

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-14	Production management	Galvanizing workshop	
2nd category		Industry	Sector / Product
Work management		Metalworking	Galvanizing

Subject

Improvement of the jigging method

■ **Diagnosis:**
 Work pieces are attached to the frame using steel wire. It is labor intensive and inefficient. Upon completion of the galvanizing operation, steel wire is cut by many workers to remove the product. Work efficiency should be improved using a special jig.

■ **Guidance:**
 Work efficiency should be improved by designing and making a special jig using steel chains or other materials.

■ **Response of the enterprise (as confirmed during the follow-up activity):**
 Various jigs have been made and are used. (See attached photographs)

■ **Other relevant points (issues to be solved and problems remained):**
 It is desirable to expand use of special jigs.

1 Case A

Description of Problems

Many workers are involved in jiggling the work to a lifting beam prior to being galvanized and de-jigging of work after galvanizing. This process is time consuming and unproductive.

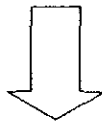
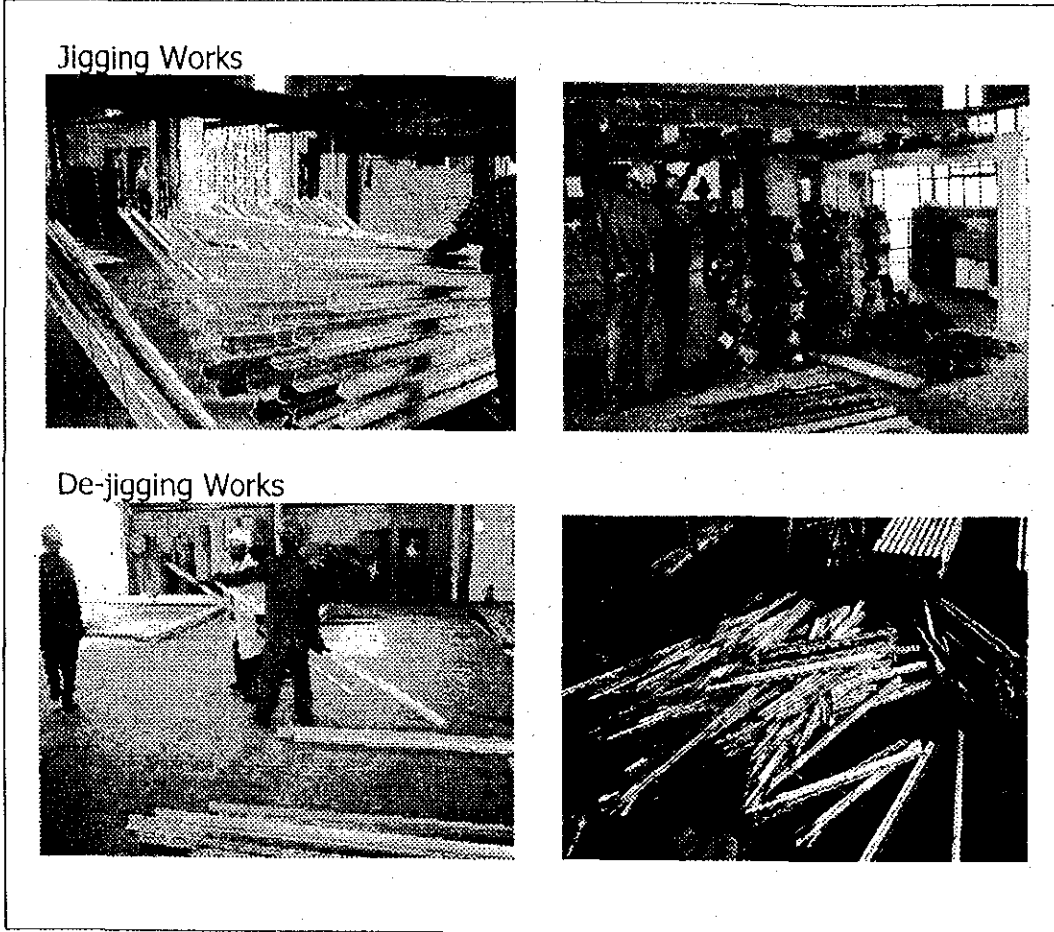
This method of jiggling and de-jigging is also costly as the wire is used only once in this process and is thereafter thrown away. There have also been incidents where the galvanized works have sometimes fallen into the tanks and onto the floor due to the wires cutting. This results in damage to the products and is also dangerous as products can fall and injure workers.

Diagnosis and Recommendation

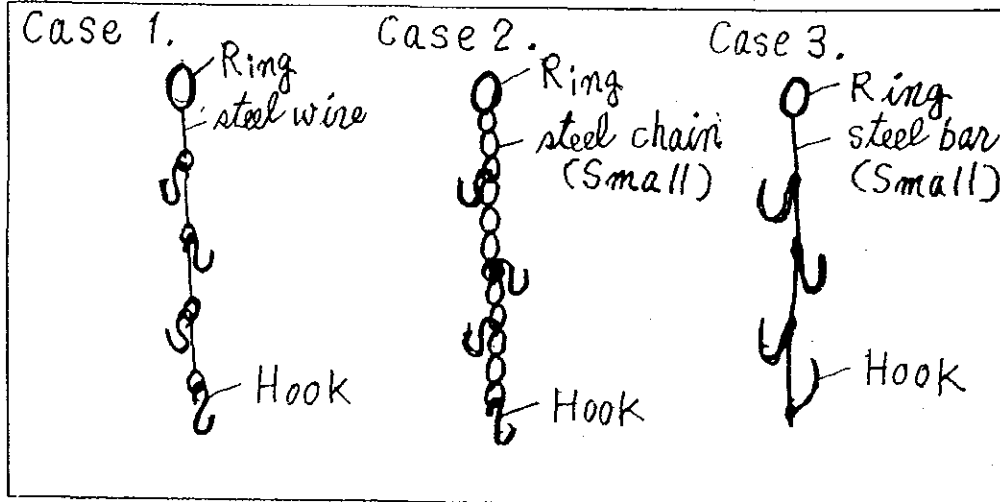
Hangers that can be used repeatedly should be utilised for the purpose of jiggling. The hangers reduce the jiggling and de-jigging time and the manufacturing cost, as it is not necessary to dispose of the hangers each time after use. The hangers can be made beforehand, provided that their lengths are standardized (See Photograph 1).

Photograph 1 Improvement of the jiggging & de-jiggging works

The present state



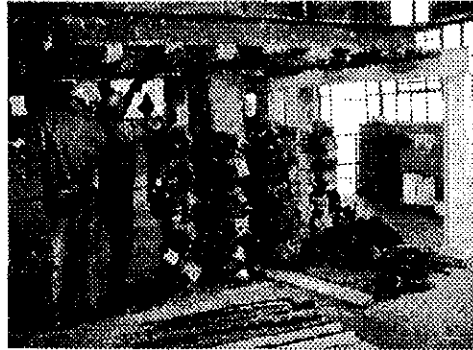
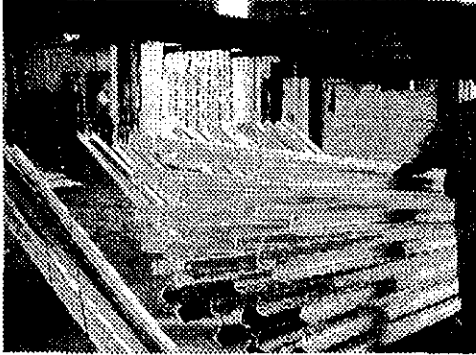
Recommendation



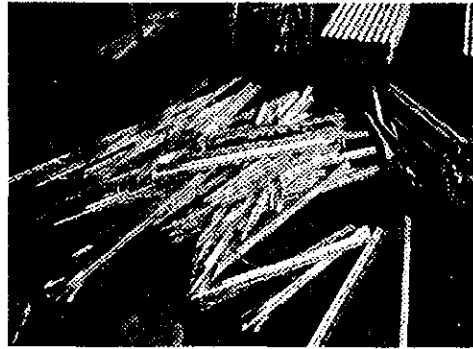
Photograph 1 Improvement of the jiggging & de-jiggging works

The previous state

Jiggging Works



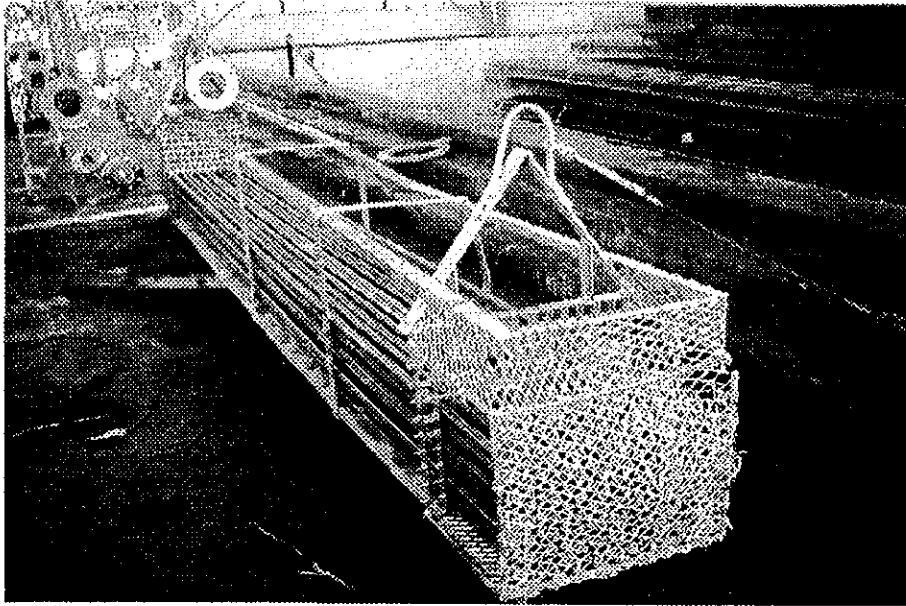
De-jiggging Works



The Present State



Introduced hanging jigs for steel pipes



Introduced hanging jigs for steel pipes with small diameters

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-15	Production management	Galvanizing workshop	
	2nd category	Industry	Sector / Product
	Quality control	Metalworking	Galvanizing

Subject

Promotion of quality control using control charts

■ Diagnosis:

While various data are recorded, such as acid concentration in the pickling tank and thickness of the galvanized layer, they are not effectively used for production management purposes.

■ Guidance:

Control charts should be made from key data, including acid concentration and plating thickness, and should be used for process control.

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

The above recommendation was not implemented at the time of the follow-up survey.

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

The company does not understand quality control techniques and fails to use key data for production management purposes. During the detailed diagnosis, the study team wanted to teach QC techniques including use of control charts, but the shop was busy with installation of a new galvanizing tank.

1 Case A

Description of Problems

- (1) The concentration of acid in pickling tanks is measured and recorded once a week by the acid suppliers in conjunction with the production manager. These records are only kept by the production manager, and not displayed on site.
- (2) The thickness of the galvanizing on the products are measured by random inspection and recorded by quality inspectors. It was however observed that the thickness of the galvanizing was generally above the customers' requirements and this factor therefore contributes to increasing the cost of production.

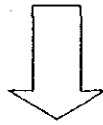
Diagnosis and Recommendation

- (1) A quality control graph should be put up on the wall located close to the relevant tanks or on the sidewall of the tanks in order to inform people of the condition of the chemicals. The upper control limit, the lower control limit and the measured value should be written down on the control graph. This method of displaying information motivates all employees to show interest in quality control, and improves the morale of workers. As a result, quality control can be carried out easily at the factory (See Sketch 1).
- (2) The galvanized thickness should be controlled using a quality control chart, on which the upper and lower limit value of the standard are shown beforehand, and the measured thickness are shown with the mean value, the maximum value, and the minimum value as recorded daily. This insures that the interpretation of the actual thickness is clear and easily compared with the standard. The measuring accuracy of the quality inspectors can also be improved by this method. The control chart should be situated where it is clearly accessible and visible (See Sketch 2).

