Japan International Cooperation Agency
Ministry of Industry and Commerce
The Republic of Zimbabwe

THE MASTER PLAN STUDY
ON
THE PROMOTION OF SMALL AND MEDIUM SCALE ENTERPRISES
IN
THE REPUBLIC OF ZIMBABWE

(EXAMPLES OF FACTORY IMPROVEMENT)

NOVEMBER, 1998

THE MATERIALS PROCESS TECHNOLOGY CENTER
(SOKEIZAI CENTER)

SYES CO., LTD.

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FOREWORD

The Examples of Factory Improvement give some details of the technical guidance provided for 10 SMEs (three metal processing, two food processing, two textile and three wooden furniture-making SMEs) for which the Study Team conducted factory diagnosis.

Many of the improvement points raised by the technical guidance were accepted for immediate implementation by the subject enterprises and the positive results were confirmed by the follow-up survey.

As the improvements made are applicable to not only those SMEs for which diagnosis was conducted but also other SMEs facing similar problems, it is hoped that this report will prove useful for such SMEs.

The Examples which are compiled by sector are described below.

METAL PROCESSING

CONTENTS

Case 1

Change of material to improve function of the bearing

Present state:

The wheel bearing is designed as metal touch sleeve type bearing for easy production.

Wheel axle : steel bar / as rolled is used

Wheel sleeve : seamed steel pipe / as seemed is used

Problems:

1 The wheel does not turn or turns hardly though the bearing gap between axle and sleeve are kept 5 mm.

2 When the wheel is used in heavy duty, friction between steel to steel comes to high. It takes strong power to drive the wheel.

Advice for improvement:

1 It is recommended as one of realistic idea to that The wheel axle is to be made from cast iron bar.

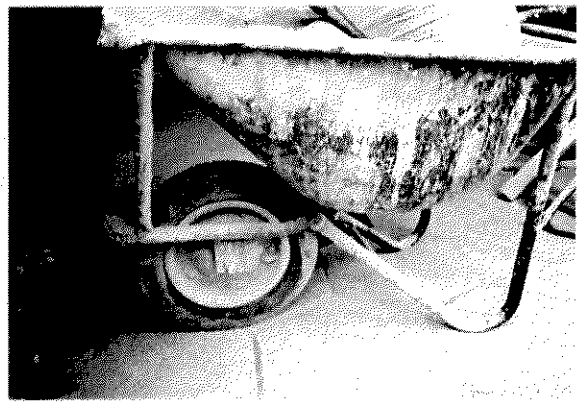
2 It is desirable to use ball bearings although expensive and very difficult to import in Zimbabwe.

Expected result:

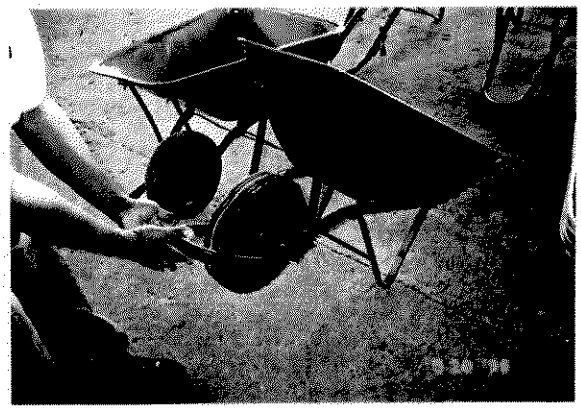
Merit ① Friction between steel and cast iron is lower than steel and steel.

Merit ② Cast iron does not deform and it is easy to cast bar.

Merit ③ The function of the wheel can be improved without cost increasing.



wheel barrow / bad



wheel barrow / good

Case 2

Putting materials under process and residuals in order

Present state:

The materials under process and residuals are scattered around the machine or working area.

Problems:

1 The scattered materials disturbs another job and next job.

2 It is dangerous. There is a possibility the worker is injured.

Advice for improvement

1 Disseminate following concept among workers and staff

-to put in order materials under process to enable to handle at once when necessary.

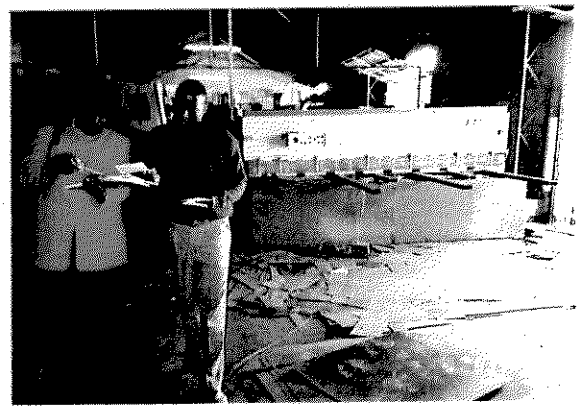
-keep clean to improve working environment.

2 To breed the habit of concept mentioned above, managing director should patrol the factory daily.

Expected result:

1 Safety of the work will be improved by clean working environment.

2 Efficiency of work will be improved by saving unproductive time through easy access to the materials needed.



Case 3

Disposal of scraps

Present state:

Scrapped structures, cars, machines, etc. those are gathered to use as recycle materials are left on the floor or on the ground disorderly.

Problems:

1 The working area is cramped.
2 The factory comes dirty and bad view.
3 Dangerous parts and materials such as butteries, oils, etc. are existing in working area.

Advice for improvement:

1 Dispose immediately those dangerous parts and materials.
2 The important parts such as electric part, bearings, bolts, nuts, etc. must be properly maintained to prevent rusting and deterioration.
3 Large scraps must be cut into small size for easy recycle.
4 Those materials not able to reuse must be disposed as quick as possible.

Expected result:

The factory comes clean and working area is widened.

Case 4

Arrangement and stock of row material

Present state:

1 The raw materials and the parts are left on the floor of the factory disorderly.

2 The area to leave the raw material is not allocated in the factory.

Problems:

1 The worker is necessary to trace them.

2 If the raw materials are left near to working area, it will reduce working space and disturb the work.

Advice for improvement:

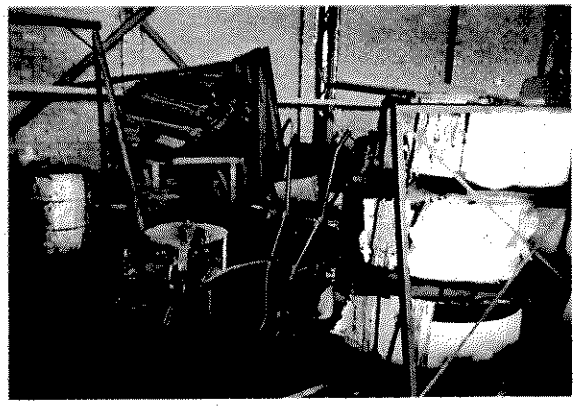
1 Create specified area to storage raw materials.

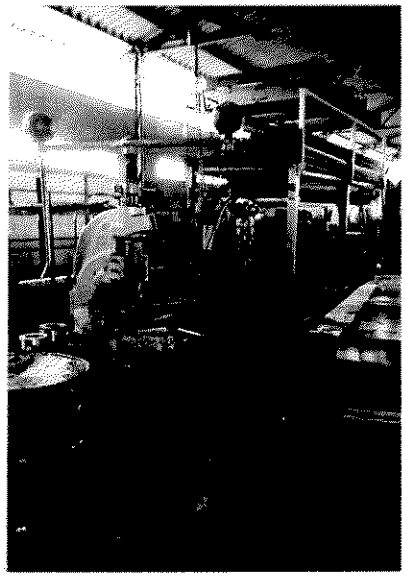
2 The specified area for storage should be named or numbered for easy access.

Expected result:

1 The work is not disturbed and working space is widened.

2 Material control become easy and can control stock amount by glance.





Case 5

Creating pathway in the factory

Present state:

1 Pathway is not created in the factory clearly.

2 If they can not find a vacant area, they must cross working area and interrupting the work.

Problems:

1 The workers will stumble over a work pieces and be injured.

2 When the worker transport large or heavy parts, dangerous materials such as melt iron, it is very dangerous without having clear pathway.

Advice for improvement:

1 Create pathway in the factory and the pathway should be marked white line on the floor clearly.

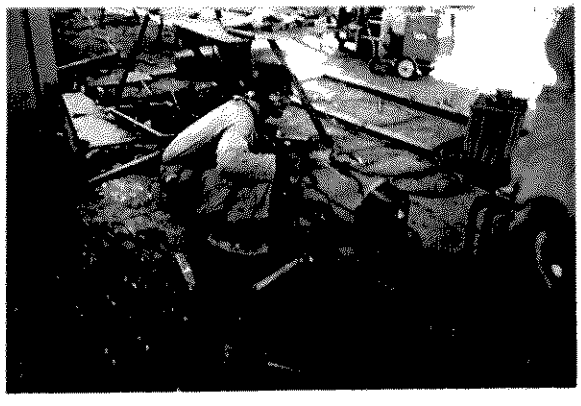
2 The pathway width should be sufficient to run transportation cart or folk lift.

3 If the pathway are used as working area temporally, the pathway must be locked indicating " No entrance " on the board.

Expected result:

1 Safety of the factory is improved.

2 Worker can move to place to place easily for transportation or for meeting to proceed the job.



Case 6

To use work piece holder/table and transportation box/palette

Present state:

The work pieces are left on the floor and after finished the process, those are left again on the floor directly.

Problems:

1 The worker will be tired to pick up, to leave and to transport those work pieces.

2 It takes working time to pick up those work pieces one by one.

3 The work pieces are liable to be damaged by hitting.

Advice for improvement:

The work pieces should not be left on the floor directly. It is recommended

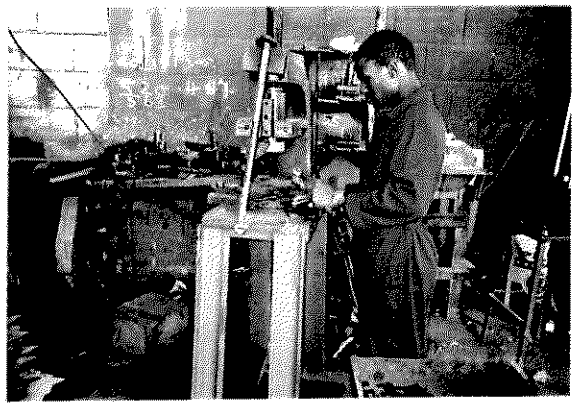
- to use work piece holder/setting table for high position work such as press work, machining work, etc..
- to use transportation box/palette so as to be able to leave, to pick up and to transport easily.

