upgrading of auxiliary equipment, jigs and tools

■ Diagnosis:

Some factories do not use a support, a tool or a jig to support a work piece during press work or welding, resulting in poor productivity and/or quality.

1) Blanking operation by a press is conducted to process a sheet material without a support, generating deformation.

2) Spot or arc welding is carried out without a support or a jig and two workers are required due to poor workability.

■ Guidance:

1) To use a support for a long sheet that is blanked by a press;
2) To provide a support for spot welding to allow work by one person; and
3) To use a fixing jig for arc welding that involves a relative large amount of work.

■ Response of the enterprise (as confirmed during the follow-up activity):

Because of simplicity to execute, the above advice was quickly put into practice.

■ Other relevant points (issues to be solved and problems remained):

The press should use an uncoiler and a leveler, but a small number of press molding shops use them because the automatic press work process has not been widely introduced. Especially, no leveler is used for hoop materials to press a material that remains coiled at its end.

1 Case A

Description of Problems

- Raw material strip feed not supported during first pass hence second pass difficult to feed because material bent or split (Annex A-1).
- Tool no 73c, operator waste time by removing part by manual scraper. This also results in some parts being scraped onto the floor and not in the bin.
- Part with 8mm diameter bar with shape of sharp Vee. First operation on far side of die, second operation on front of die closest to operator. During press cycle part from first operation falls away from operator who then has to stretch across the die to retrieve the part to put into second operation which is in front of the die (Annex A-2).
- Operator picks up material from the floor to set the die, which takes too much time.

Diagnosis and Recommendation

- Support system should be used to support the material strip during the first pass through the die to prevent the strip from bending thus eliminating the difficulty of feeding the strip into the die during the second pass.
- Modify tool by introducing simple spring loaded injector.
- Modify tool by introducing simple support to prevent part from falling away from the operator during the first operation.
- Introduce simple material handling stands to hold material or bin at operator working height. Introduce roving material handler to support operator with material feed.

2 Case B

Description of Problems

- Raw material strip feed not supported during first pass hence second pass difficult to feed because material bent or split.
- Tool no 73c, operator waste time by removing part by manual scraper. This also results in some parts being scraped onto the floor and not in the bin.
- Part with 8mm diameter bar with shape of sharp Vee. First operation on far side of die, second operation on front of die closest to operator. During press cycle part from first operation falls away from operator who then has to stretch across the die to retrieve the part to put into second operation which is in front of the die.
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Diagnosis and Recommendation

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- Introduce simple material handling stands to hold material or bin at operator working height. Introduce roving material handler to support operator with material feed.

3 Case C

Description of Problems

The company overlooked the following areas of improvement:

(1) Some lost time in press work is due to:
- Raw material (Coil) strip is often jammed in the die.
- Blanking is not a continuous process i.e. Operator stops the press every time and removes the finished product prior to the next blanking.

(2) Material is lost due to:
- Low yield of material strip

Diagnosis and Recommendation

(1) The followings are recommended to insure continuous operation of press.
- Width of raw material strip should be strictly controlled.
- Die design should be changed so that the product automatically comes out from the die (component ejection designed).

(2) Insuring that minimum widths of strips are used should maximize raw material utilization of Strips. The size of material strip should be reduced by 1mm at a time and if there is room for improvement then this should be repeated until the optimum width of strip is achieved (1mm Reduction Activity).

4 Case D

Description of Problems

(1) Spot welding process
- 2 operators hold work piece for spot welding process as no support in place (Annex D-1).
- Specification / Drawing not in line with actual. E.g. indicated 24 points found to be 5 points only.

(2) Arc welding process
- Welding without jig or support can cause variations.

(3) Punching process
- Time consuming operation was done after punching process. One component of "Large bore valve housing" was filed due to rough edge made by punching process (Annex D-2).

Diagnosis and Recommendation

(1) Spot welding process
- Fabricate support so one operator can be used for the operation.
- Ensure that work carried out is as per specifications.

(2) Arc welding process
- Use jig, clamp or blocks to hold components in place for consistency (Annex D-3).