Sketch 1 Applying quality control chart in galvanizing process

The present state

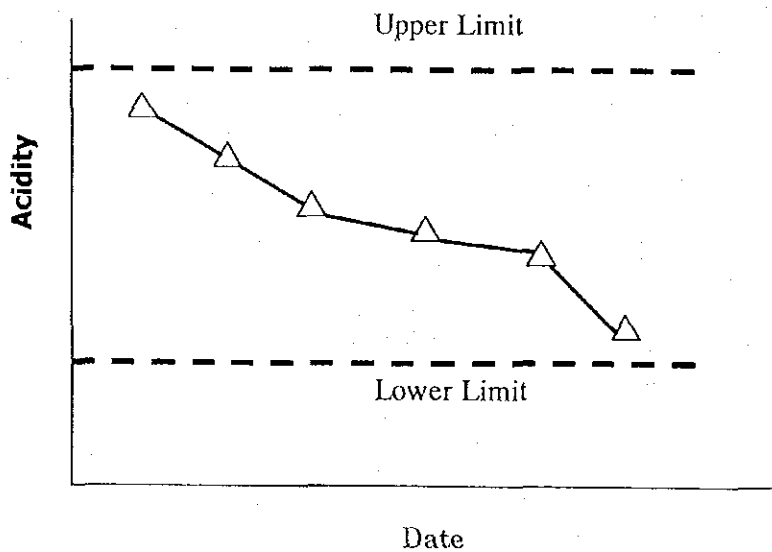
The concentration of acid in pickling tanks is measured and recorded once a week by the acid suppliers in conjunction with the production manager. These records are only kept by the production manager, and not displayed on site.



Recommendation

A quality control graph should be put up on the wall located close to the relevant tanks or on the sidewall of the tanks in order to inform people of the condition of the chemicals. The upper control limit, the lower control limit and the measured value should be written down on the control graph.

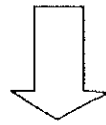
This method of displaying information motivates all employees to show interest in quality control, and improves the morale of workers. As a result, quality control can be carried out easily at the factory.



Sketch 2 Applying quality control chart to galvanized thickness

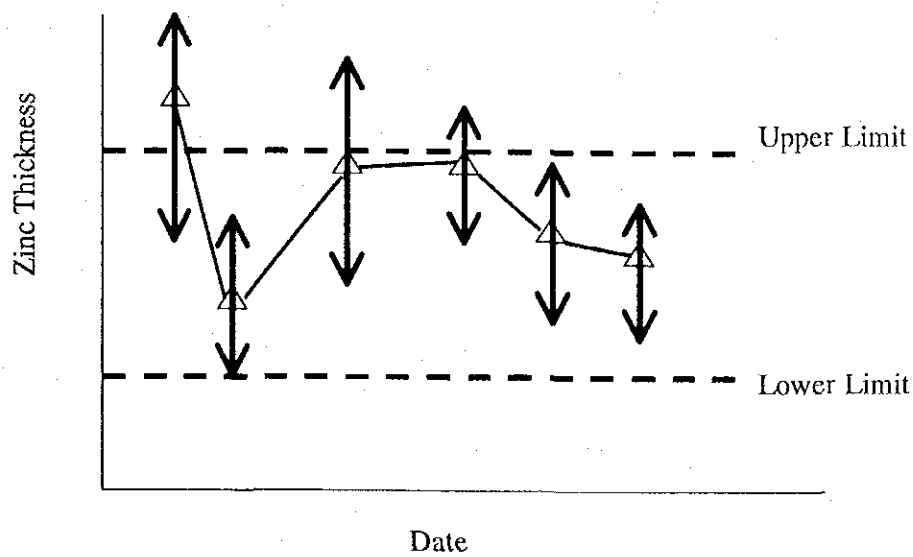
The present state

The thickness of the galvanizing on the products are measured by random inspection and recorded by quality inspectors. It was however observed that the thickness of the galvanizing was generally above the customers' requirements and this factor therefore contributes to increasing the cost of production.



Recommendation

The galvanized thickness should be controlled using a quality control chart. It is a useful tool to reduce the dispersion of thickness, and to keep constant thickness.



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-16	Production management	Galvanizing workshop	
	2nd category	Industry	Sector / Product
	Quality control	Metalworking	Galvanizing

Subject

Work time management

■ Diagnosis:

In the pickling, cleansing and plating processes, the time to start and end the dipping is recorded, but there is no instrument to measure duration. As workers check it with a clock in the shop, dipping time varies greatly. An instrument to indicate dipping time is required to ensure stable quality and reduction of materials.

■ Guidance:

Each tank should be provided with a timer and a pilot lamp indicator to measure and indicate dipping time. A worker sets dipping time on the timer when the product is put into the tank, and the pilot lamp lights when the preset time lapses to alert workers.

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

At the time of the follow-up survey, every tank was provided with a timer and a pilot lamp indicator. Dipping time was properly managed. (See attached photographs)

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

Now it is recommended to improve the process in order to ensure ease of work and prevent incorrect operation.

1 Case A

Description of Problems

The time for dipping of products into the tanks for purposes of degreasing, pickling, fluxing, zinc galvanizing, etc. is measured by the clock situated on the wall of factory. The control of the dipping time into each tank is not performed accurately because of there being many tanks. This contributes negatively towards quality control.

Diagnosis and Recommendation

A timer and indication lamp should be installed on each tank to inform operators of the lapse time for dipping. This method of operating would improve quality and efficiency in the factory.

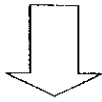
Photograph: Improvement of quality control

The previous state

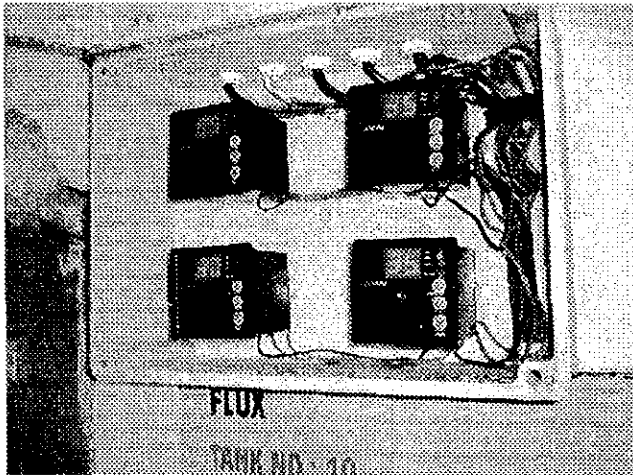
The time for dipping of products into the tanks for purposes of degreasing, pickling, fluxing, zinc galvanizing, etc. is measured by the clock situated on the wall of factory. The control of the dipping time into each tank is not performed accurately because of there being many tanks. This contributes negatively towards quality control.

• Recommendation:

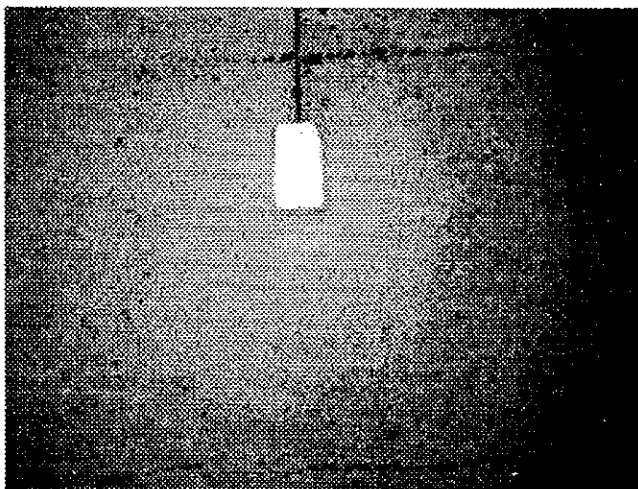
A timer and indication lamp should be installed on each tank to inform operators of the lapse time for dipping. This method of operating would improve quality and efficiency in the factory.



• the Present state



Timer for dipping (newly – installed)



Indication lamp (newly – installed)

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-17	Production management	Galvanizing workshop	
	2nd category	Industry	Sector / Product
	Quality control	Metalworking	Galvanizing

Subject

Prevention of recurrence of customer claims

■ **Diagnosis:**

Customer complaints and claims are recorded in "Customer Complaints Register" but they are not analyzed or linked to prevention activities. Systematic efforts to prevent recurrence of customer complaints and claims are called for.

■ **Guidance:**

The manager of the quality control department should analyze a customer complaint or claim and appoint a person in charge of preventive measures, who identifies a cause for the complaint or claim and devises measures to prevent its recurrence, followed by formal verification of effectiveness of the preventive measures. These procedures should be established as a formal system.

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

The above recommendation was not implemented at the time of the follow-up survey.

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

To win confidence of customers, it is essential to prevent recurrence of a customer claim or complaint, which should not be repeated under any circumstances.

1 Case A

Description of Problems

Complaints from customers and actions taken to rectify situation are registered in a document called the "Customer Complaints Register".

However an analysis of the data captured is not carried out and therefore the company is unable to identify the trends arising from customer complaints and cannot carry out preventive actions against repetition.

Diagnosis and Recommendation

The quality control manager should analyze and stratify the complaints, then nominate a person to carry out the preventive action against repetition.

The nominated person should investigate the true factors of the occurred fault, and carry out the countermeasures to dissolve the harmful factors until obtaining good results.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-18	Production management	Galvanizing workshop	
	2nd category	Industry	Sector / Product
	Quality control	Metalworking	Galvanizing

Subject

Installation of a QC bulletin board

■ **Diagnosis:**

Work piece receiving and product shipping yards are well arranged and cleaned, and signs are posted to give instruction or caution to workers. Inside the factory, however, there is no bulletin board to communicate important notices or instructions to workers.

■ **Guidance:**

- 1) To indicate the process name on each tank and post relevant work standards and control charts; and
- 2) To post a notice or bulletin containing quality information within the factory.

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

The above recommendations were implemented at the time of the follow-up survey, except for the posting of control charts on each tank. (See attached photograph)

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

The bulletin board is an important communication tool in the shop floor to provide information on the current quality status for workers and thereby to raise their interest.

1 Case A

Description of Problems

It is commendable to note that areas for receiving and dispatching of goods are clearly demarcated and addressed on signboards.

There is however a lack of signboards in the factory.

Diagnosis and Recommendation

A signboard/notice board for quality control should be prepared and should indicate the process name, working standard, quality control chart, etc.

Photograph: Improvement of quality control

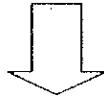
The previous state

It is commendable to note that areas for receiving and dispatching of goods are clearly demarcated and addressed on signboards.

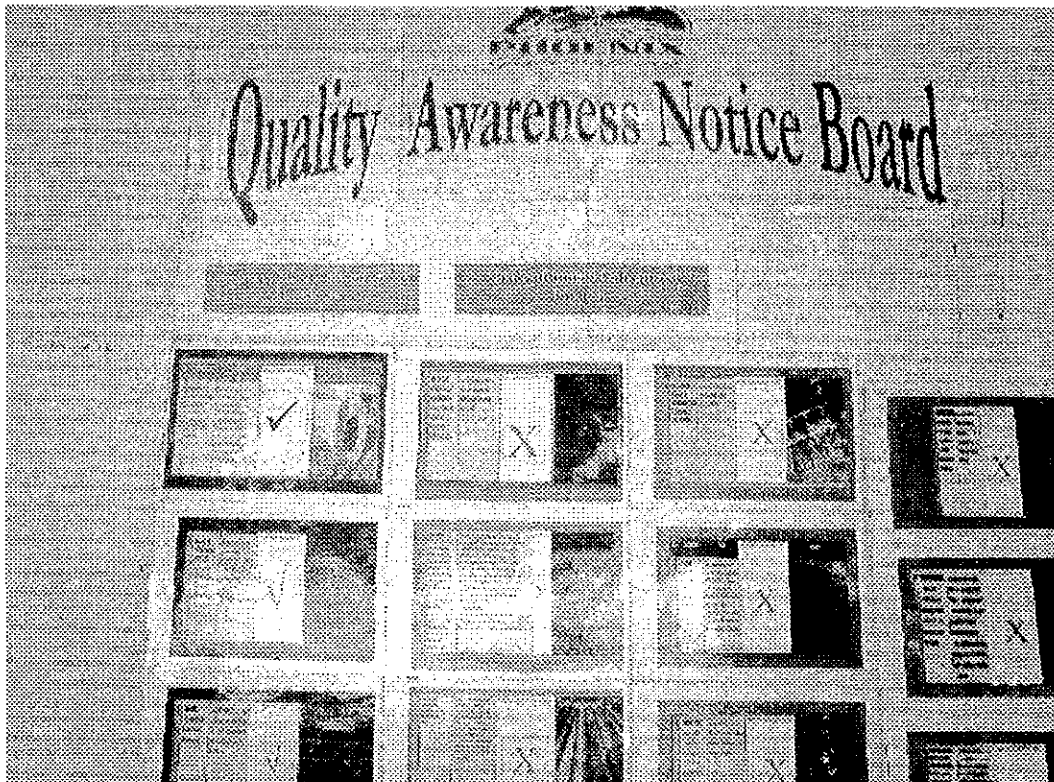
There is however a lack of signboards in the factory.