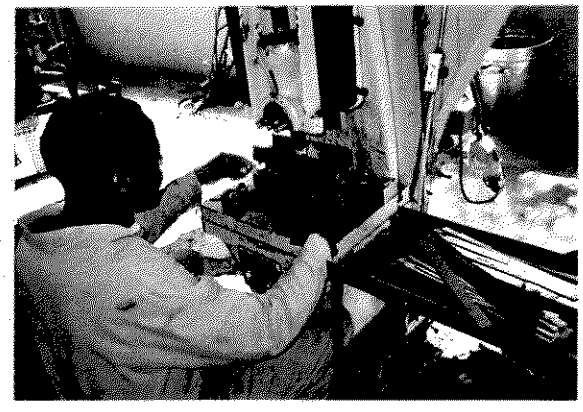
Expected result:

1 To leave, to pick up and to transport work pieces can do easily, then the worker will not be tired.

2 The work pieces are not damaged by hitting.

3 The working speed will be increased.





Case 7

Integration of separate castings for improvement of quality

Present state:

Two pieces of castings are jointed by welding as the photograph below.

Problems:

1 The welding can be done out side only. Inner side is impossible. Then the welded portion is liable to crack by concentration of stress and it causes leakage of water.

2 Casting cost of two pieces is higher than one integrated casting. The machining and welding cost are much expensive.

Advice for improvement:

The reason they can not make	Advice to make
They can not handle heavy mold.	Hoist or chain block must be equipped.
They can not prepare casting plan due to lack of experience.	The company shall consult with the specialist.
Melting capacity is small and facility of holding the melt is not equipped.	Receiving ladle must be equipped to hold the melt.

Expected result:

1 It is possible to decrease production cost and to improve the quality of the products

2 Productivity and quality of all castings they make are also improved by the preparation of casting plan and the receiving ladle newly equipped.

Case 8

Preventing sand adhesion/burned-on-sand of the casting

Present state:

On the surface of the casting, sand adhesion/burned-on-sand is found.

Problems:

1 To remove out sand adhesion/burned-on-sand, the worker must remove it by grinding in dusty environment.

2 The sand will damage the cutting tools when machining.

Advice for improvement:

1 The molding sand must be rammed tightly from the corner of the the pattern.

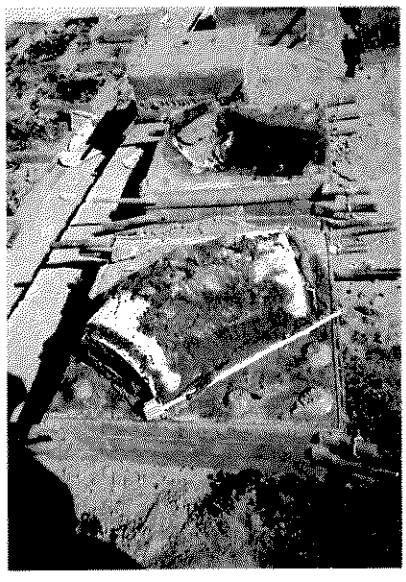
2 Fine adhesive mold coat must be applied on the surface of mold by coating or by spraying.

3 Using those poor materials are cause of sand adhesion /burned-on-sand. It is recommended that powder graphite made by themselves and yellow sand should not be used.

Expected result:

1 Injurious sand adhesion/burned-on-sand is not found on the surface of the casting.

2 Those castings made by the advice can be finished easily.



Case 9

Preventing of run-out on the pouring

Present state:

When the team visited the foundry, many rejected castings by run-out were found. (including rejected by cold shut)

Problems:

1 The casting is liable to be rejected.

2 It is dangerous. The worker get burned.

Advice for improvement:

1 2～5 mm of no molding box zone must be made to the contact surface of cope and drug.

2 Before pouring, the weight must be set on the assembled mold properly.

3 Proper weight shall be put on the molded sand and shall not be put on the molding box.

Expected result:

Run-out does not happen after applied the advice.

Case 10

Material inspection and improvement for the melting of cast iron

Present state:

1 Most of companies of SMEs do not inspect the material properties.

2 Measuring temperature, analysis of chemical components are not applied in SMEs generally.

3 They can melt low grade material only.

Problems:

1 They can not make castings in accordance with international specification.

2 They can not control material property so as to fit requirement or to make good property.

Advice for improvement:

1 The physical properties and chemical components of the material they made must be tested periodically by the institution such as SAZ, technical college, etc..

2 Material property check and temperature measuring by experience;

① For gray iron melt, edge test shall be done and recorded.

② For gray iron melt, "Break Surface Patterns" shall be observed in the dark.

If clear pattern is not observed, the melt are poor property.

③ For high temperature measuring, the beam color from the surface of the melt shall be observed in the dark.

If the worker is experienced, he can measure the temperature by beam color of the melt.

Expected result:

1 They can control the material property by observing "Break Surface Patterns".

If the material property is found poor, they can improve melting process by controlling chemical components and melting temperature so as to fit specified material requirement.

2 The casting defects caused by poor melt can be decreased.

3 They can make castings in accordance with international specification.

FOOD PROCESSING

CONTENTS

1. Improvement of Flour Milling Process

1.1 Present State

Milled flour (maize meal) is directly fed to bags from the outlet of the milling machine.

1.2 Problem

The flour which falls from the bags onto the floor and the powdery flour flying in the air are not only unhygienic but also uneconomical as the total yield amount is reduced.

1.3 Advice for Improvement

The following advice was provided to the production manager and the above-mentioned problem was improved.

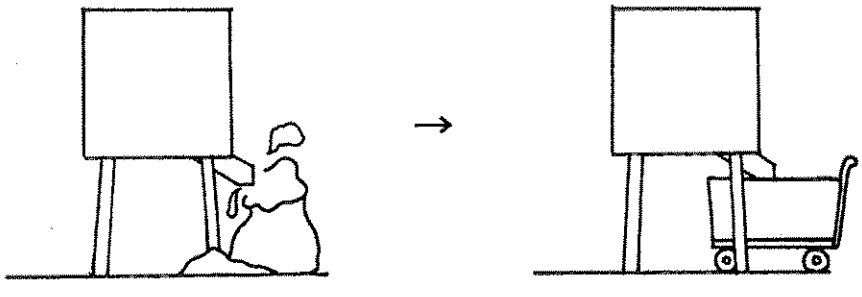
1) Use of a box-type platform car equipped with a pulley

2) Attachment of a side cover to the milling machine

1.4 Improvement Result

The improvement measures led to the prevention of flour dispersion by the milling machine to increase the yield and to facilitate hygienic production and work rationalisation.

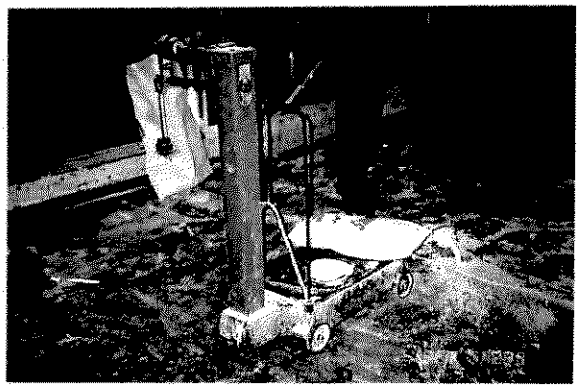
(Present System) (After Improvement)



2. Improvement of Measuring Method

2.1 Present State

The use of a 100 kg scale for both small maize meal bags (2 kg) and large bags (20 kg and 50 kg) is inappropriate.



2.2 Problem

The accurate measuring of 2 kg bags by the 100 kg scale is impossible, resulting in measuring error of some ± 100 g.

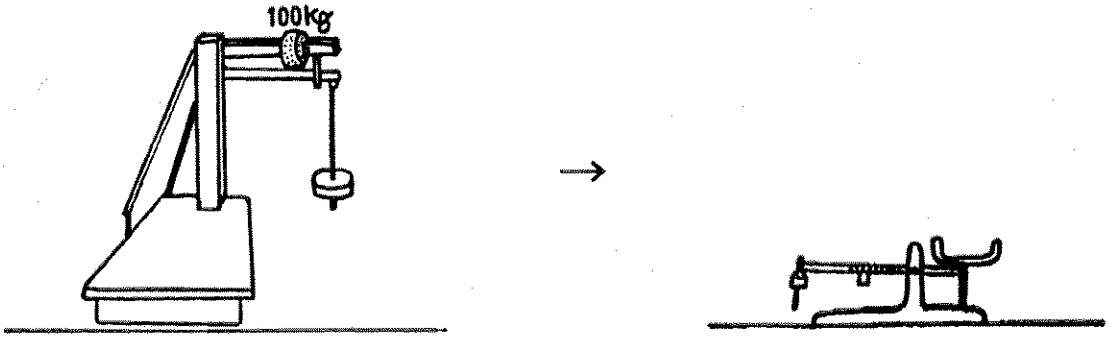
2.3 Advice for Improvement

Advice was provided to the production manager in regard to the use of a desk scale suitable for the measurement of upto several kilogrammes.

2.4 Improvement Result

The use of an appropriate scale depending on the subject weight of the flour has made accurate measurement possible, preventing measuring error.

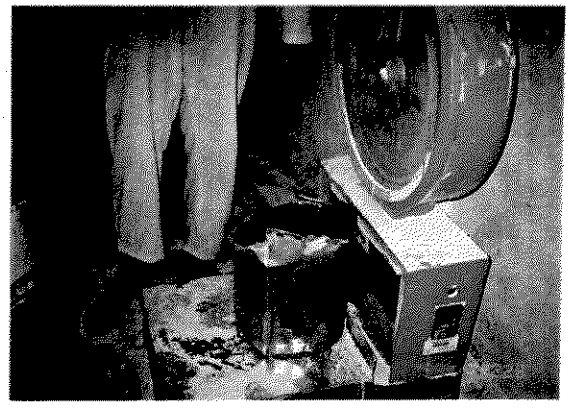
(Present System) (After Improvement)



3. Improvement of Measuring Process

3.1 Present State

Such inappropriate tools as aluminium buckets with an uneven edge and enamelled plates are used to measure flour.



