Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-01	Plastic molding technology	Molding	
2nd category		Industry	Sector / Product
Injection		Household goods	Household goods / Small articles parts

Subject

Prevention of silver streaks on POM products

■ Diagnosis:

Silver streaks occur on POM (polyacetal) products and cannot be prevented although increasing the duration for predrying the POM resin. Predrying is done at 80°C and for 12 hours.

■ Guidance:

A silver streak may occur if predrying of POM resin is excessively long because partial deterioration occurs due to variation of the drying temperature and other factors. The appropriate predrying time should be 4-5 hours at 80°C, depending upon the construction of the dryer and drying conditions. It is recommended to shorten the predrying time.

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

The predrying time was reduced to the recommended range and no silver streak occurred.

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

An appropriate temperature and duration for predrying varies with type of resin and should be determined for other resins through additional surveys.

1 Case A

Description of Problems

In molding POM resins, some streaks are produced.

Diagnosis and Recommendation

The company is drying POM resins 12 hours at the temperature of 80 degrees C. The study team proposes that the company should shorten the drying time to four or five hours at the same temperature, because too long drying of the materials tends to produce silver streaks.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-02	Plastic molding technology
2nd category	
Injection	

Division / Process	
Molding	
Industry	Sector / Product
Household goods, Automobiles	Household goods, Automotive parts

Subject

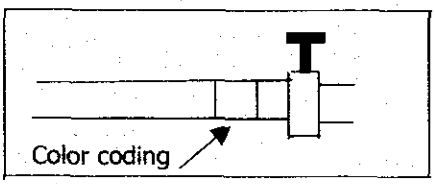
Indication method for piping (machinery and equipment upgrading)

■ Diagnosis:

Water supply, air and cooling water pipes within the factory are all made of gray-colored PVC, making it difficult to distinguish one from another, including the flow direction.

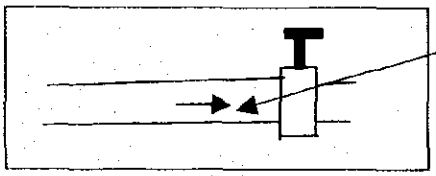
■ Guidance:

1) To paint or mark each pipe in a different color, near its joint.



Example of color coding:
Water supply - white;
Cooling water - blue;
and Air - red
or indicate each by name

2) Direction of flow



To make the direction of flow by arrow

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

Under examination (yet to be executed)

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

None

1 Case A

Description of Problems

Pipes for water, oil, and compressed air are indistinguishable in appearance. The flow of water, gas, and compressed air is also indistinguishable.

Diagnosis and Recommendation

The study team proposes that the company should make piping and the flow of water, gas and compressed air distinguishable in appearance, to maintain the production facilities more effectively.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-03	Plastic molding technology	Molding	
2nd category		Industry	Sector / Product
Injection		Automobiles	Automotive parts / Truck taillights

Subject

Prevention of flow marks on acryl-made, track taillight cover (improvement of die)

■ Diagnosis:

Investigation on various flow marks revealed that all of them occurred in the same cavity (one of four cavities), which gate was thinner than others, according to close observation.

■ Guidance:

The molding machine was stopped and the gate was finished by file to increase gate thickness. Then, molding was resumed. (See the figure)

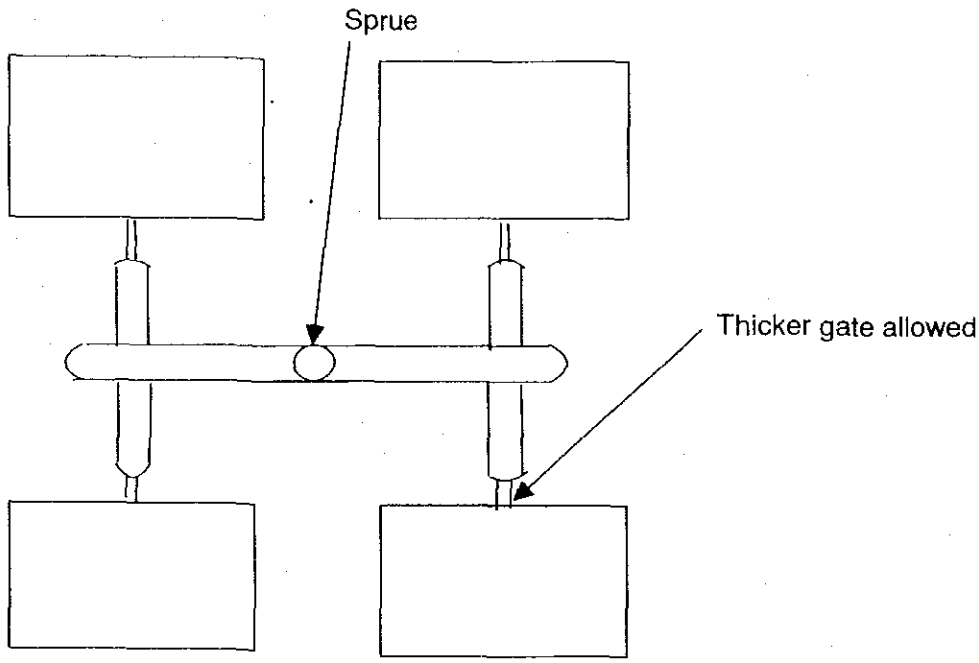
■ Response of the enterprise (as confirmed during the follow-up activity):

The thicker gate allowed smooth flow of resin and no flow mark appeared.