• Recommendation:

A signboard/notice board for quality control should be prepared and should indicate the process name, working standard, quality control chart, etc. This method of displaying/recording information motivates all employees to show interest in quality control, and improves the morale of workers. As a result, quality control and 5S activity can be carried out easily at the factory.



• the Present state



Notice board for products including rejects (newly – installed)

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-19	Production management	Galvanizing workshop	
	2nd category	Industry	Sector / Product
	Work management	Metalworking	Galvanizing

Subject
Ventilation in the factory

■ Diagnosis:

As work pieces are dipped in a molten zinc tank, fume is generated and remains in the factory. Proper ventilation is not provided.

■ Guidance:

- 1) Fume is generated partly due to insufficient drying of work pieces in the preceding process. It is recommended to provide a drying furnace or provide long drying time.
- 2) A ventilation hood should be provided above the molten zinc tank to prevent fume from spreading into the factory.

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

According to the manager, the shop plans to install a new galvanizing tank and implement the recommendation in the tank installation project to improve the working environment. Ducts and hoods have been completed at the time of the follow-up survey.

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

It is important to raise awareness of the working environment and its importance.

1 Case A

Description of Problems

A lot of fumes are generated and molten zinc is dispersed from the zinc galvanizing tank when products are dipped into the tank. This contributes negatively towards the working environment.

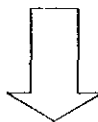
Diagnosis and Recommendation

One of the causes is that the products are dipped while still containing moisture as a result of the previous processes. It is therefore recommended that the products are preheated over the zinc tank for a longer period so as to remove the moisture or drying equipment should be installed. Furthermore, a hood and a ventilator should be installed on the roof located above the zinc-galvanizing tank in order that the generated fume does not diffuse in the workshop (See Photograph).

**Photograph:
Countermeasure against fume from the zinc galvanizing tank**

The present state

A lot of fumes are generated and molten zinc is dispersed from the zinc-galvanizing tank when products are dipped into the tank. This contributes negatively towards the working environment.



Recommendation

It is therefore recommended that the products are preheated over the zinc tank for a longer period so as to remove the moisture or drying equipment should be installed.

Furthermore, a hood and a ventilator should be installed on the roof located above the zinc-galvanizing tank in order that the generated fume does not diffuse in the workshop.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-20	Production management	Switchboard production	
2nd category		Industry	Sector / Product
Work management		Metalworking	Sheet metal processing / Assembly

Subject
Improvement for support bars

■ Diagnosis:

During operation of a shearing machine or a bending machine, two workers hold a steel material for cutting or bending. This is not a good practice in terms of work quality, safety and productivity. Instead, a support for steel materials should be provided.

■ Guidance:

For the shearing machine, an additional support bar should be provided between two support bars in order to facilitate the cutting of a narrow steel material. (See Photograph 1)
 For the bending machine, a support for steel materials should be provided to ensure stable feeding. (See Photograph 2).

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

During the follow-up survey, no work was carried out in the factor as most workers went to a switchboard installation site. The manager stated that he would like to implement the recommendations after the installation work has been completed.

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

It is strongly desirable to implement these recommendations as they will contribute greatly to improvement in terms of work quality, productivity and safety. It is important to realize that small improvements will accumulate and lead to major results.

1 Case A

Description of Problems

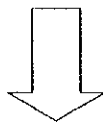
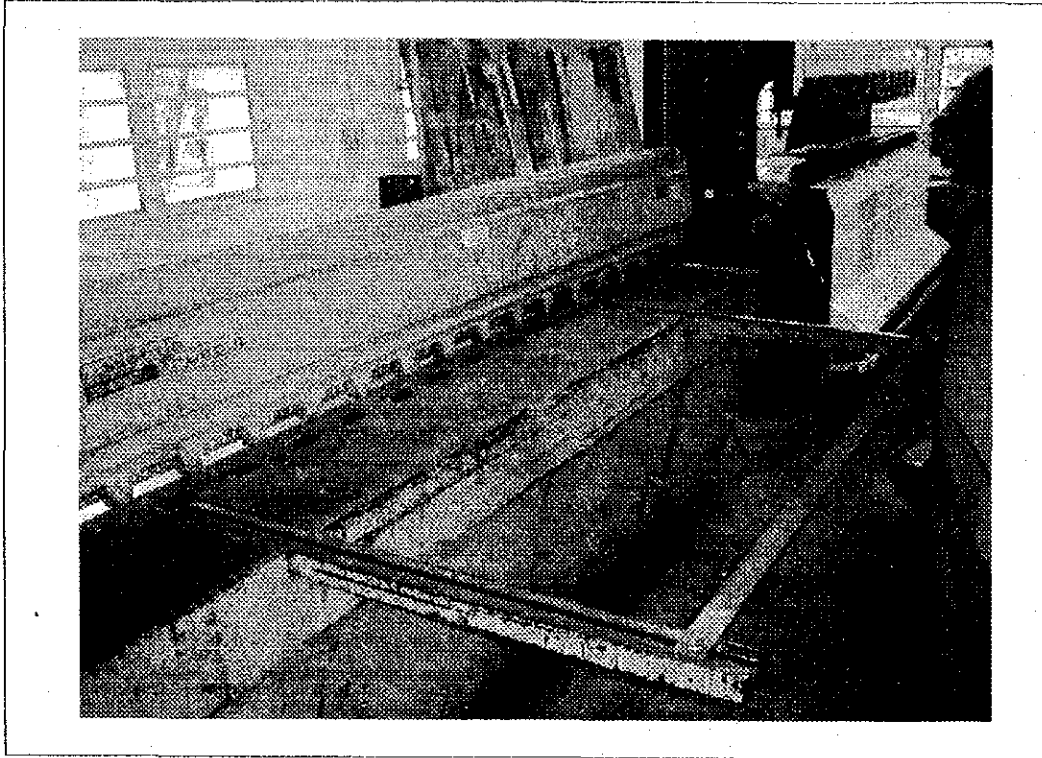
- 1) Two guide scale sliders have been installed on the shearing machine with distance of 1.5 m apart. Steel plates exceeding a width of 1.5 m are guided with the sliders and those less than 1.5 m width are not guided resulting in two workers support the narrow steel plate by hand in the shearing process. Furthermore, because the length of guide sliders and scales is 1 m, steel plates that must be sheared with a length over 1m is scribed/marked at the first, then sheared resulting in unproductive work.
- 2) During bending, two workers hold, adjust and align the plate prior to being bent to the required position. This method of operating is time consuming and not productive.

Diagnosis and Recommendation

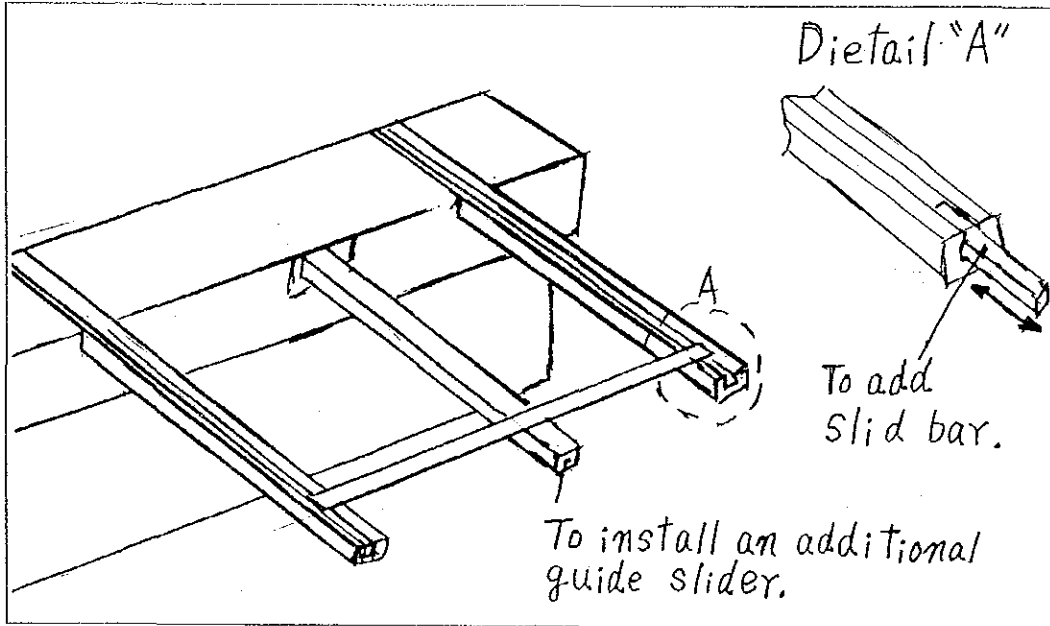
- 1) An additional guide slider should be installed in between the two existing guide sliders for the shearing of narrow sheets. In addition, the guide sliders and scales should be extended using sliding bars (See Photograph 1).
- 2) A guide slider should be installed at the same height as the bending jig, which would make holding the steel plate unnecessary. Workers can now concentrate on the adjustment of bending position (See Photograph 2).