3.2 Problems

Foreign matters, such as broken pieces of bucket, are mixed with the flour. In addition, the use of inappropriate tools for measuring purposes makes accurate measurement impossible and scatters the flour.

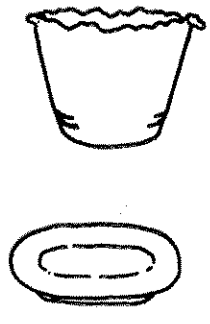
3.3 Advice for Improvement

Advice was provided to the production manager in regard to the use of appropriate measuring tools (stainless cup, scoop and spoon, etc.) for the measurement of flour.

3.4 Improvement Result

The use of a stainless scoop has made accurate measurement possible and prevented the inclusion of foreign matters.

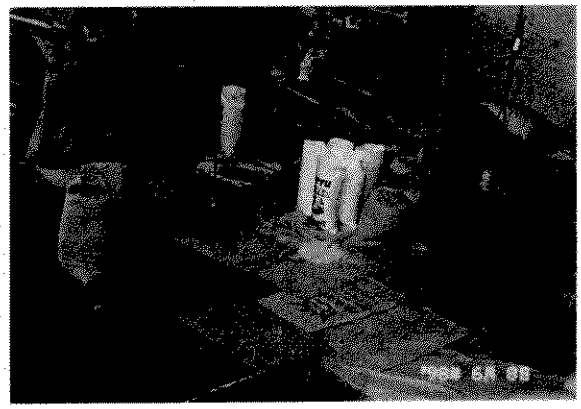
(Present System) (After Improvement)



4. Improvement of Packaging Process

4.1 Present State

Because of the lack of work tables, the bagging (packaging) of the product is conducted on the floor. This is unhygienic.



4.2 Problem

During the bagging process, the flour is scattered on the floor. The bagged products are placed directly on the floor, presenting a problem of hygiene as well as work efficiency.

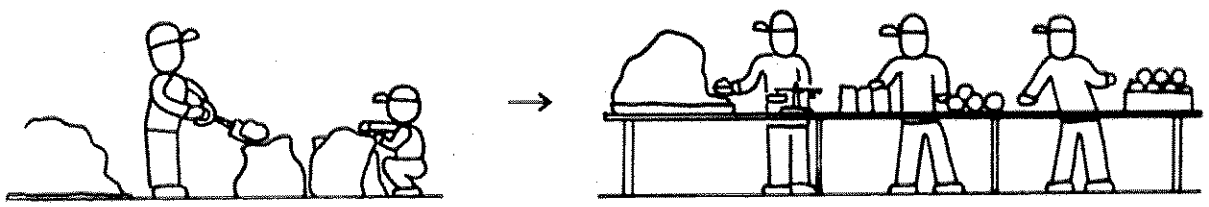
4.3 Advice for Improvement

Advice was provided in regard to the introduction of work tables for smooth work even if such tables were small, allowing only a few persons to work on them.

4.4 Improvement Result

The work efficiency has been improved and the more hygienic handling of the products made possible by the introduction of work tables.

(Present System) (After Improvement)



5. Improvement of Inventory Control Method

5.1 Present State

Products with various manufacturing dates are stored together.

5.2 Problem

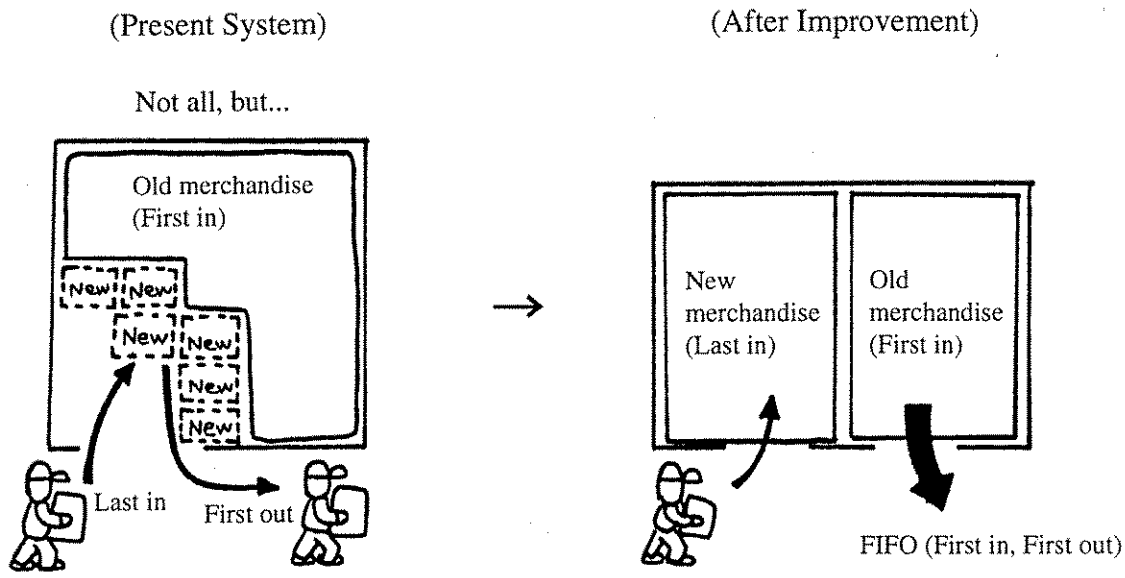
Products with old manufacturing dates remain unshipped as newer products stacked in front of older products are shipped first.

5.3 Advice for Improvement

Advice was provided to the production manager in regard to recording the storage situation or marking products so that products are shipped in accordance with the order of manufacture.

5.4 Improvement Result

The new inventory control practices mean that older products are not kept for a long period of time, preventing the marketing of qualitatively declined products.



6. Improvement of Raw Material and Product Storage Methods

6.1 Present State

The bagged maize meal is stacked directly on the floor or at the side of a wall without air space between the bags and the wall. This kind of storage is inappropriate for flour products. The same applies to bagged raw materials (maize).

6.2 Problem

The raw materials and products are liable to microbe contamination and damage by insects and/or rats.

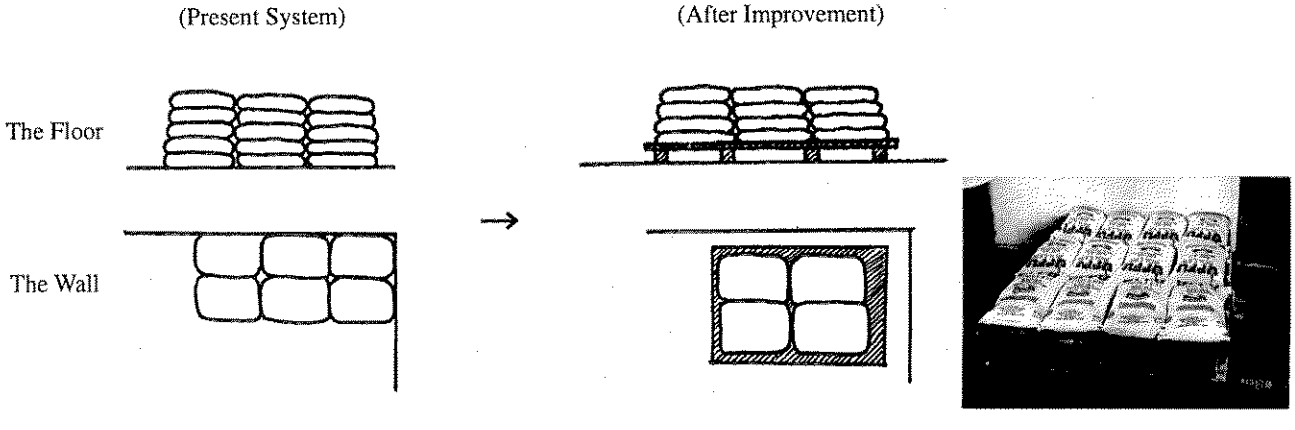
6.3 Advice for Improvement

The following advice was provided to improve the above-described problem.

1) Laying of panels on the floor
2) Maintenance of a distance of at least 20 - 30 cm between the piles of bags and the wall

6.4 Improvement Result

The introduction of an appropriate stacking method has made prevention of microbe contamination and damage by insects and rats possible.



7. Improvement of In-Factory Distribution

7.1 Present State

While pushcarts with two wheels are used for the transportation of raw materials and products in the factory, all other types of transportation are conducted manually, resulting in a low level of efficiency.

7.2 Problem

As the manual transportation capacity is limited, the work efficiency is low.

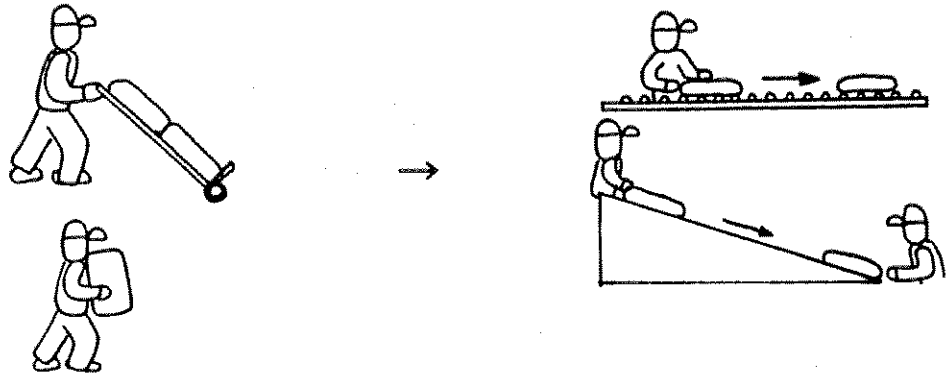
7.3 Advice for Improvement

As the use of a belt conveyor is said to be too expensive, advice was provided in regard to the planned use of a wheeler, shooter using the slope and sliding-type apparatus.

7.4 Improvement Result

The use of simple apparatus has improved the in-factory distribution efficiency of the raw materials and products.

(Present System) (After Improvement)



TEXTILES / CLOTHING

CONTENTS

Case 1

The improvement of arrangement, order and cleaning in the factory

The present state:

Many needless things like containers of soft drinks, cut-off of fabrics and etc. are scattering on the floor of the factory.

A sweeper cleans the floor irregularly.