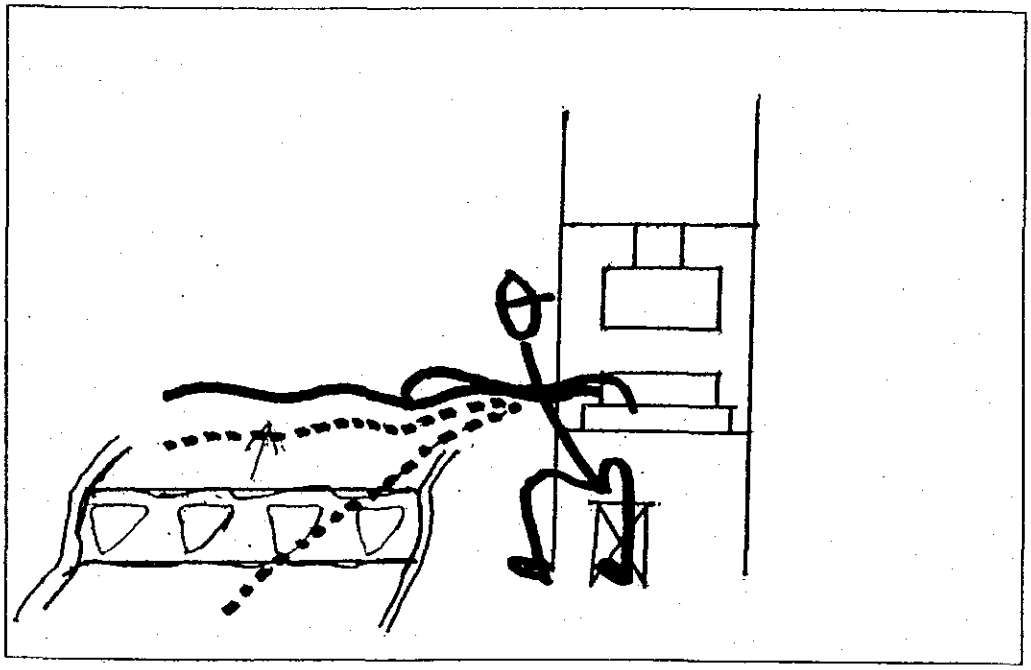
(3) Punching process

IMMEDIATE ACTION
- Use belt sander to sand nibbled edge so that time can be saved.

FUTURE CONSIDERATION
- Develop tool and die technology, so this kind of job can be done by stamping process with in house simple die.
- Introduce inexpensive wire EDM (Electric Discharge Machine) for small production volume.

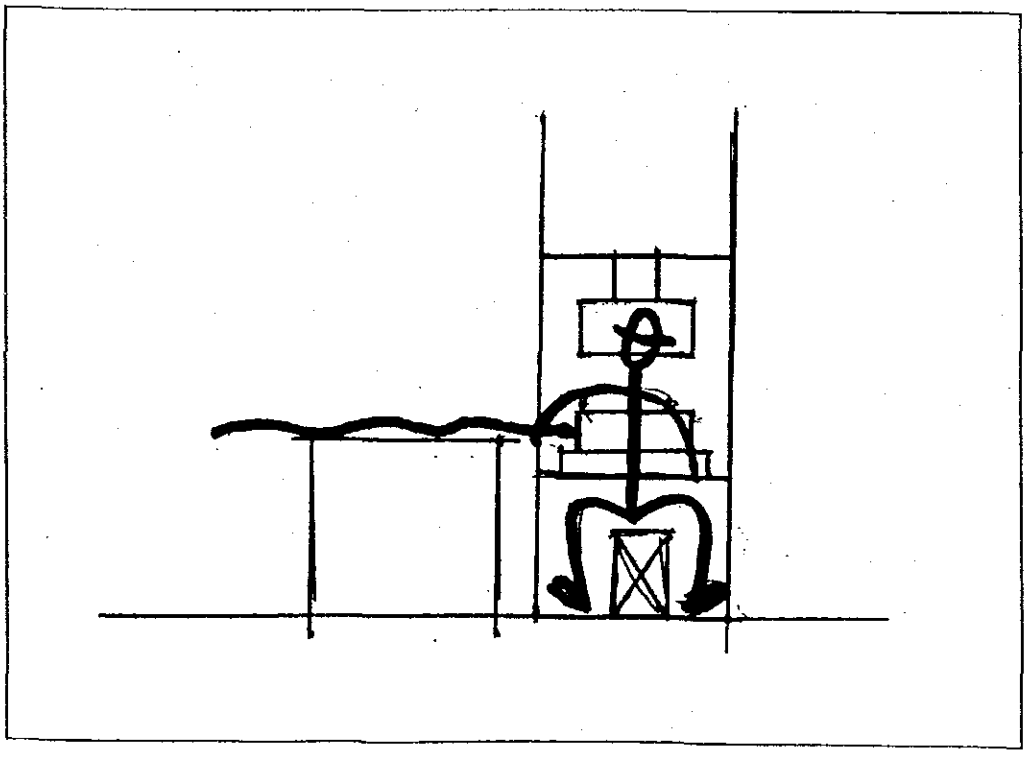
Present situation: Annex A-1

Strip not supported in die feed



After Improvement:

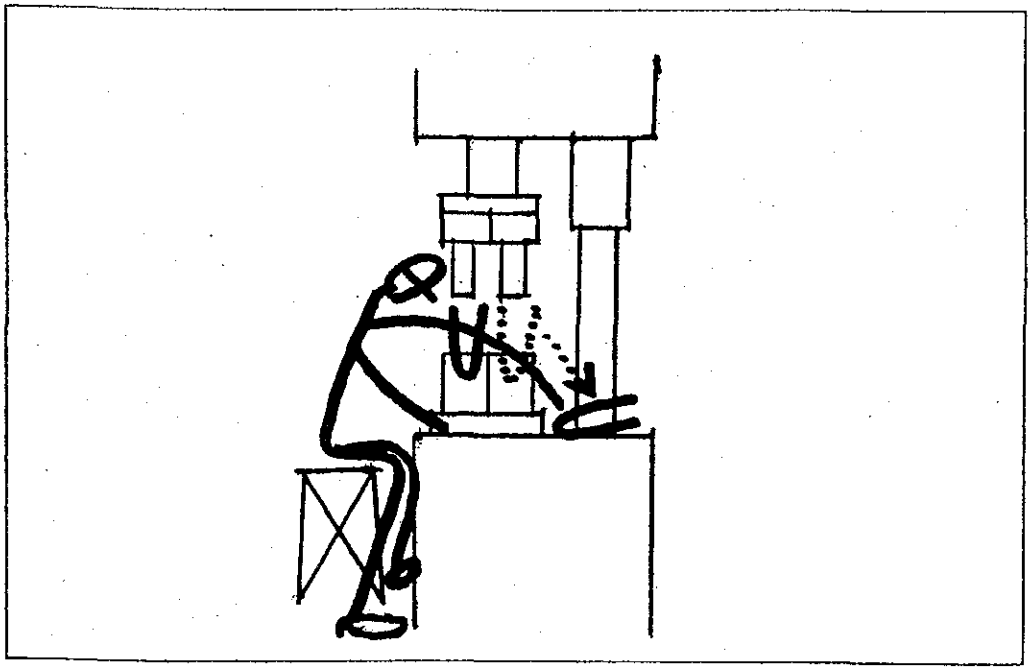
Strip supported.



Annex A-2

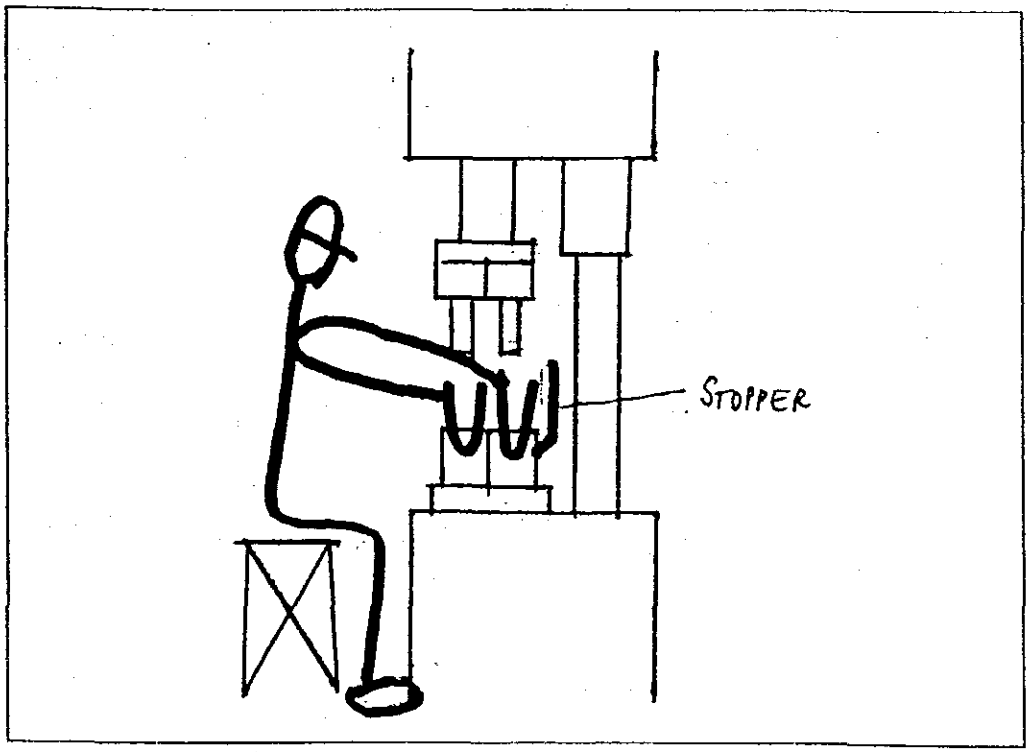
Present situation:

Part ejection not controlled



After Improvement:

Part ejection controlled by stopped.



removal of

die clamping bolts, removing die, waiting for inspector, etc)

2) Analyze all work time by using Bar Chart

3) Internal set-up activities are analyzed in detail to identify activities that can be carried out without stopping the machine

4) Pre plan die availability and raw material, so that they are available at the press when the current run is completed

5) Reorganize die storage, so that dies are classified based on their usage(i.e. weekly, monthly, etc). In addition identify dies accordingly and establish identification system

6) Have checking jigs and inspector available at press when off is produced

7) Prepare the necessary tools and store orderly

8) Reduce setup time by Parallel operating system where preparation for die change

is done whilst press is running

<u>Second phase</u>

1) Standardize the die specification

- Die height
- Die-set size
- Clamping thickness of platen

2) Introduce “ANDON” (signal light) for Parallel Die Change System

10 Case J

(Annex J-1 and J-2)

Description of Problems

- Long time is needed to setup changeover

Diagnosis and Recommendation

- Use of the die exchange trolley or lifter with tool hanger
- Classification by color code of the mold shelf and stamping die