Photograph 1 Improvement of the guide sliders of the sharing machine

The present state

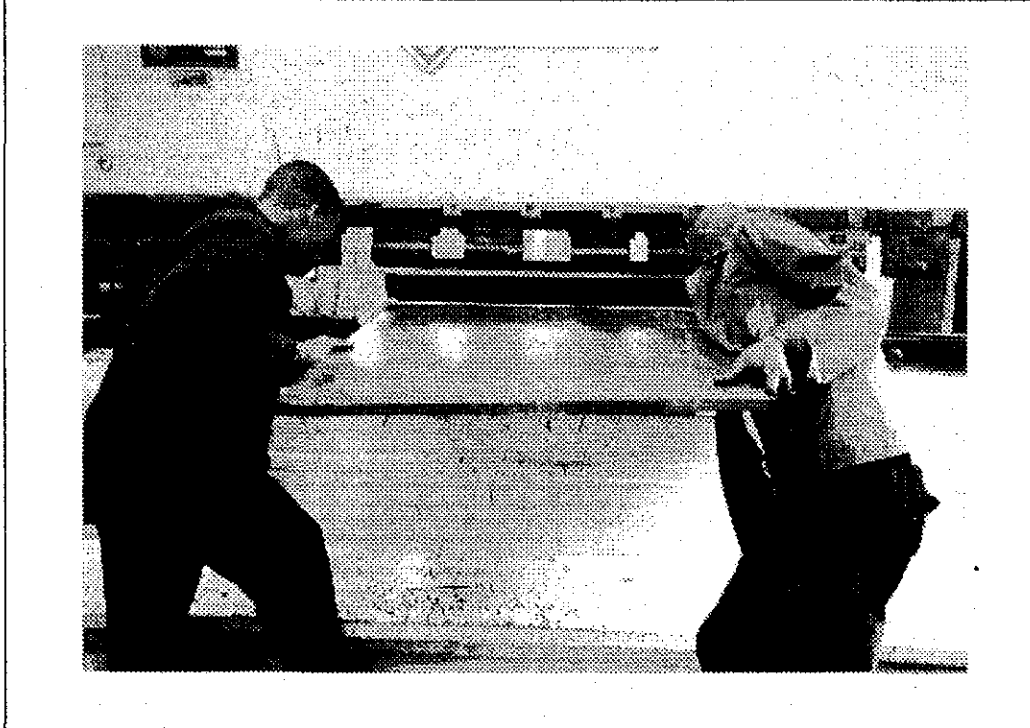


Recommendation

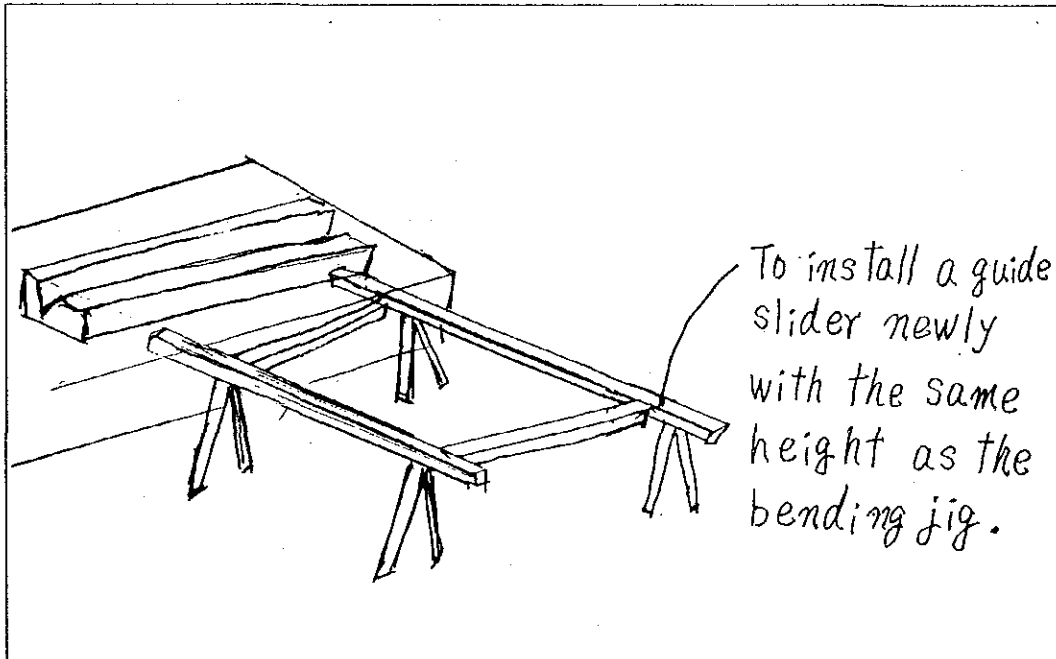


**Photograph 2 Improvement of working method
at bending machine**

The present state



Recommendation



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-21	Production management	Switchboard production	
	2nd category	Industry	Sector / Product
	Designing management	Metalworking	Sheet metal processing / Assembly

Subject
Improvement of work instruction for marking on a steel material

■ Diagnosis:

A steel material is marked off by using a gauge, but a work instruction sheet does not indicate dimensions properly, requiring the worker to calculate some dimensions.

■ Guidance:

To enter dimensions from each reference line along which the gauge is placed, thus eliminating the need for additional calculation by the worker and improving efficiency, while preventing incorrect marking.

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

During the follow-up survey, no work was carried out in the factory as most workers went to a switchboard installation site. The manager stated that he would like to implement the recommendation after the installation work has been completed.

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

It is strongly desirable to implement the recommendation as they will contribute greatly to improvement in terms of work quality, productivity and safety. It is important to realize that small improvements will accumulate and lead to major results.

1 Case A

Description of Problems

When it comes to the marking of specific components, workers refer to a dimensional diagram situated on the wall of the workshop, which indicates bending position. Thereafter they calculate the necessary dimension and select a gauge with the same length as the calculated dimension and scribe/mark the bending position on the required steel plate.

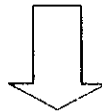
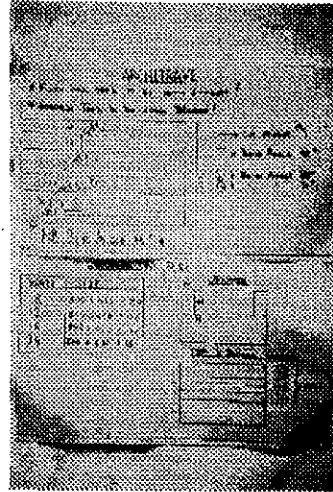
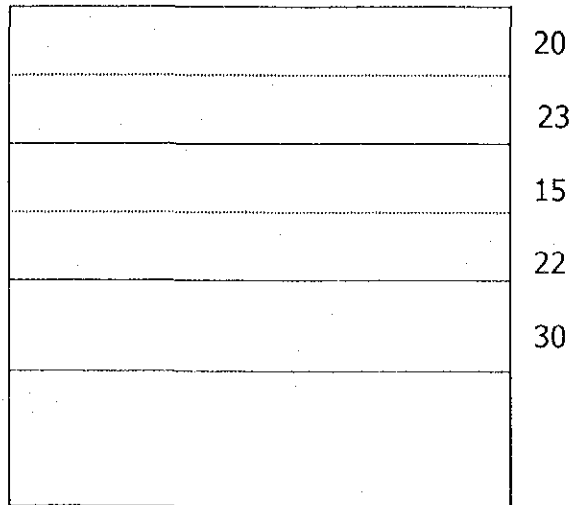
Diagnosis and Recommendation

All bending positions should be indicated with dimensions from the base line on the dimensional diagram. It makes the marking of work easy because the calculation of dimensions becomes unnecessary and this also avoids calculation errors (See Sketch & Photograph).

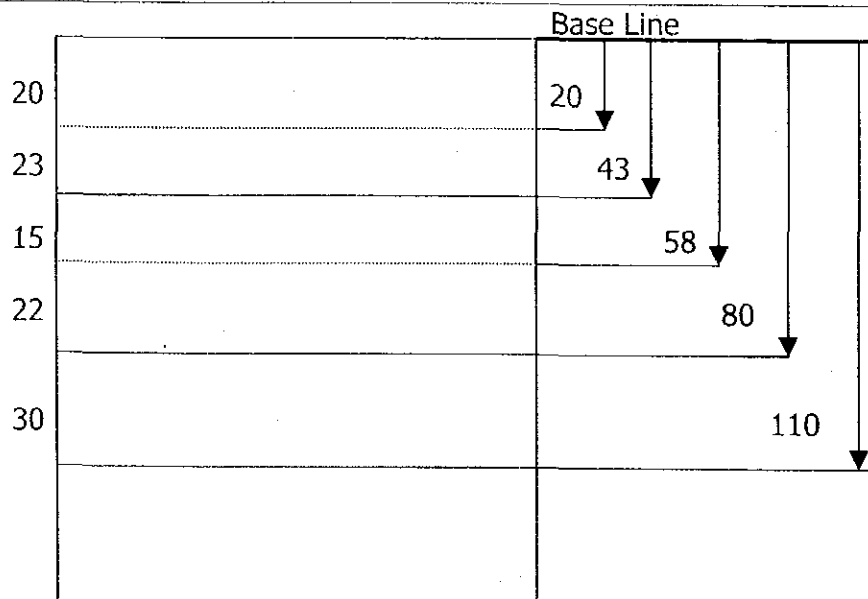
Sketch & Photograph: Improvement of dimensional diagram

The Present State

A dimensional diagram stuck on the wall of workshop



Recommendation



The dimension from base line to each bending position should be also shown.

It makes the marking off with gauge easy.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-22	Production management	Switchboard production	
	2nd category	Industry	Sector / Product
	Work management	Metalworking	Sheet metal processing / Assembly

Subject

Protection of painted surface during assembly

■ **Diagnosis:**

When switchboards and panels are assembled, workers repeatedly open and close doors for adjustment. Painted surface is not protected and subject to damage.

■ **Guidance:**

Painted surface should be covered by a plastic sheet before assembly work.

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

During the follow-up survey, no work was carried out in the factor as most workers went to a switchboard installation site. The manager stated that he would like to implement the recommendations after the installation work has been completed.

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

If a painted surface is damaged, it should be reworked to adversely affect quality and productivity. Therefore, careful protection is very important. Again, small improvements will accumulate and lead to major results.

1 Case A

Description of Problems

In the assembling process of enclosures, doors are repeatedly opened and closed for the purpose of adjustment and alignment, resulting in a possible damage to the surface finish of these products due to a lack of protection.

Diagnosis and Recommendation

The door should be protected with transparent plastic sheet at damage prone areas.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-23	Production management	Switchboard production	
2nd category		Industry	Sector / Product
Equipment management		Metalworking	Sheet metal processing / Assembly

Subject

Introduction of machinery and equipment for productivity and safety improvement

■ Diagnosis:

A manually operated press is used to punch 50mm and 7mm holes through 1.6mm steel plates. As the press capacity is small, a handle needs to be turned several times to result in poor productivity and safety.
To transport a large product, a forklift is used to lift the product and rollers are placed below it. Without a hoist, work involves a high risk of accident.

■ Guidance:

To introduce a larger, manually operated press and a hoist.

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

The above recommendations were not implemented probably because of financial burden.

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

While the purchase of the press and the hoist is large investment for the shop, it should be seriously considered because the present working condition creates a high risk of personal injury.

1 Case A

Description of Problems

- 1) During the punching process, steel plates of 1.6mm thickness are punched with a hole of approximately 50mm in length and 7mm in width using a manual press machine. Due to the insufficient machine press capacity, the punching process has to be repeated several times until the required hole is punched.
- 2) The transportation of bulky and heavy finished products from the assembly area to the dispatch area is done with the use of a trolley. From here the product is hoisted onto a vehicle with the use of a chain block. This method of operating is unproductively and dangerous.

Diagnosis and Recommendation

- 1) Punching machine with larger capacity should be used.
- 2) A suspension hoist should be installed for the transport of goods and would result in increased productivity and safety.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-24	Production management	Switchboard production	
	2nd category	Industry	Sector / Product
	5S	Metalworking	Sheet metal processing / Assembly

Subject
Proper arrangement and assortment of molds, jigs and drawings

■ **Diagnosis:**

Molds and jigs used for bending and pressing steel materials are placed disorderly below a worktable. They should be kept tidy to reduce time for search.
 A set of drawings for cutting of steel materials are placed on the worktable, and it takes time for a worker to find a drawing.

■ **Guidance:**

Serial numbers should be assigned to molds and jigs, and they should be indicated at respective storage locations (molds and jigs should be stored in right place).
 Drawings required for each work should be placed in a plastic case and distributed to workers.

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

During the follow-up survey, no work was carried out in the factor as most workers went to a switchboard installation site. The manager stated that he would like to implement the recommendations after the installation work has been completed.

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

Housekeeping is carried out to allow workers to work efficiently. Workers should receive information required for each day's work. Field guidance should aim to make the manager and field supervisors realize that their role is to create and maintain the working environment where workers can perform their work efficiently and safely.

1 Case A

Description of Problems

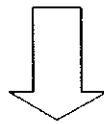
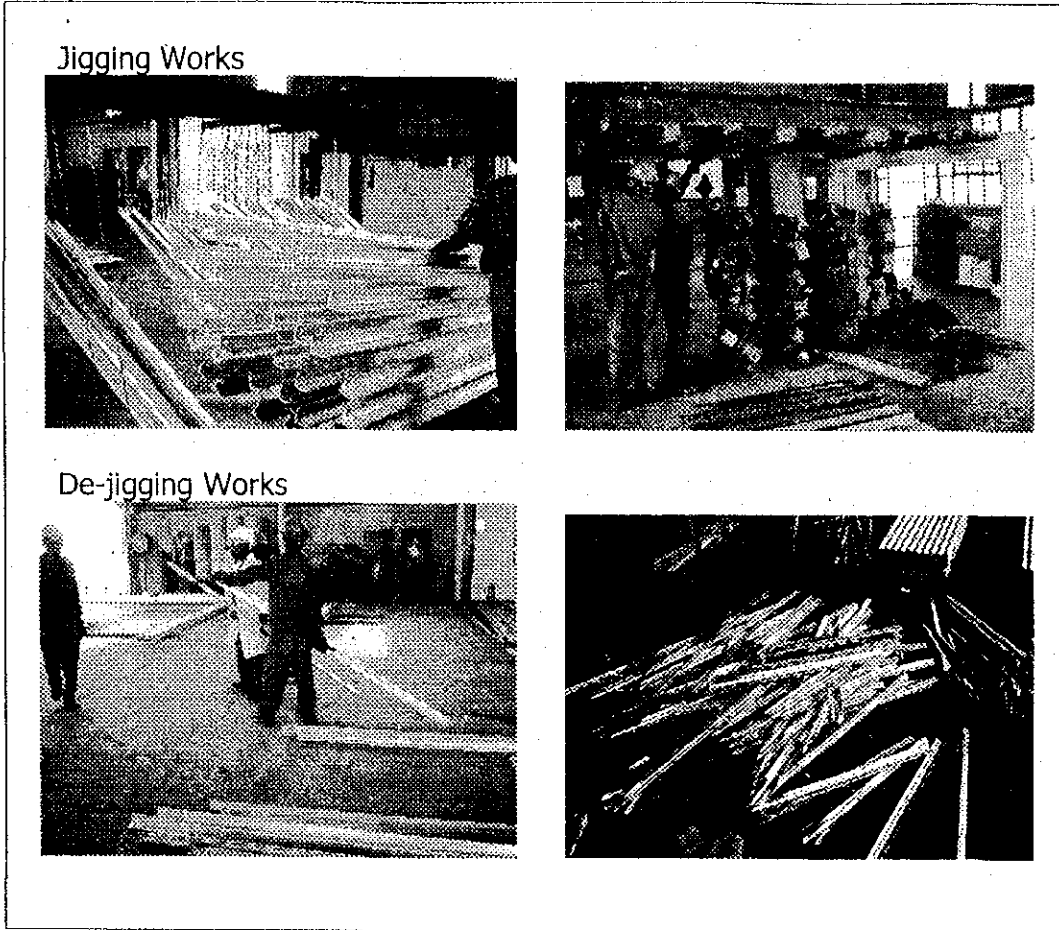
- 1) The dies and punches for bending and pressing are not properly labeled and stored, resulting in loss of time in the locating of these tool when required.
- 2) All the dimension tables, which indicate the size of steel plates to be cut, are located on the worktables. The condition of these documents are very dirty and difficult to read and can result in interpretation errors.