Problems:

Bringing the soft drinks and foodstuffs to the factory cause high possibility of creating stained products.

The situation where things are scattered disarranges the order of the factory and invites deterioration in the work environment, which may influence the workers with a bad attitude.

The advice of improvement:

The cleaning work was guided to be done by all the workers after the end of work everyday.

Bringing soft drinks and foodstuffs to the factory was prohibited.

The improvement result:

All workers started to do the arrangement, order and cleaning by themselves, which improved the work environment in the factory.

All workers came to pay more attention to a clean work environment.

Many workers realize that the maintenance of environment in the factory is their responsibility.

The work environment of the factory is improved, and it takes less time to look for the things than that of previous conditions.

The floor became clean.

The chance of producing defected goods caused by stains of foodstuffs and soft drinks has decreased.

Case 2

The improvement of method of inspecting quality

The present state:

The inspection work is done at the sewing stage while cutting the extra thread after stitching.

The majority of the work is cutting the extra thread of sewing.

Therefore, the inspector is not able to concentrate to inspect the garments.

And it is difficult for the inspector to take records of inspection.

Problems:

A drastic improvement plan cannot be adopted because there is no statistic records of problem found.

The tendency of the measures becomes the makeshift.

The advice of improvement:

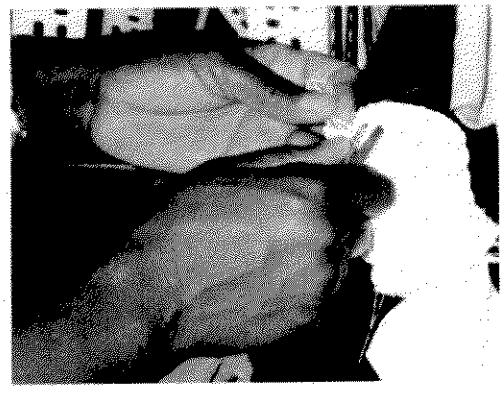
The work was divided into the work of cutting extra threads and the work of inspection.

The improvement result:

They could accumulate the data of the problems.

As a result, they understood the problems statistically, and they could take drastic measures against the problems.

And they could take preventive measures of the problems more than the before.



A photo before improvement

A photo after improvement

Case 3

The improvement of uniformity of the collar point of shirts

The present state:

There is no uniformity of the collar point of shirts produced in the factory.

Problems:

The collar is not inspected enough.

The garments process without checking the quality.

The methods of the cutting and the sewing are not appropriate.

The advice of improvement:

The first of all, the inspector was taught that the collar point was so called one of the critical points.

And the inspector was also taught that he should inspect the critical point without fail.

It was guided to confirm whether the cutting pattern was accurately made.

It was also guided to confirm the following if there would be no problem:

Cut pieces of the right and left shape

The size difference

It was guided that the ruggedness of the table should be repaired to keep precise works.

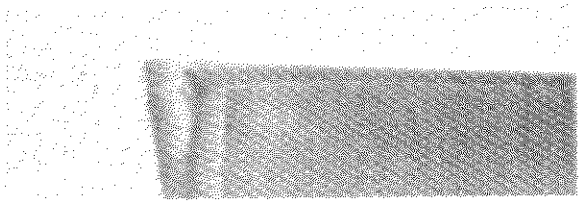
The operator of sewing machine should keep a margin to sew up for the right and left even.

Operators of sewing machine were guided to check the size frequently.

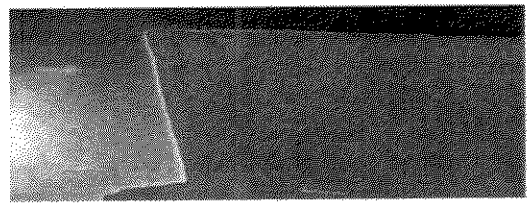
And the operators of sewing machine were guided to improve the skills of even up stitching by trainings.

The improvement result:

It decreases the collar unevenness.



A photo before improvement



A photo after improvement

Case 4

The reduction of number of processes by using attachments

The present state:

If a bottom hemmer is used, it is one process usually. However, it is two to three processes at present.

Problems:

Because it has more processes than the necessity, it takes more time than using an attachment.

The finishing of products is not uniform since it is not used the attachment.

The advice of improvement:

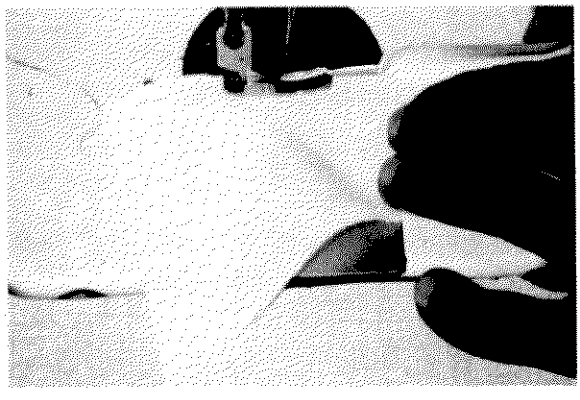
The attachment catalog was introduced for the following improvement:

a) Number of process
b) Efficiency
c) Costs
d) And productivity

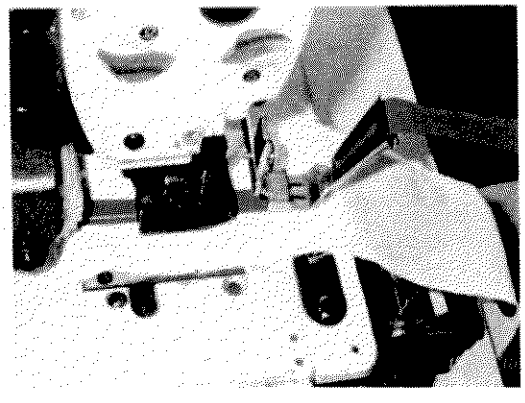
The improvement result:

They are planning to purchase the attachment. (The attachment is not available in this country so that it may take a bit of time to get it.)

Attachment catalog for "Bottom hemmer"



Before improvement



After improvement

Case 5

The improvement of quality of interlinings used for collar and plaket

The present state:

Interlinings obtainable from the local market are used, which are not always suitable to the raw materials stitched for garments.

Problems:

The required quality cannot be produced always.

The advice of improvement:

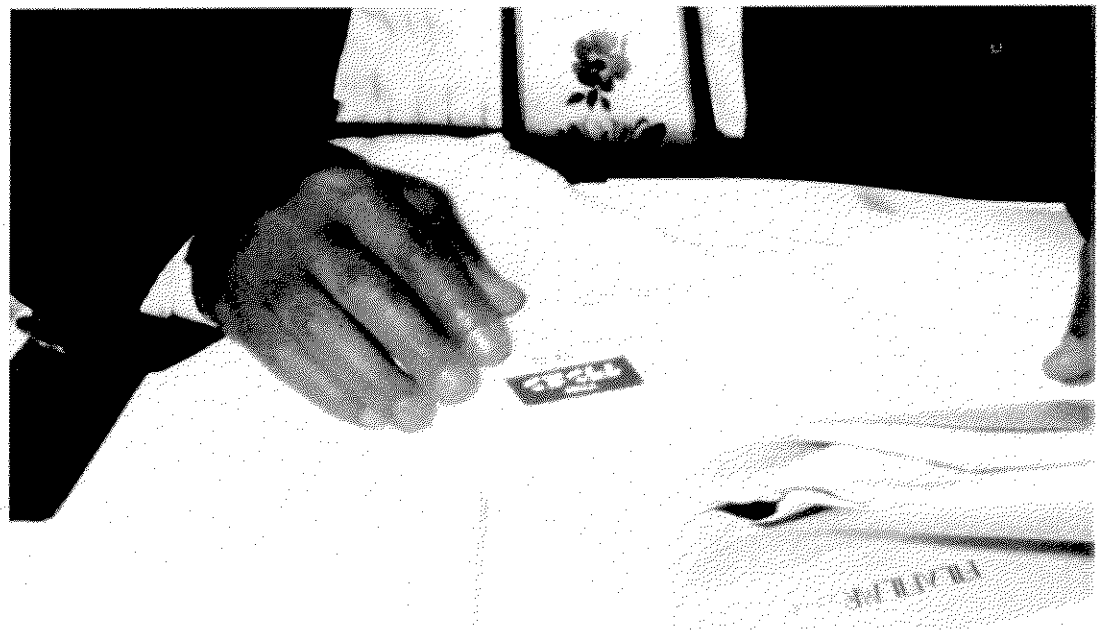
There is no local trader who supplies the interlinings suitable for the quality.

Therefore, overseas traders and the samples were introduced to them.

The improvement result:

The proposed prices and the quality of raw and sub-materials are being examined.

They are trying to find out the possibility of importing such products considering the quantities, the prices, the delivery schedules and the qualities.



A photo of sample catalog

Case 6

The improvement of work motion of workers in the factory

The present state:

There are overall dully work motions of workers in the factory at present.

Problems:

The productivity in the factory at present is low.

There is a possibility that the present situation fixes as atmosphere of the factory.

The advice of improvement:

Do the study of work motions of workers.

And it was guided for them to specify the targeted figures of works and to clarify the standard of work motions.

We encouraged them to have a morning gathering everyday, and guided them to use the chance to repeat the education for the workers.

The improvement result:

The study of work motion was started in the factory.

The small meeting was started every morning in the factory.

A photo of the meeting

Case 7

The improvement of relapse prevention of defective products

The present state:

The inspector returns the defective product to the worker causes the problems and the worker repair the defective part of the garments in working hours.

Problems:

The worker himself who made the problem has neither consciousness of relapse prevention nor consciousness of problem produced.

Therefore, the worker is repeating similar mistakes.

The advice of improvement:

The counter measure to the problem spreading in Southeast Asia was proposed as guidance:

- The repair work of the product is not done in working hours.
- The worker who caused the problem repairs the products and takes responsibility of the repair work.
- The group leader assists the work together with the worker for repairing.

The improvement result:

The worker and the leader of the group repair the defects together at lunchtime and after working hours.

The repair work in working hours has decreased.

The actual production resulted almost as same as the production plan.

The worker comprehended the uselessness of the repair work keenly.

The occurrence of the mistake that leads to the repair work has decreased.

A photo of the repairing after the working hour

Case 8

The improvement of productivity

The present state:

Job leaders arrange preparations of works of the day every morning.

Problems:

Workers can not start the job punctually, since they have to wait until the preparation is over. And this often caused the delay of start working in case of late coming of job leaders.

Therefore, the delay of the preparation directly influences the work of the workers.

The advice of improvement:

It was guided the work preparation of the next day has to change to the previous evening after finishing the work of the day.

The overtime work allowance was offset to the leaders, which would be compensated by minimizing unnecessary stand by time of workers.

The works uncompleted the process at the end of the working hour should be accomplished by the job leaders.

The improvement result:

The start of the job for every morning becomes punctual, which up-heaves the moral of workers, too.

Because the job leaders prepare the next day's work before hand, one day before, the works for the next day becomes smooth and well fulfilled.

"Plan-do-think" becomes leaders' habit and contributed to their capacity building.

"Team spirit" is fostered by the relationship between the job leaders and the workers, which encourages the workers to cooperate with the leaders and to finish the job assigned for the day.

As a result, entire productivity is improved and the factory becomes more orderly in terms of working atmosphere.

A photo of the work preparation for the next day by job leaders

Case 9

The improvement of the color fastness of dyed materials

The present state:

The color fastness of dyed materials in this country does not seem good, which depends on the technical levels of dyeing factories.

The principle of competition does not seem to be working since the dye factory is few. And this is why the clothing manufacturers are obliged to accept the inferior quality of dyeing which is below the international standard.

Problems:

No efforts to improve the quality because of an oligopolitic situation of dye factory.

The people in the SMEs lack the quality awareness for the color fastness.

The advice of improvement:

At the time of placing an order, the required color fastness should be specified to the dye factory.

The test report of color fastness for the dyed materials should be submitted to the sewing factory when the fabrics are delivered.

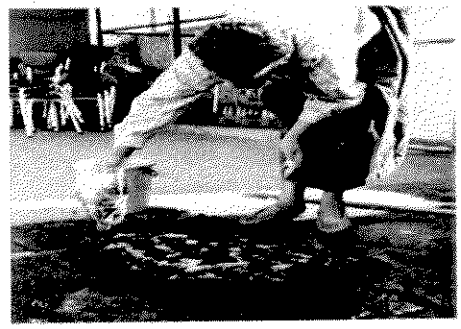
Random sampling tests have to be carried out by the sewing factory.

In case of the inferior quality of dyed fabrics, the sewing factory should have a hard negotiation with the dyeing factory to up-bring their technique until the quality improves.

And the improvement of quality has to be supervised by the relevant authority such as SAZ to up-grade skills of dyeing factory to meet international standards.

The improvement result:

The user starts to practice above suggestion and trying to change the attitude of dyeing factories by repeating the action such as random sampling, etc.



A photo of batik dyeing factory

Case 10

The improvement of collar shape

The present state:

The collar is a rugged and non-symmetry on a right and left side.

Problems:

The rugged and non-symmetry collar debases the shirt.

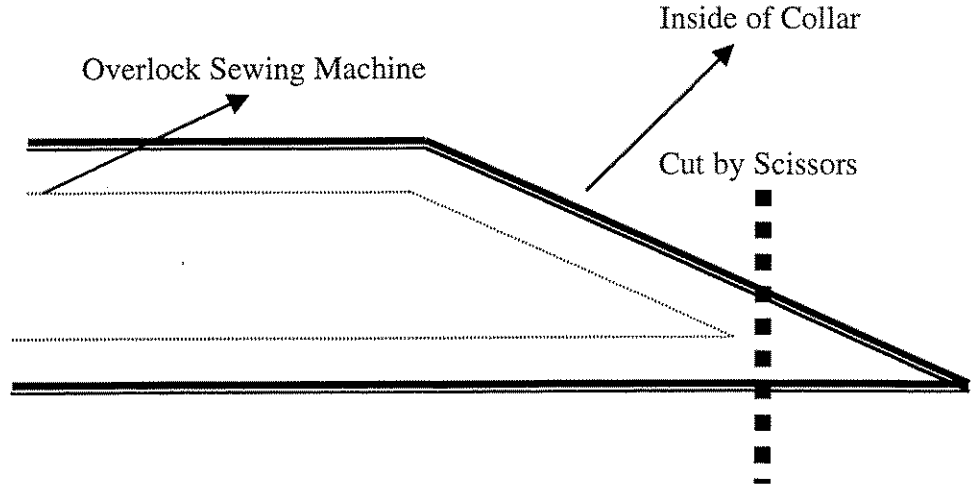
The non-symmetry of the collar is caused by the ruggedness.

The advice of improvement:

The extra cloth of the collar point as shown below should be cut off with scissors before turning the collar inside out.

The improvement result:

The collar is symmetry and up-grade the quality.



Case 11

The improvement of uneven required time of processes by time studies and analyses

The present state:

There are uneven amounts' stays of products in the process of sewing.

And it seems that the norm of process set low because of neck processes.

Problems:

The problems of process have not been found since the time studies of process have not been carried out.

As a result of above-mentioned, the target of production has been based on only the past records and set low, which would not have been possible to improve the bottle neck processes and to solve the fundamental problems about the efficiency of production.

The advice of improvement:

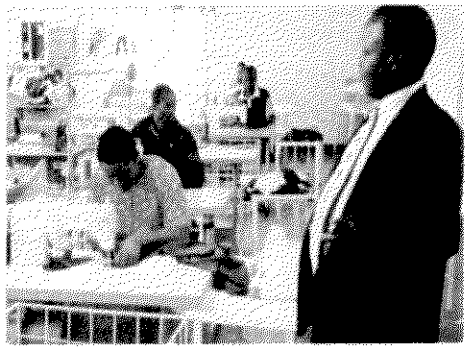
The method of time study and analysis is guided and executed.

The upper limit and the lower limit of the time study and analysis for the production are identified. And the work processes are restructured to be in the limits both for the upper and the lower after analyzing the processes of the works.

The improvement result:

The bottle neck processes are improved and the entire productivity has been improved.

They became applicable to solve the similar problems in the future by understanding the method of time study and analysis.



Case 12

The improvement of late comers at the factory

The present state:

There are many late comers including group leaders of works at the factory and the absenteeism of workers is also high, which create a bad atmosphere of the company.

Problems:

Because the work leaders who should instruct workers do not keep the start of work time, the workers cannot be ordered.

Unpunctual timekeepers influenced and contributed to the delay of delivery time and also the low productivity of products.

The advice of improvement:

It was educated that the unit of the time in sewing factory is a second. For instance, eight hours are 28,800 seconds.

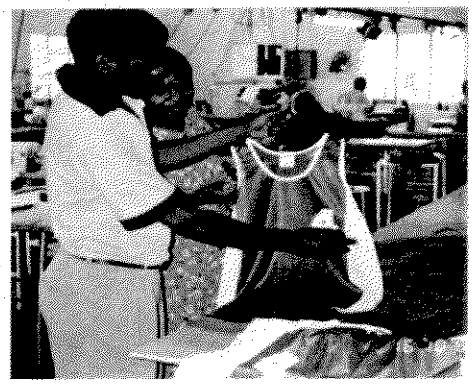
Workers' targets were shown by the unit of second, which was lectured at the meeting of workers with a example of time study and analysis.

All group leaders are educated that such situations like the current state of 10 to 20 minutes' delay of starting works are out of the question and the competition.

The improvement result:

One week later, I received a telephone call from the owner of the company that he was so happy with the results of the advice.

And mentioned that the leaders were educated to come to the company before the starting time and even the preparation works were completed in advance everyday.



A Preparation Work by Leaders

Case 13

The improvement of the daily routine

The present state:

The group leaders should have regularly oiled the sewing machinery and others consulting the condition of each of them. However, it was often forgotten.

And the parts of sewing in the process should have been kept properly after finishing the day job. But the parts left in the each process after leaving the workers were not in order.

Problems:

The sewing and other machinery are not in good condition because of the irregular maintenance to them.

The sewing parts left not in order should be rearranged the next day, which might take an extra loss time before starting the works of the day.

The advice of improvement:

The workers who handle the machinery oil them instead of the group leaders.

And the workers arrange the parts left unfinished in order after finishing the working time of the day.

The improvement result:

The workers oiled the machinery every day, which affected the workers' attitudes to pay more attention on cleaning and maintenance of machinery and the cleanliness of the products, too.

The parts of fabrics for sewing are always arranged in order, which contributed the high productivity of production by minimizing the loss for searching the parts required.

And it also contributed a lot for the improvement of qualities of products by simplifying the work motions.

Case 14

The improvement of new products development capability

The present state:

New products development relied on the samples and instructions given by buyers.

Problems:

Without receiving the samples and instructions from buyers, it seems very difficult for the suppliers to create new one.

And this made the activities of suppliers in the passive attitude, with which the suppliers would not easily maintain the production capacity.

The advice of improvement:

The following training is necessary to be able to propose new samples of which the trends are in fashion for buyers:

To subscribe fashion magazines for studying and analyzing the current fashion trends regularly, and for training themselves to create new samples repeatedly to the buyers.

The improvement result:

They pay enough attention to the current fashions.

Regular subscriptions of the fashion magazines are under consideration.

They started to use the fashion-related information in libraries.

Fashion Magazines

FURNITURE

CONTENTS

1. Improvement of Miter Joints

1-1 Present State

Miter jointing technique is inadequate, resulting in the formation of unnecessary gap in joints.

Two edges are miter jointed, decorating the sides of the table's top boards or cupboard inner shelves at each corner.

Due to inadequate jointing technique, unnecessary gaps are formed as shown in Photograph 1, degrading the product quality.

Photograph 1 Miter joints with chinks

1-2 Problems

Work of adjacent angles is made by hand. As a result, precise work is neglected.

Even in case when machinery is used, techniques required for precise processing are insufficiently applied.

Products with chinks in places of miter joints are nevertheless sold in the market with putty-filled gaps.

1-3 Technical Transfer for Improvement

The first prerequisite for improvement is to increase precision of processing. In order to improve the above problems, the following improvement methods were advised.

(1) A miter joints processing method commonly used in the Japanese furniture manufacturing factories (see Figure 1) was introduced.

Junction angle is made to be slightly less than 45° (44.7°), and adjacent angles are compressed with big strength against each other until they stick fast together.