Diagnosis and Recommendation

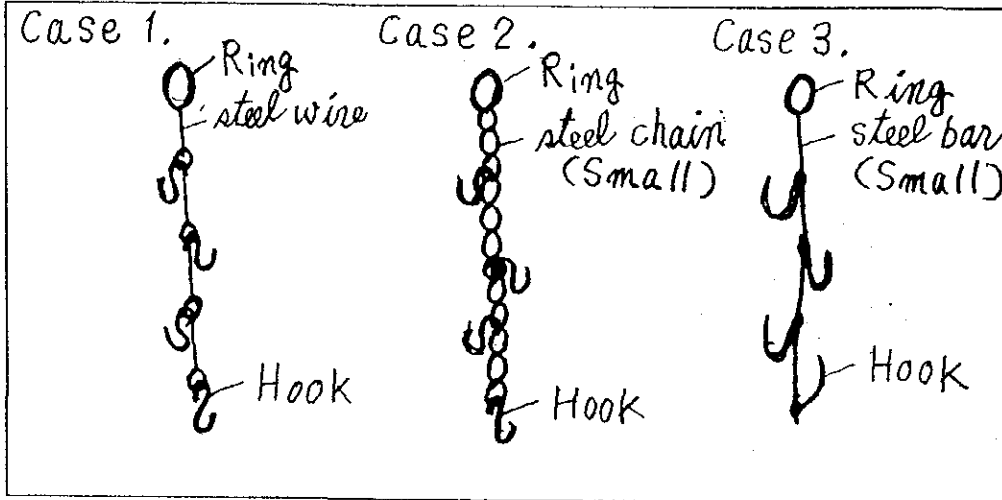
- 1) These dies and punches should be arranged and given control numbers. Their storing address should also be indicated at the storage place. It makes the finding of required dies and punches easy, and reduces the changing/setup time.
- 2) Only the necessary dimension table for the days work should be placed on the worktable and should be placed in transparent plastic jackets to prevent them getting dirty.

Photograph 1 Improvement of the jiggging & de-jiggging works

The present state



Recommendation



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-25	Production management	Bus sheet framing	
	2nd category	Industry	Sector / Product
	Productivity	Automotive parts mfg. (after-market)	Sheet manufacturing

Subject
Improvement of the sheet frame pipe machining and assembly process and its workability

■ **Diagnosis:**
 In pipe cutting and bending operations, a convex rule is used to determine the stopper's position and fix the stopper using a wrench. However, the work takes time and is not efficient.

■ **Guidance:**

- 1) To fix a tape scale to the guide for pipe cutting and bending, instead of the convex rule; and
- 2) To use bolts with tools to fix the stopper.

■ **Response of the enterprise (as confirmed during the follow-up activity):**
 The shop planned layout modification and the recommendations were not implemented. It is planned to carry them out when layout is fully modified.

■ **Other relevant points (issues to be solved and problems remained):**
 While workers presumably realize poor workability, there is no system to request an improvement to the management (such as an employee suggestion program). Thus, field guidance should be provided when both managers and workers are present.

1 Case A

Description of Problems

1) Pipe cutting process

Pipes are cut to size by the use of a cutting grinder. The operator of the cutting grinder measures and decides the position of the stopper for the required length of pipe with the use of a convex ruler.

The set-up time of the stopper is long and contributed to poor working efficiency.

2) Pipe bending process

Pipes are bent by the use of a pipe-bending machine. There are four separate stoppers installed on the pipe-bending machine for the purposes of fixing the bending position of the pipe in the length direction.

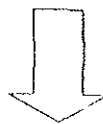
The set-up time for this process is long and working efficiency is poor. The required position of the stopper is measured with the use of a convex ruler; thereafter the stoppers are locked in position by a wrench.

Diagnosis and Recommendation

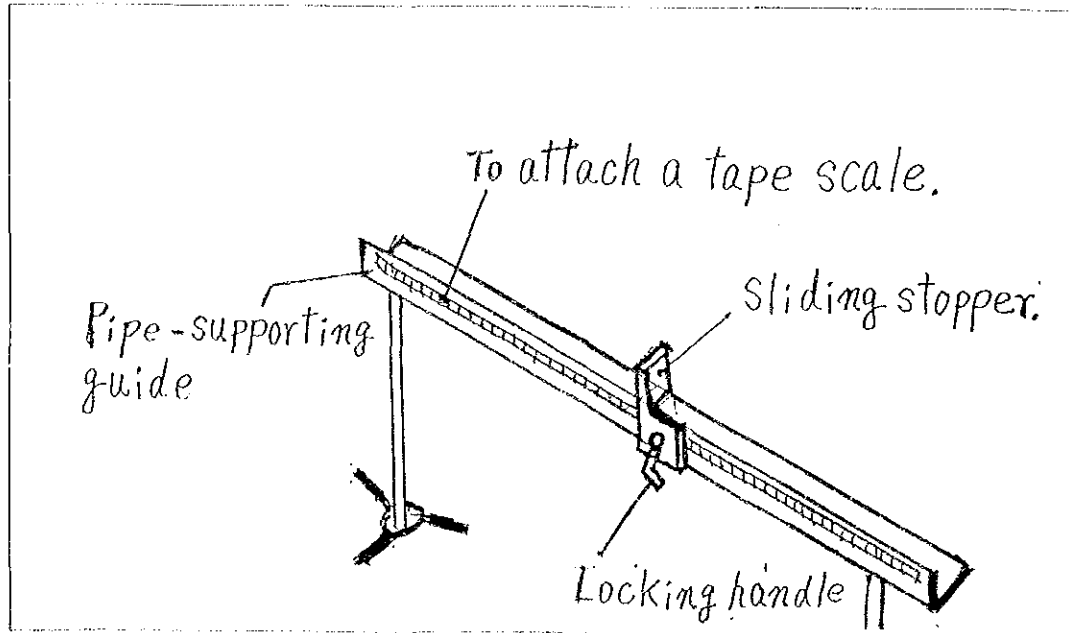
- 1) A tape scale should be attached on the pipe-supporting guide improving the efficiency of setting up (See Photograph 1).
- 2) A tape scale should be attached on the stopper guide. Moreover, a tool should be attached to each locking bolt so that it is possible to be locked by one-turn. This method of working reduces set-up time and increases working efficiency (See Photograph 2).

Photograph 1 Improvement of the pipe positioning on the cutting grinder

The present state

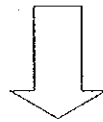
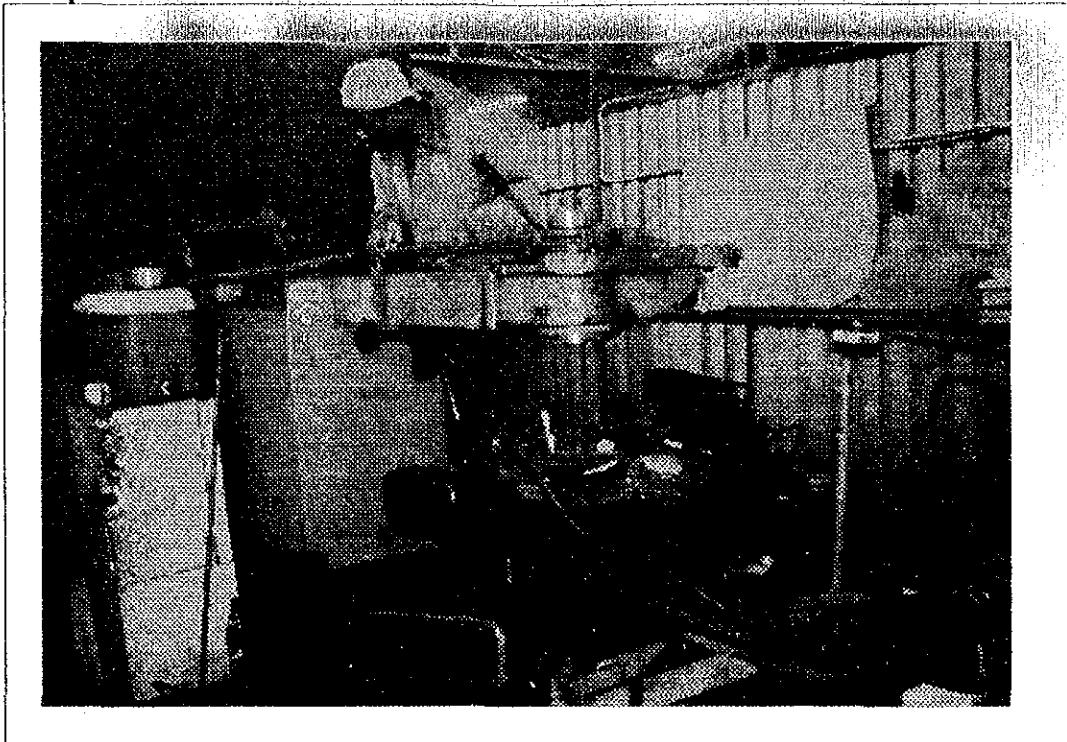


Recommendation

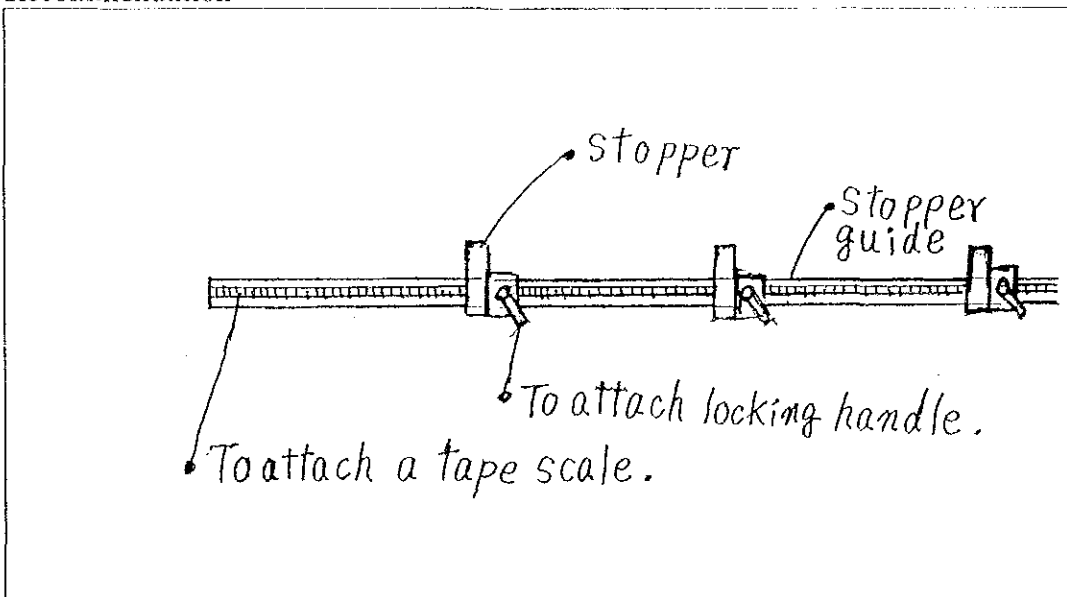


Photograph 2 Improvement of the pipe positioning on the bender

The present state



Recommendation



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-26	Production management	Bus sheet framing	
	2nd category	Industry	Sector / Product
	Productivity	Automotive parts mfg. (after-market)	Sheet manufacturing

Subject

Improvement of the sheet frame pipe bending process and workability by addition of jigs

■ Diagnosis:

In pipe bending operation, a worker determines the turning direction (horizontal and vertical) intuitively as no jig is used. The work takes time and results in poor accuracy.