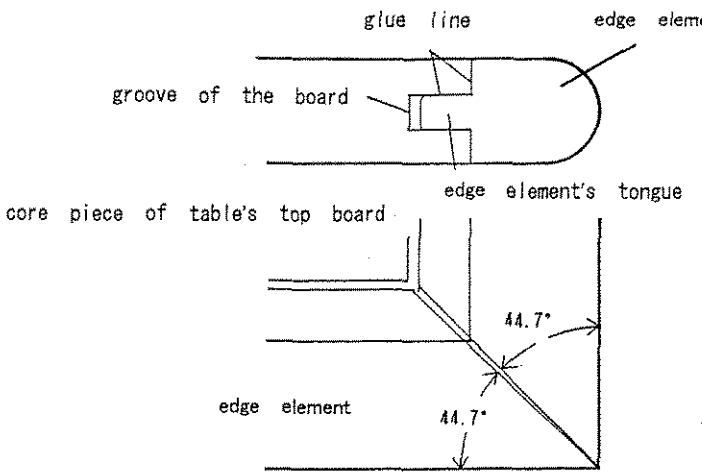


Figure 1 Miter joint treated at 44.7°

(2) To cut a thin board according to the shape of the joint and fasten it over the thick board (base board), as shown at Figure 2.

(3) To use finger-joint method, as shown at Figure 3. This method requires preparation of the machine's cutting blade.

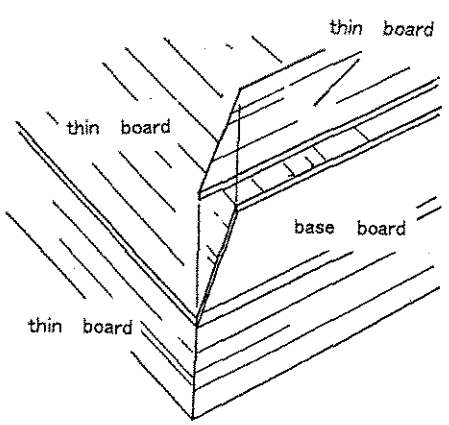


Figure 2 Miter joint with the use of a thin board

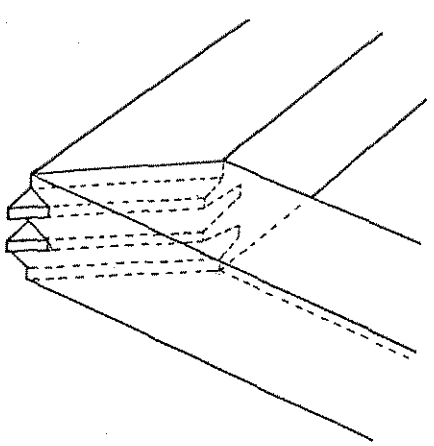


Figure 3 Miter joint with the use of finger-joint method

1-4 Results of Improvements

As a result of technology transfer, the workers acquired necessary techniques for miter jointing.

Making angles at both surfaces of miter joint narrower is an experience-proven technique. Therefore, the workers should repeat their practice as much as possible.

2. Improvements of Sofa's Frame Assembly Methods

2-1 Present State

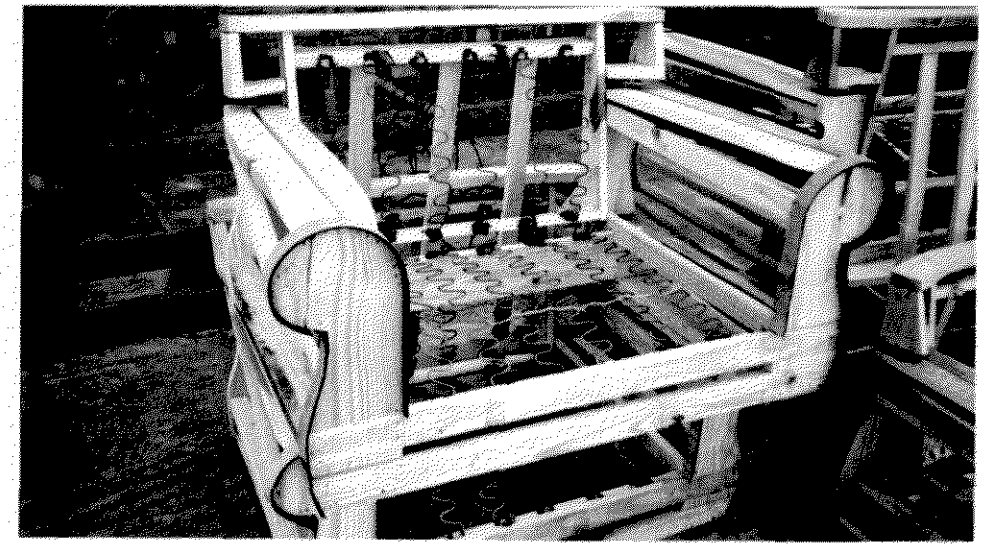
The workers employ an improper assembling method as to assemble all frame parts at one time.

Pieces are assembled using butt joint method, making the whole structure of the frames unstable.

Workmanship is extremely poor. Therefore, pegs are bent, boards are cracking, joints have chinks.

2-2 Problems

As shown at the Photograph 2, work is carried out by setting a sofa's frame through a single operation.



Photograph 2 Sofa's frame setting

If sofa's frame setting is not accomplished by at least 40 - 50%, pieces under operation become shaky and unstable; thus pegs/nails that are driven in also will have no strength.

Under such conditions assembly work easily causes mistakes in operation. All this contributes to the deterioration of product's strength.

2-3 Technical Transfer for Improvement

The following advice was given to the workers:

As shown in Figure 4, fabricate the components into four blocks [seat, back and armrests (left and right)].

After this, assemble these four blocks to build the framework of the sofa.

Furthermore, at the stage when blocks are fabricated (see Figure 5), holes for driving in pegs should be opened in specified places, according to the drawing.

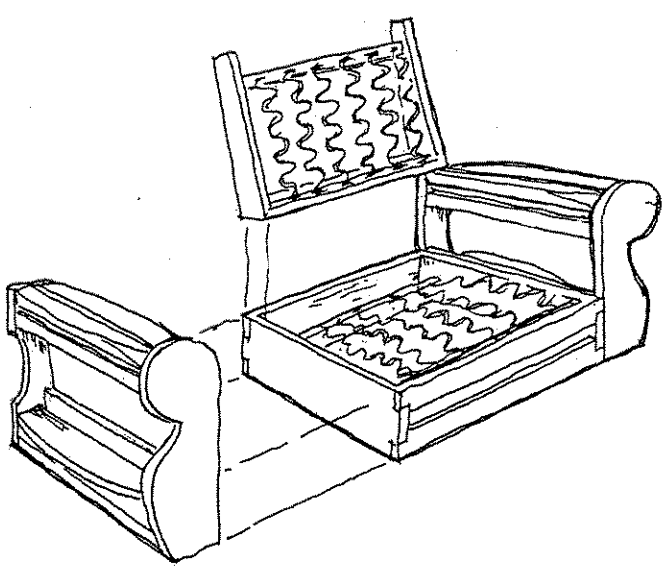


Figure 4 Method for assembling prefabricated blocks

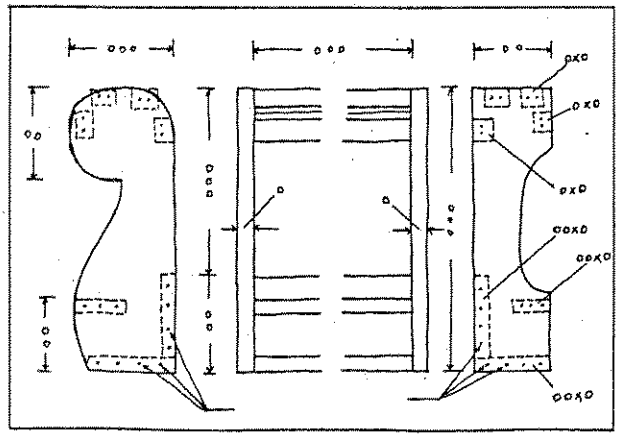


Figure 5 Drawing for processing

2-4 Results of Improvements

Prefabrication of 4 blocks, and preparation beforehand of holes for driving in pegs would make the work easier, and may lead to substantial shortening of time required for working operations. Furthermore, strength of the commodity may also be increased. (see Photograph 3. After the improvement)

Photograph 3 After the improvement

3. Improvement of Fixing Shelves

3-1 Present State

As shown at the Photograph 4, wardrobe's shelves are crooked.

3-2 Problems

The widths of the wood supports are varied, and this wakes the total framework of the shelf unstable. (see Figure 6)

The higher the racks are positioned, the wider are the differences in the height of shelves.

Finally, the racks are made inclined.

Photograph 4 Wardrobe's shelves with defects

3-3 Technical Transfer for Improvement

Width of wooden supporting rails has to be properly arranged.

In case when width of supports is not arranged, special saw-shape gauge should be made by the workers (see Figure 7) so that they can fix the shelves at proper positions.

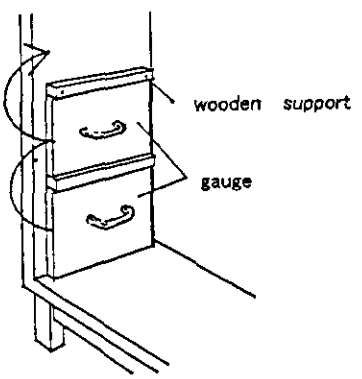


Figure 6 Gauge and working method used at the factory

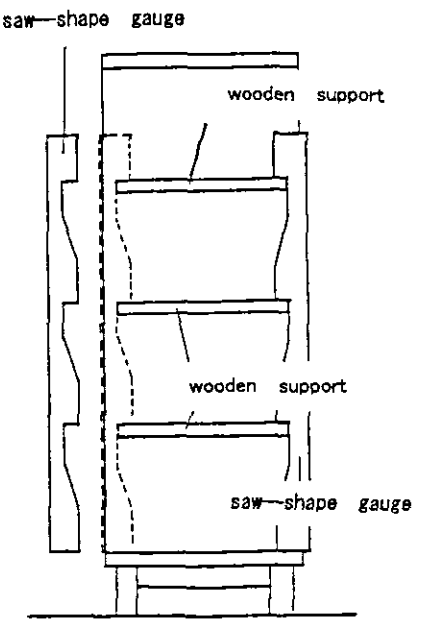


Figure 7 Using saw-shape gauge

3-4 Results of Improvements

As a result of the above technical transfer, the workers improved their technique for fixing shelves and high quality wardrobes were manufactured.

4. Improvement of Slide Rails for Cupboard's Drawer

4-1 Present State

Slide rails are set inside the frames of a cupboard for supporting the drawers (see Figure 8).

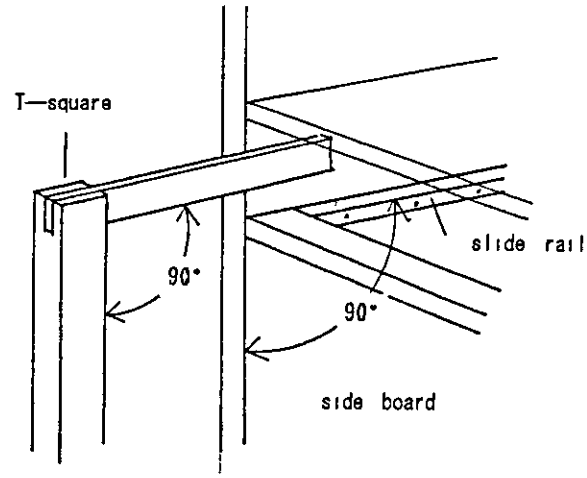


Figure 8 Fixing slide rails of cupboard

In the factory two slide rails are positioned with different heights (in horizontal direction), causing rattling when the drawers are pulled out.

4-2 Problems

The workers fix the slide rails at their respective positions with "eye measurement" without using a Try-square. (see Table 1)

The following table shows the heights of both left and right frames, which were actually measured at each position. The troubles of rattling occur in proportion to the size of height differences.

4-3 Technical Transfer for Improvement

The Consultant trained the workers in the following skills:

(1) To fix the slide rails at their correct positions using a Try-square as shown in Figure 8.

(2) To fix the supports for the wardrobe's pipe for hanging clothes by using a limiting gauge as shown in Figure 9.

Table 1 Comparison between the heights of left and right slide rails

(Units: mm)

Sample	Point of measurement	Left		Right	
		Left slide rails	Right slide rails	Left slide rails	Right slide rails
A	Height	155	145	143	155
	Difference left/right	10		12	
B	Height	150	145	145	155
	Difference left/right	5		10	
C	Height	140	145	155	155
	Difference left/right	5		0	
D	Height	155	150	150	160
	Difference left/right	5		10	

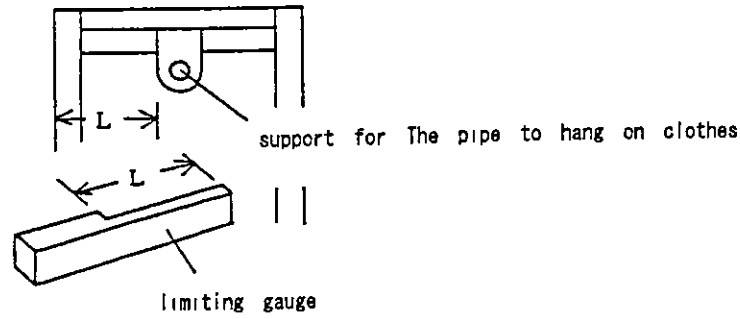


Figure 9 Fixing the support with the use of a limiting gauge

4-4 Results of Improvements

The workers have acquired skills for fixing the rail slides and the supports for wardrobe pipes at their right positions by using a Try-square and a limiting gauge. As a result, the quality of a wardrobe in the factory has greatly improved.

5. Improvement of Methods for Panel's Processing

5-1 Present State

The widths of the side boards used for a wardrobe are uneven, contributing to the deterioration of its (Wardrobe's) quality, a shown at Figure 10.

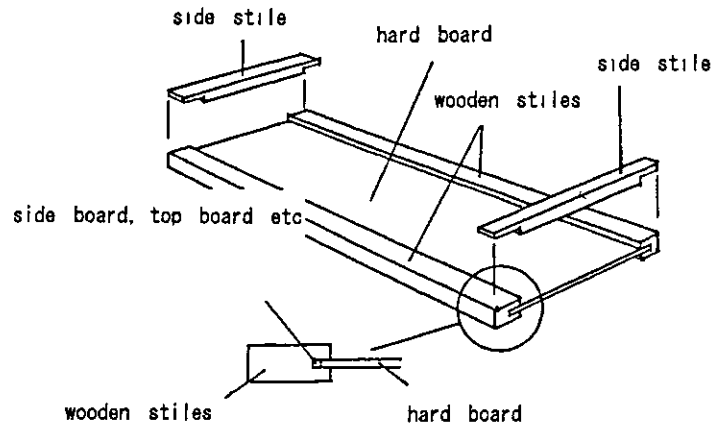


Figure 10 Processing of side boards and top boards

5-2 Problems

The workers install the hard-board into the slots of the stiles without using proper tools or gadgets, and as a result, the widths of the side boards are made uneven.

5-3 Technical Transfer for Improvement

(1) As a method of allowing the hard-board to enter the slot made in each frame properly, a compression device shown in Figure 11 with stoppers has been proposed.

In this case, the compressor presses the hard-board to the positions where the both stoppers are positioned.

It is necessary to nail the side stiles in order to firmly fix the hard-board.

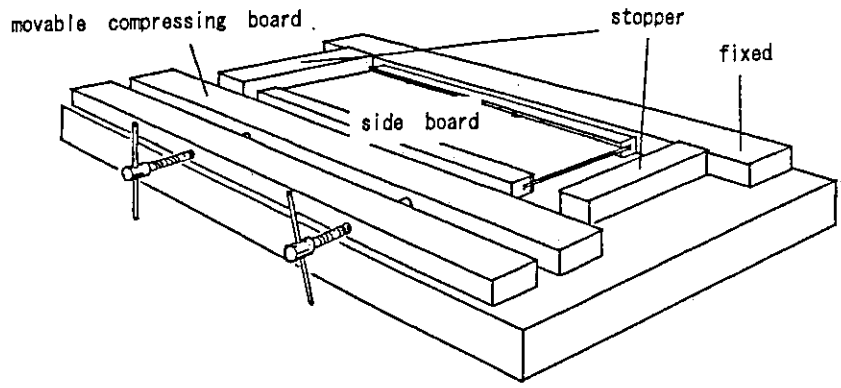


Figure 11 Compressing device for processing boards with even width

(2) If it is only to install a hard-board into the stile's slot, big compression is not needed. There cam-assisted compression (as shown at Figure 12) may be sufficient.

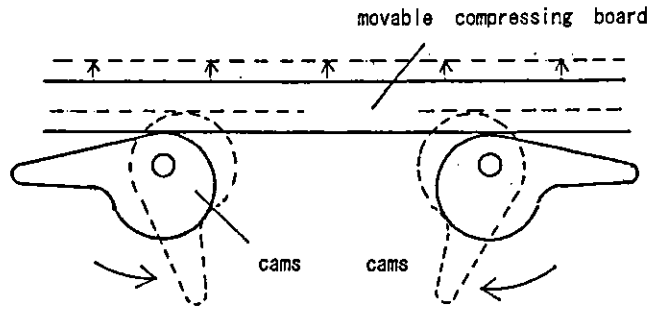


Figure 12 Cam-assisted compression

(3) A fire-fighting hose or case/cover alike may be used, as shown at Figure 13, to give necessary pressure to the side stiles.

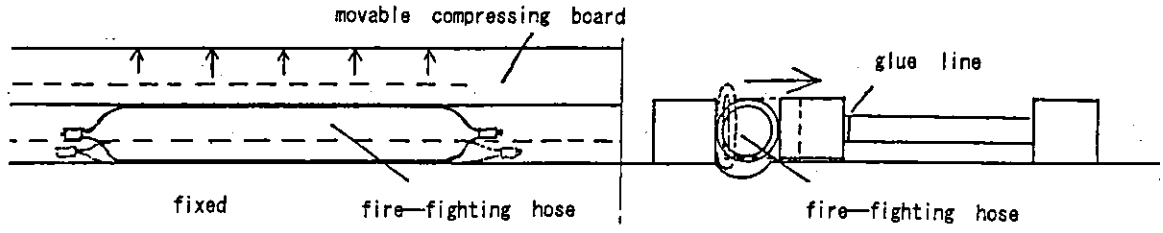
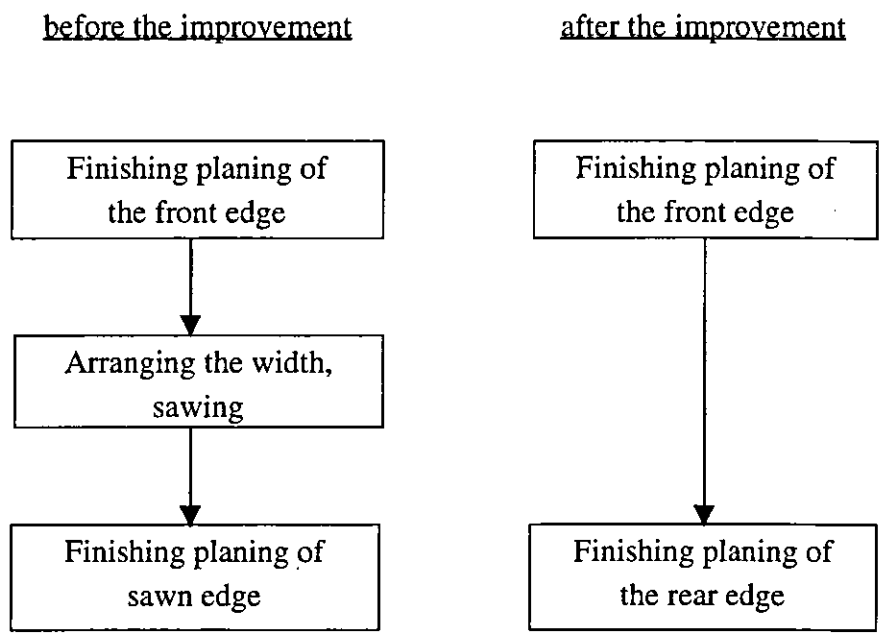


Figure 13 Compression with the use of fire-fighting hose

5-4 Results of Improvements

As a result of the necessary instructions mentioned in 5-3 (1), (2) and (3) above, the widths of the side board have become even and one manufacturing process (sawing for arranging widths at both ends) becomes unnecessary. (see Table 2, after the improvement)

Table 2 Comparison of stage's number in manufacturing processes, before and after the improvement



6. Improvement of Working Tables

6-1 Present State

As shown in Photograph 5, the top board placed on the work table is not thick enough for strong hammering.