■ Guidance:

- 1) To use a jig that serves as reference to determines the turning direction for pipe bending; and
- 2) To introduce a new bender that can indicate a turning angle in the future.

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

The shop planned layout modification and the recommendations were not implemented. It is planned to carry them out when layout is fully modified.

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

While workers presumably realize poor workability, there is no system to request an improvement to the management (such as an employee suggestion program). Thus, field guidance should be provided when both managers and workers are present.

1 Case A

Description of Problems

Pipe length and bending angle can be fixed by this type of pipe bending machine but the rotation direction cannot. The rotation positioning of pipes depends on worker's intuition, because there is no measuring method on the bender. As a result, the U-shaped pipes are twisted and are not parallel, resulting in poor quality and difficulty in welding assembly.

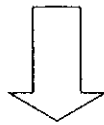
Diagnosis and Recommendation

Install a jig on the bender so that parallelness can be measured. The accuracy of parallelness is improved by the bending of pipe with the use of this jig. The company should in the future consider the upgrading the pipe-bending machine to one that is able to specify angles so as to improve the accuracy of parallelness (See Sketch).

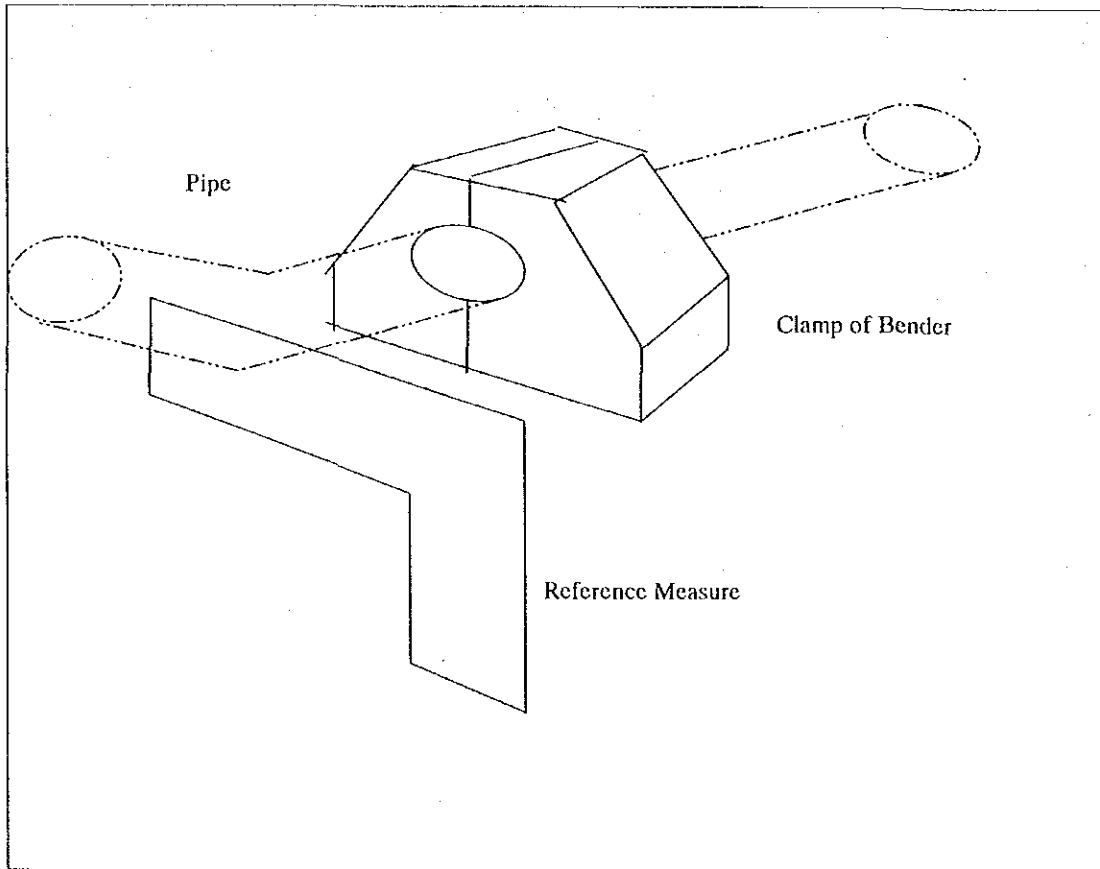
Sketch: Improvement of pipe setting on the bender

The present state

The rotation positioning of pipes depends on worker's intuition, because there is no measuring method on the bender. As a result, the U-shaped pipes are twisted and are not parallel, resulting in poor quality and difficulty in welding assembly.



Recommendation



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-27	Production management	Bus sheet framing	
	2nd category	Industry	Sector / Product
	Productivity	Automotive parts mfg. (after-market)	Sheet manufacturing

Subject

Modification of set frame pallets (addition of wheels for ease of transport)

■ Diagnosis:

Pallets are used to transport a frame from the bending process to the welding shop. They are heavy and large, requiring considerable time and effort to move it.

■ Guidance:

The pallets should be provided with wheels for ease of movement and reduction of time for transportation.

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

The shop planned layout modification and the recommendations were not implemented. It is planned to carry them out when layout is fully modified.

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

As layout modification is planned, the size of the pallets and the method for their use should be determined after modification has been completed.

1 Case A

Description of Problems

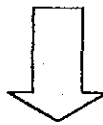
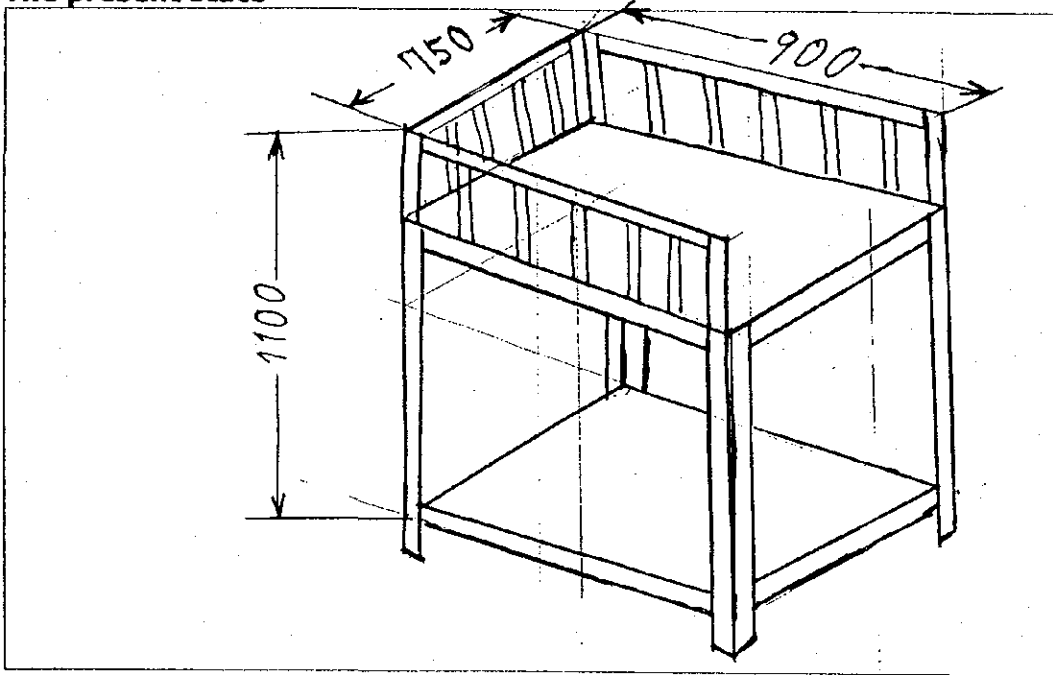
The bent pipes are either carried by hand or put onto a palette and carried to the welding area. The palette is bulky and heavy and is therefore an impractical mode of transferring components to the welding area. This method of operating contributes to low productivity.

Diagnosis and Recommendation

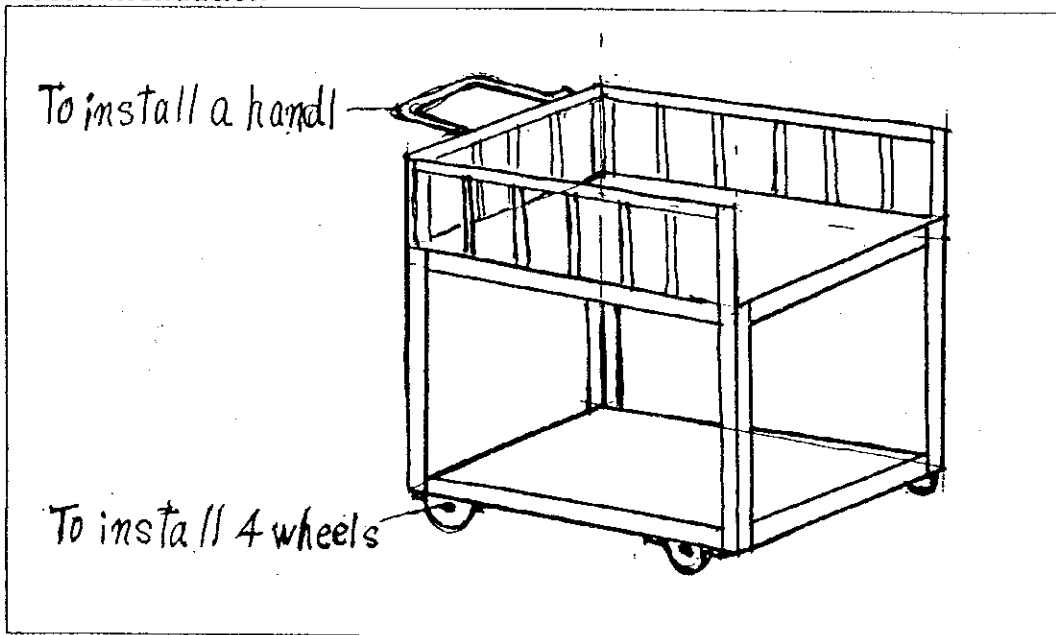
Four wheels should be installed at the bottom of the palette making the transport of pipe to welding area easy and increases productivity (See Sketch).

Sketch Improvement of the transference on the bent pipes

The present state



Recommendation



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-28	Production management	Bus sheet framing	
	2nd category	Industry	Sector / Product
	5S	Automotive parts mfg. (after-market)	Sheet manufacturing

Subject

Creation of storage space for finished products through 5S activities

■ **Diagnosis:**

The shop is filled with scraps and intermediate products that are placed on the floor and racks disorderly. Overall, space is not efficiently used.

■ **Guidance:**

To eliminate intermediate products and dispose scraps to create a new space for storing finished products, and to promote 5S activities throughout the factory for productivity improvement.

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

The shop planned layout modification and the recommendations were not implemented. It is planned to carry them out when layout is fully modified.

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

While source documents on 5S activities (used at the seminar) have been distributed, a formal mechanism is needed to promote 5S activities throughout the factory. To help workers to understand the basic concept of 5S practice, continuous guidance is required by sending experts to the factory.