Photograph 5　Working table in a local factory

6-2 Problems

The top board of the working table vibrates at each hammering and nailing work is hindered.

6-3 Technical Transfer for Improvement

The Consultant instructed the workers to replace the thin top board with a thicker board.

He has shown the picture of a working table used in a Japanese furniture manufacturing factory (see Figure 14).

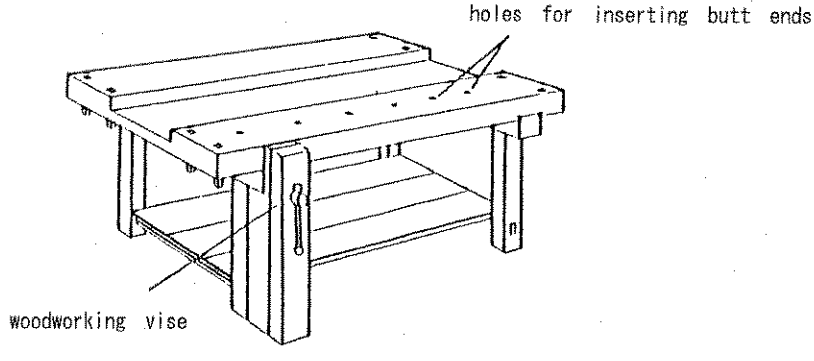


Figure 14　A Japanese working table

6-4 Results of Improvement

The workers have made several working tables with thick boards on their tops at the instruction of the Consultant.

As a result, nailing work at the factory has been greatly improved.

7. Improvement of an Adhesive Coating Machine

7-1 Present State

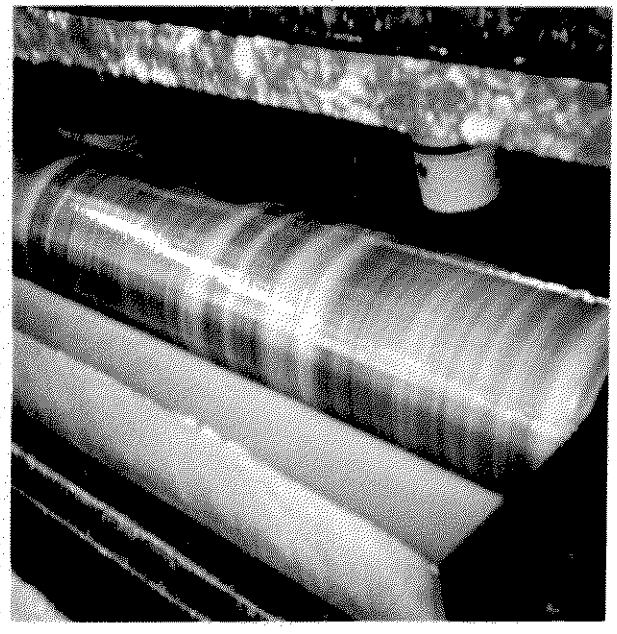
The thin boards are joined together on a hot press. The adhesive oozes out on thin boards, as shown in Photograph 6.

7-2 Problems

As shown in Photograph 7, the adhesive applied to the coating roller is uneven.

Due to this poor work, the processes at the later stages are greatly hindered. For example, unevenness in color appears on the table top or wardrobe surface.

Photograph 6 A thin board with adhesive oozing out



Photograph 7 Unevenness in sticking of adhesive to the application roller

7-3 Technical Transfer for Improvement

The Consultant advised the workers to employ the following methods:

(1) To regulate the front edge of the spatula straight to the roller so that adhesives can be applied evenly.

(2) It is desirable to use a spatula made of a material with high elasticity, such as hard rubber.

(3) To apply adhesives with average consumption of about 120～200g per square meter.

7-4 Results of Improvements

The production manager understood the importance of using the spatulas recommended by the Consultant and promised that he would purchase these in the near future.

8. Improvement of the Dressing Table

8-1 Present State

A dresser was returned to the Company for the reason that the mirror stand could not be fixed to the dresser's top-board.

The mirror stand is supplied to a customer together with a dresser in the form of a knock-down set, and it has to be fixed to dresser's top-board with bolts, as shown in Figure 15.

8-2 Problems

As shown in Figure 16, the lower board which supports the top-board from the bottom, blocks the hole for the bolt.

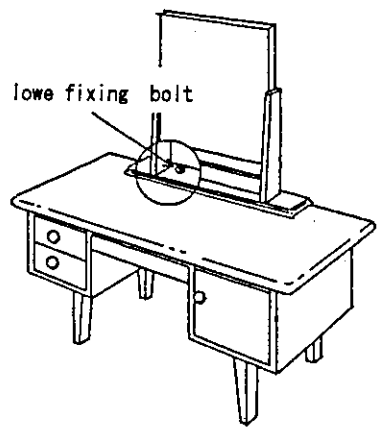
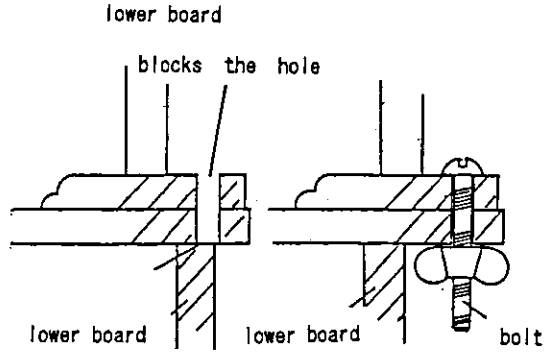


Figure 15 Sketch of a dressing table



Before the improvement

After the improvement

Figure 16 Position of the hole for a bolt

8-3 Technical Transfer for Improvement

The Consultant instructed the workers to learn the following:

(1) It is possible to mount the dresser by shifting the position of the lower board as shown in Figure 16.

Such shifting of the lower board requires no hard work.

(2) It was recommended to execute working operations by followings the drawing and working instructions which specify dimensions of parts / elements, positions for fixing, and also methods of fixing.

8-4 Results of Improvement

Improvement work was carried out according to the instructions given by the Consultant, and the dresser was accepted by the customer.

9. Preparation of Check-sheets for Articles Sent Back and for Product's Quality

9-1 Present State

There are no prepared sheets for checking the quality of the products when they are completed or when they are sent back by the customers for their defects.

9-2 Problems

Due to the lack of the above check sheets, many products with defects have been kept in the store without any measures taken.

9-3 Technical Transfer for Improvement

The Consultant gave the following advice: (see Figure 17.)

(1) To prepare the check sheets as shown below for recording the cases of defects or claims from the customers.

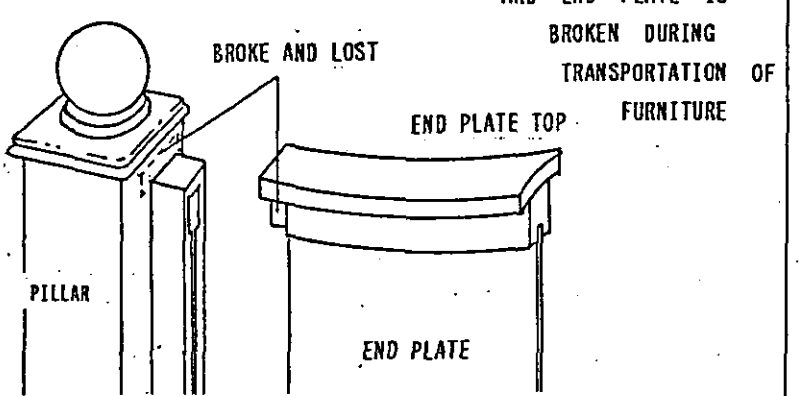
(2) To inform all the employees of the company of the above quality checking system and ask them to keep record of these claims or defects.

9-4 Results of the Improvement

The check sheets for the product's quality and claims from the customers were made by the workers as advised by the Consultant.

SERIAL NO.	DEFECTS REPORT SHEET		DATE
PRODUCT NAME	END PANEL OF BED	CLIENT NAME	
TRANSPORT BY		DATE DELIVERED	

RECORD OF DEFECT : -
(OR PHOTOGRAPHE)



CAUSE OF FAILER : -
IT COULD BE POOR DESIGN OF CONNECTING BETWEEN PILLAR AND END PLATE , SINCE END PLATE TOP AND PILLAR IS CONNECTED BY GLUE ONLY (NO MECHANICAL CONNECTION)

REMEDY TO IMPROVE : -

Figure 17 Reference example of report sheet

10. Improvement of Designs

10-1 Present State

A dining table made of pine wood has been sent back by a customer because of the defects of the table's feet.

10-2 Problems

As it may be understood from Photograph 8, the upper and lower parts of table's feet are poorly designed.

Photograph 8 Feet of a dining table

10-3 Technical Transfer for Improvement

The Consultant advised that the feet of the table be redesigned as shown in Figure 18 below.

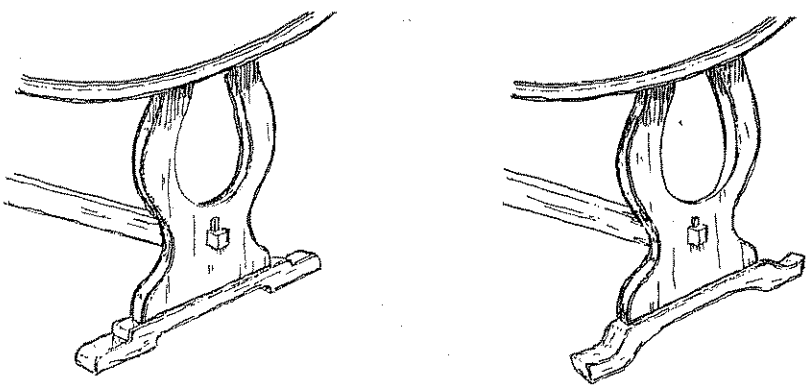


Figure 18 Improvement of table's feet

10-4 Results of Improvement

The workers improved the designs of the feet as advised, and the quality of the tables was improved to satisfy the customers.