1 Case A

Description of Problems

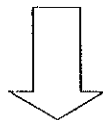
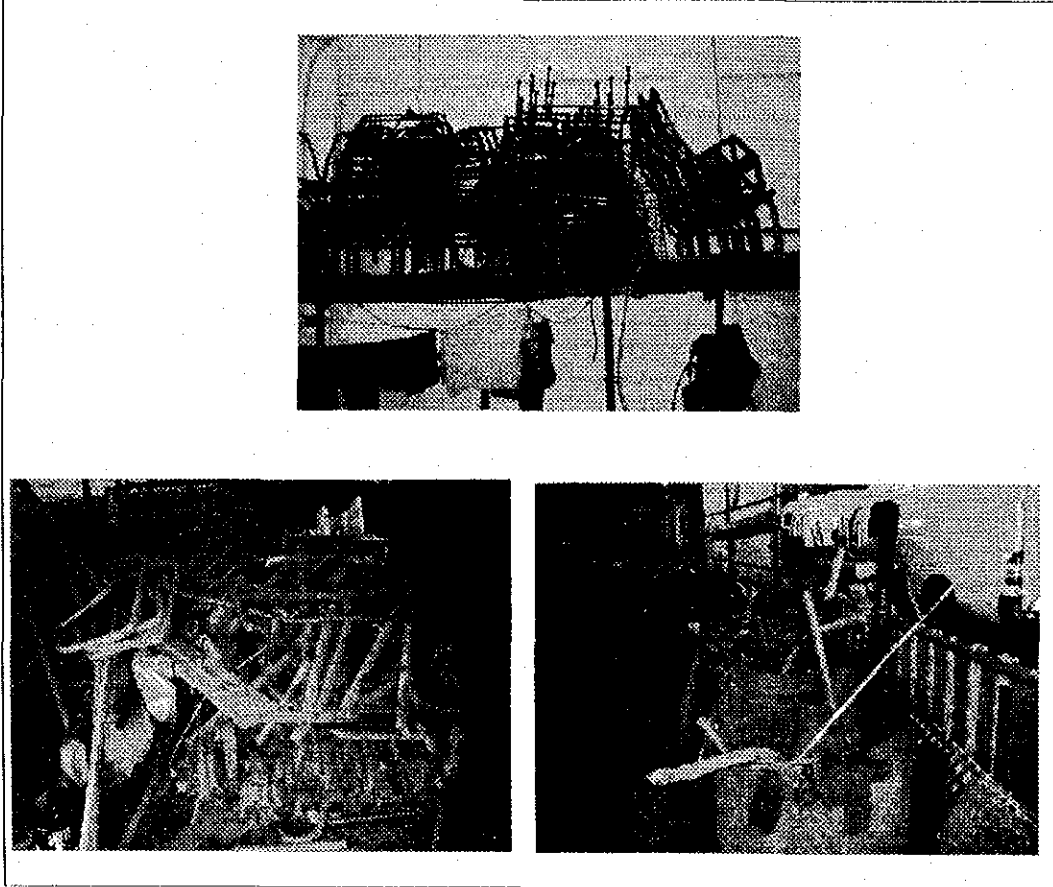
- 1) The assembled frames are temporarily stored on a shelf above the cutting grinder due to space restrictions until they are ordered. It is very difficult and dangerous to store frames on the shelf and there is also a possibility of them rusting because of being stored in a non-painted state.
- 2) The arrangement and order of the shop floor is poorly co-ordinated. Good housekeeping is the first step of shop management, and without it, any shop cannot expect reduction of defects, yield improvement and better production management, and cannot improve the morale of workers.

Diagnosis and Recommendation

- 1) There is a lot of scrape and off cuts in the workshop, which should be arranged and all obsolete items disposed off. The newly created space can be used as storage for *painted frame (See Photograph)*.
- 2) 5S activity needs to be implemented. This can be done by referring to the case of the 5S activity introduced at the seminar. Organization and promotion are necessary.

Photograph: Improvement of 3S

The present state



Recommendation

The scrape and off cuts in the workshop should be arranged and all obsolete items disposed off. The newly created space can be used as storage for painted frame.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-29	Production management	Bus sheet framing	
2nd category		Industry	Sector / Product
Transportation management		Automotive parts mfg. (after-market)	Sheet manufacturing

Subject

Layout modification to facilitate movement of work pieces by reducing distance between subsequent processes.

■ **Diagnosis:**

A materials storage yard is provided at the entrance to the shop and the welding and assembly lines are located at the most end. As the paint shop is located near the entrance, work pieces need to be transported back from assembly to painting, and again to a storage yard for finished products. This complex flow of goods requires long transportation time.

■ **Guidance:**

To modify the layout to ensure smooth and efficient flow of work pieces.

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

The shop planned layout modification and the recommendations were not implemented. It is planned to carry them out when layout is fully modified.

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

As the factory plans layout changes, the above recommendation can easily be incorporated as part of the overall plan.

1 Case A

Description of Problems

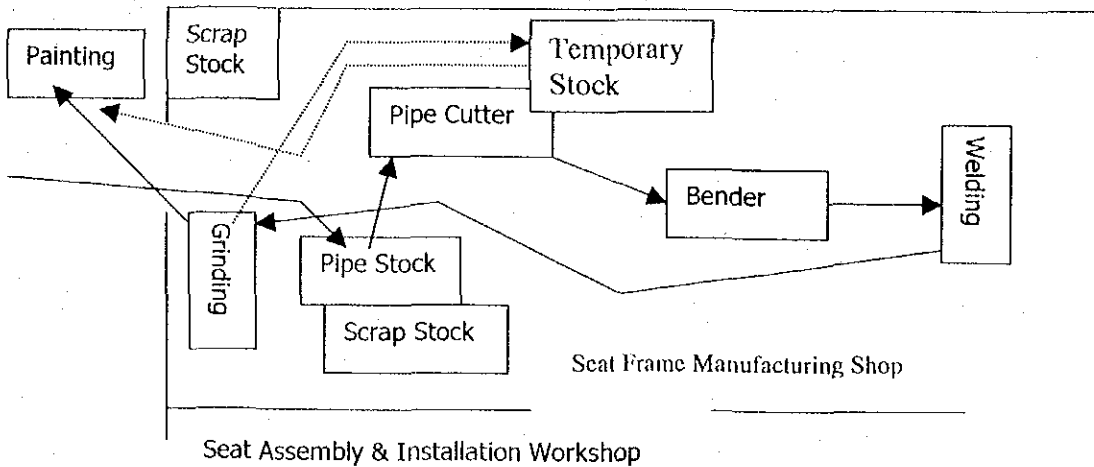
The welding of frames take place at the end of the workshop, whereas grinding is done at the entrance of workshop and painting is done outside. This flow of work is contrary to proper workflow and the distance between operations is too far apart and unproductive.

Diagnosis and Recommendation

The factory layout should be revised so as to eliminate double handling and improve workflow (See Sketch).

Sketch: Improvement of the workshop layout

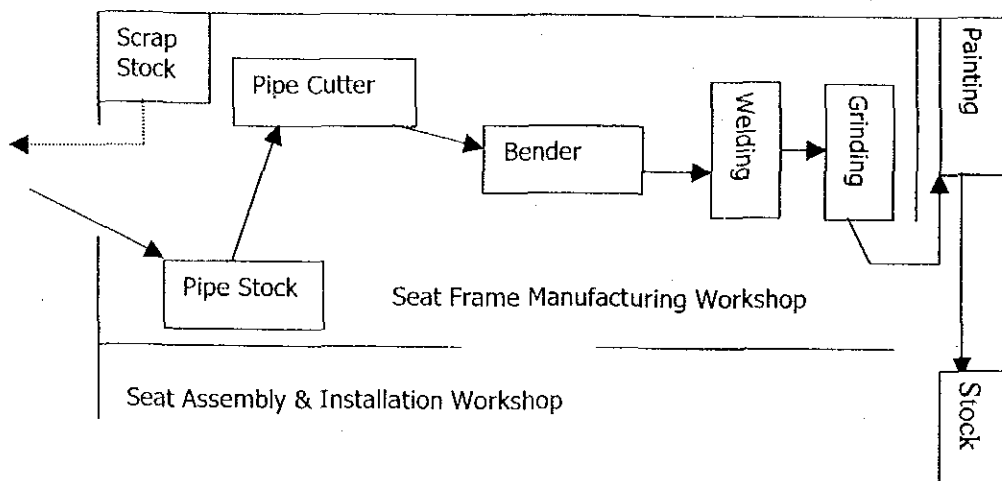
The present state



This flow of work is contrary to proper workflow and the distance between operations is too far apart and unproductive.



Recommendation



The factory layout should be revised so as to eliminate double handling and improve workflow.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-30	Production management	Stainless exhaust pipe manufacturing	
	2nd category	Industry	Sector / Product
	Work management	Automotive parts mfg. (after-market)	Exhaust pipe manufacturing

Subject
Improvement of safety in the working environment

■ **Diagnosis:**

A cutter grinder uses a small safety cover and the footing for a screw press is high and small, both constitute safety hazards.

■ **Guidance:**

To use a larger cover and remove the footing.

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

The recommendations have not been implemented as the company plans to relocate the factory and is busy with new jobs.

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

Although the management understands what they should do, but they do not seem to feel the need for safety improvement strongly because they do not have management staff and are busy with daily operation. It is important to visit them frequently and provide information and guidance repeatedly.

1 Case A

Description of Problems

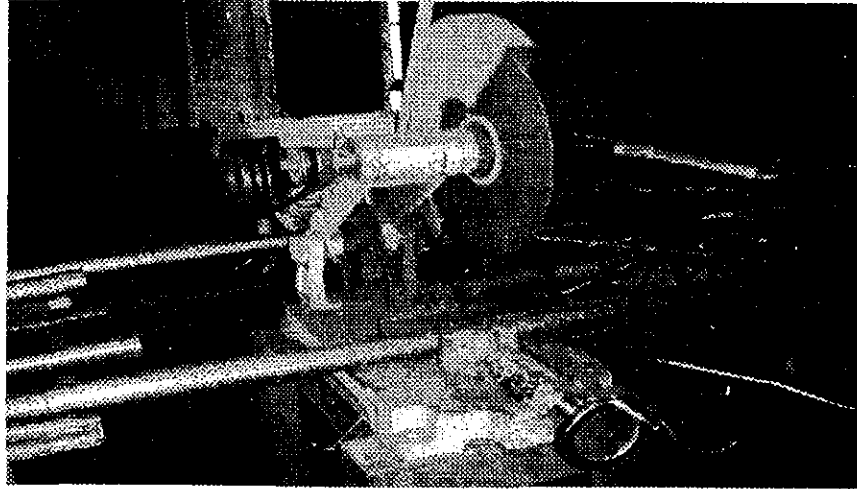
- 1) The safety cover of the cutting grinder is too small. It is very dangerous, if the grinding disc had to break.
- 2) The operator of one of the machine presses has to step on a make shift platform due to the unsuitable height of the machine press. This method of operating is not only dangerous but also unproductive.

Diagnosis and Recommendation

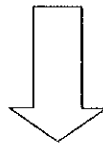
- 1) The safety cover should be expanded (See Photograph 1).
- 2) The table should be adjusted to a suitable height (See Photograph 2).

Photograph 1 The cutting work of pipes

The present state



1. Although a scale is installed on the guide, operator is required to adjust the length of pipe each time because there is no stopper for length adjustment.
2. The cutting grinder is dangerous due to the safety cover being too small.



Recommendation

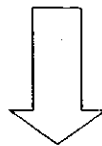
1. A sliding stopper should be installed on the guide.
2. The safety cover should be expanded.

Photograph 2 The pressing work for flange

The Present state



The operator of one of the machine presses has to step on a make shift platform due to the unsuitable height of the machine press. This method of operating is not only dangerous but also unproductive.



Recommendation

The table should be adjusted to a suitable height.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-31	Production management	Stainless exhaust pipe manufacturing	
	2nd category	Industry	Sector / Product
	Productivity	Automotive parts mfg. (after-market)	Exhaust pipe manufacturing

Subject

Improvement of workability by modification of work arrangement

■ Diagnosis:

In the bending shop, wood materials are placed on the floor and a worker has to pick them up with additional time and effort. In the welding shop, a worker also has to bend down to pick up parts that are kept on the floor.

■ Guidance:

- 1) To place a table that is high enough to keep wood materials at the same height as the bending machine; and
- 2) To relocate a box used to store parts in the welding shop in order to permit the worker to pick them up easily and quickly.

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

The recommendations have not been implemented as the company plans to relocate the factory and is busy with new jobs.

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

Although the management understands what they should do, but they do not seem to feel the need for improvement strongly because they do not have management staff and are busy with daily operation. It is important to visit them frequently and provide information and guidance repeatedly.

1 Case A

Description of Problems

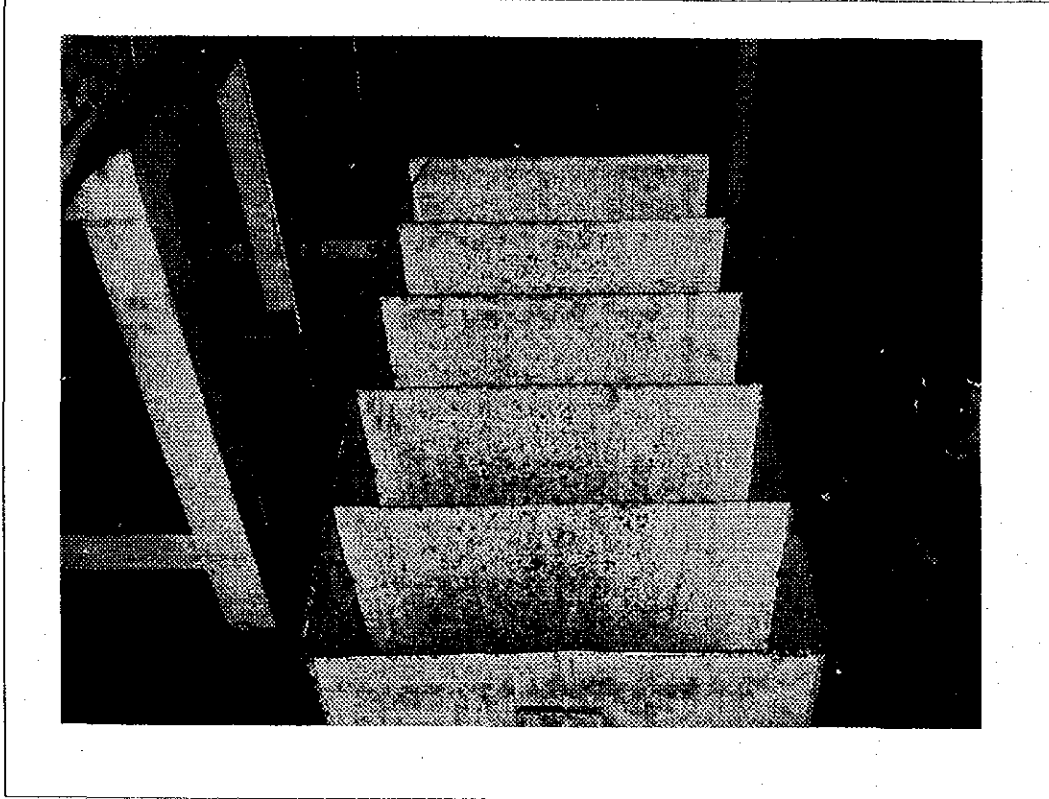
- 1) A steel box in which pipes are stored prior to welding is situated between two welding worktables. It is difficult to pick up the pipes located in the far end of the box due to the narrow space.
- 2) Steel plates sheared by shearing machine are put on the floor beside a bender. The plates are prone to damage when they are bent by the bender with dust adhered. Productivity becomes poor firstly because the steel plates are put on the floor, then the operator of the bender picks them up. There is loss of time due to this method of operating resulting in low productivity.

Diagnosis and Recommendation

- 1) A vertical steel box should be made and installed in front of the wire fence. It makes the accessibility of pipes easy and results in increased productivity (See Photograph 1).
- 2) The storing table of the steel plates should be made and installed adjacent to the bender. It prevents damage from dust, and increases productivity (See Photograph 2 and Sketch 1).

Photograph 1 The steel box for pipes store

The Present state

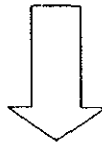
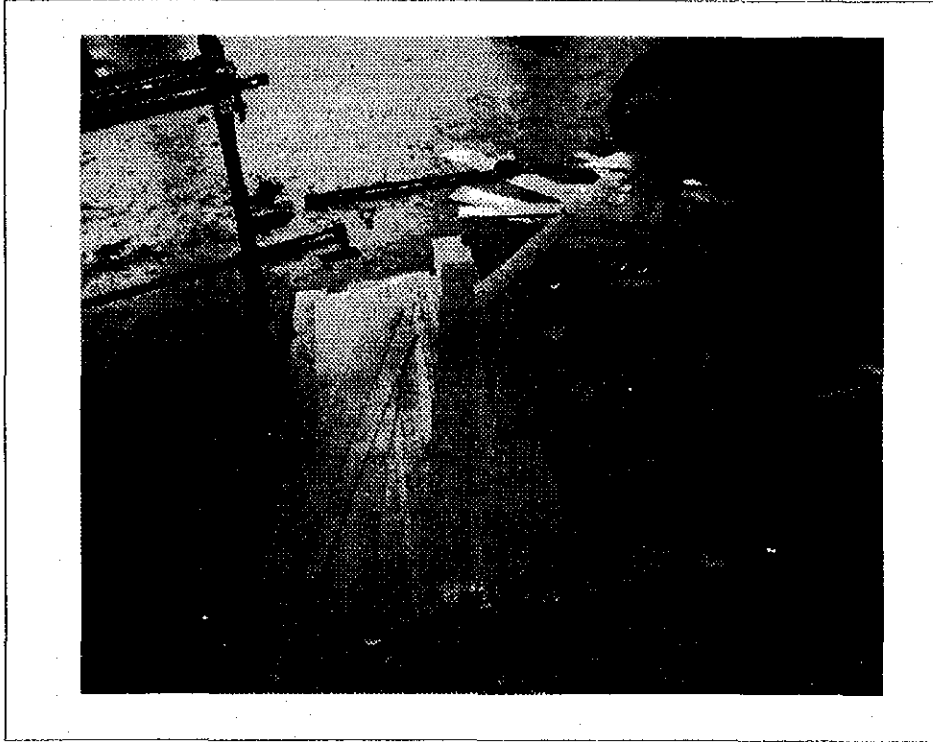


Recommendation

A vertical steel box should be made and installed in front of the wire fence.
It makes the accessibility of pipes easy and results in increased productivity.

Photograph 2 The steel plates sheared by shearing machine

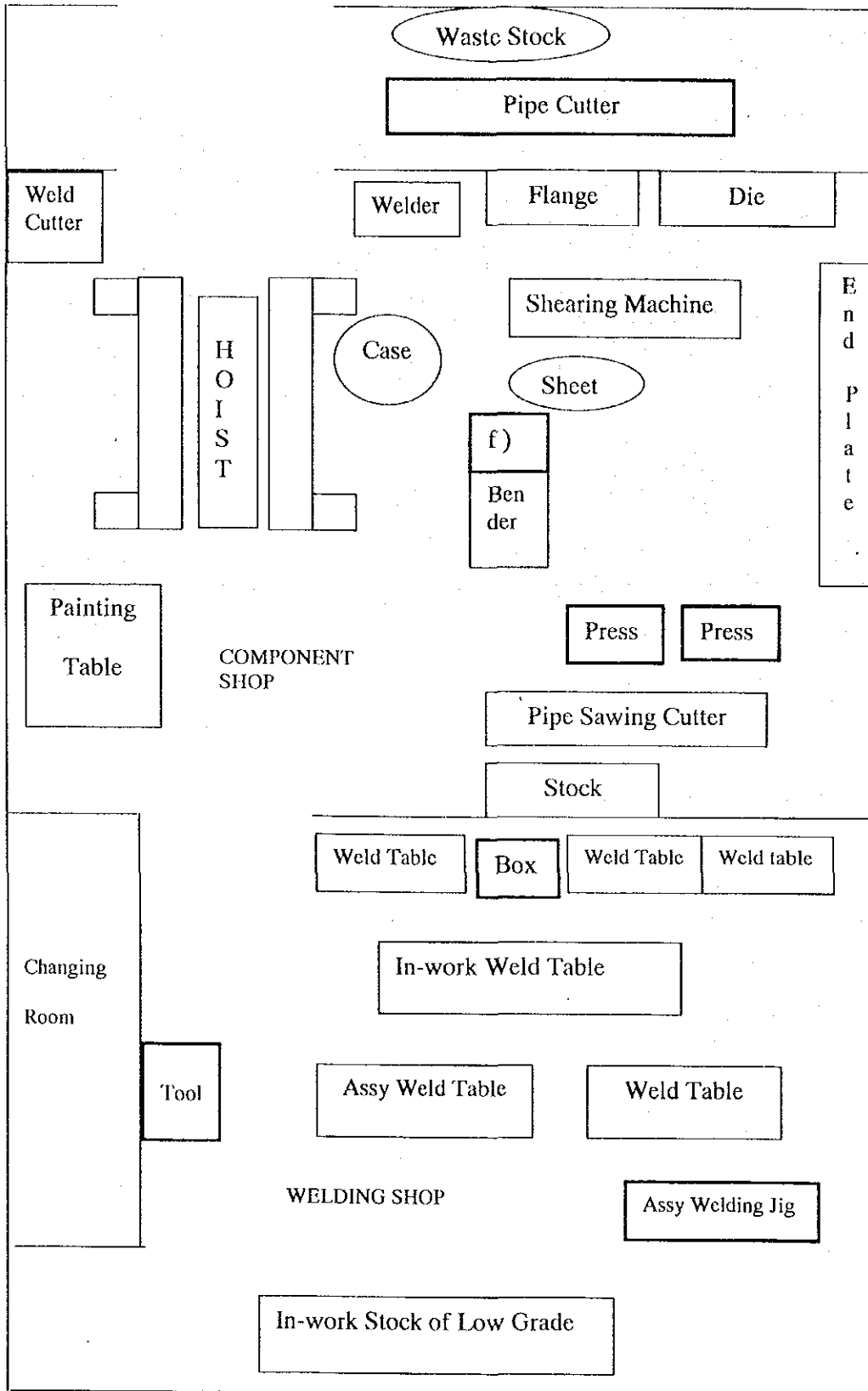
The Present state



Recommendation

The storing table of the steel plates should be made and installed adjacent to the bender. (See Sketch 1)
It prevents damage from dust, and increases productivity

Sketch 1 The Layout of the factory



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
MW-32	Production management	Stainless exhaust pipe manufacturing	
	2nd category	Industry	Sector / Product
	5S	Automotive parts mfg. (after-market)	Exhaust pipe manufacturing

Subject

Reduction of intermediate products by providing a storage space
(inventory reduction through 5S activities)

■ **Diagnosis:**

Cases bent and welded are placed on the floor disorderly and it is difficult to identify which products are kept where. A large amount of cases is kept as inventory and takes up much space. In the welding shop, parts are kept around the worktable without proper assortment.

■ **Guidance:**

- 1) To provide a rack to store completed cases and stop production when the rack becomes full; and
- 2) To use small pallets to keep weld parts so as to limit the stock waiting for welding.

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

The recommendations have not been implemented as the company plans to relocate the factory and is busy with new jobs.

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

Although the management understands what they should do, but they do not seem to feel the need for improvement strongly because they do not have management staff and are busy with daily operation. It is important to visit them frequently and provide information and guidance repeatedly.

1 Case A

Description of Problems

- 1) Parts are hand-transported from the component shop to welding shop. Often insufficient and excessive components are transported to the relevant working areas.
- 2) The steel plates are bent, thereafter welded to form completed cases. These cases are stored on the floor beside a hoist. This method of storage makes it difficult to know the size and quantity of these cases and contributes to poor space utilization.

Diagnosis and Recommendation

- 1) Small carrying palettes that have sufficient space for 5 sets of silencer components excluding case should be utilized. When the palettes are filled with the components, they are transported to the welding worktable. This eliminated insufficient or excessive parts being transported to the welding worktables. The carrying palettes for cases should be utilized separately to avoid the bulkiness of palette.
- 2) The cases should be stored according to size on a shelf, which must be situated adjacent to the hoist. When the stock of a certain size reduces until the specified minimum quantity, then that type of case will be produced till the space on the shelf is full. By this control method, the problem of shortage and excessive stock will be resolved.