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

None

Figure Prevention of flow marks on acryl-made, track taillight cover (improvement of die)



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-04	Production management	Extrusion	
2nd category		Industry	Sector / Product
Work management		Construction, Electrical work	Guide grooves, Trims, Electric cord covers

Subject

Preparation of an extrusion molding condition table

■ Diagnosis:

No extrusion molding condition table is available, and molding conditions are set by a supervisor according to personal judgment based on intuition and experience. As the supervisor does not memorize all molding conditions for a wide range of products, defects often occur until the optimum conditions are found and set. In particular, quality of extrusion molded products can be judged only after sizing, cooling and drawing. As no immediate evaluation can be done unlike injection molding, more defects are inevitably produced.

■ Guidance:

The molding condition table allows an inexperienced operator to set the molding machine correctly and free the supervisor from judgment based on intuition and experience. As a result, defects can be reduced and profits will increase.

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

Not implemented

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

The JICA team prepared molding condition tables for two machines on the basis of detailed diagnosis. The company is expected to prepare the tables for other machines by themselves.

1 Case A

Description of Problems

The lists of extrusion conditions for each machine and each product are not made.

Diagnosis and Recommendations

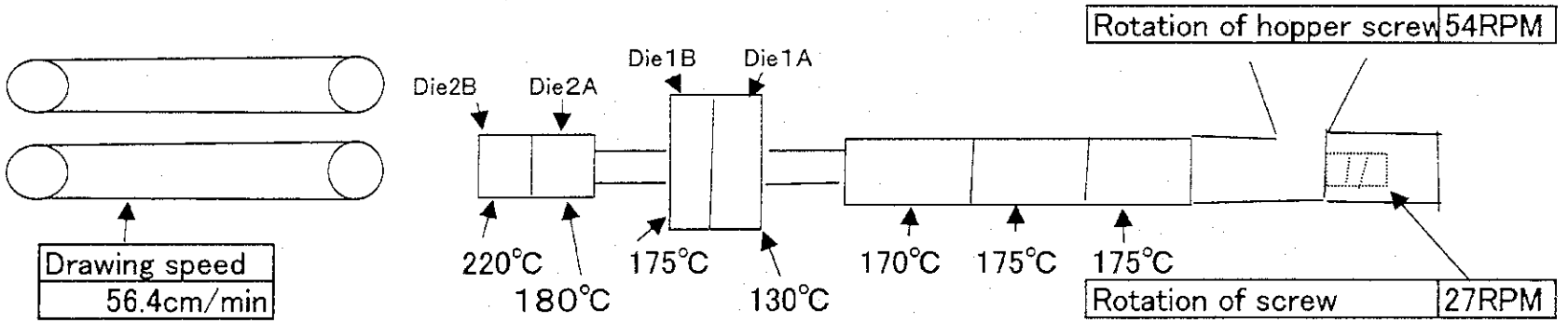
As a result of this diagnosis, the JICA study team proposed that DM Plastics should make a list of molding conditions for each extruder and post it by the side of the extruder.

1) At present, DM Plastics has depended on the past experience and intuition of the setters for setting up the molding conditions. But, no matter how experienced they may be in this work, it will be impossible for them to remember all extrusion conditions they have so far set up. As a result, every time they change dies, they will need some time to set up the optimum molding conditions. It also follows that a lot of defective articles will be produced. Since, in the case of extrusion molding, the quality of the articles can be judged only after they are cooled and drawn, more defective articles will be produced.
2) Moreover, if the setters are absent on account of illness or accidents, the company will find much difficulty in starting production. Accordingly, it is necessary to make standardized tables for extrusion conditions so that the setters with less experience can set up them effectively.
3) The extrusion industry in every country has made strenuous efforts to set up numerical molding conditions including speed, revolution and temperature in order to reduce rejects, not relying on experience and intuition of the setters. Especially in molding transparent products, it is more important to set up these numerical conditions because their materials can not be recycled.
4) The examples of the list of extrusion conditions are attached (Annex A-1).

Annex A-1 EXTRUSION MOULDING CONDITIONS (1)

MACHINE: EXT 17

PRODUCT NAME : Double trunking



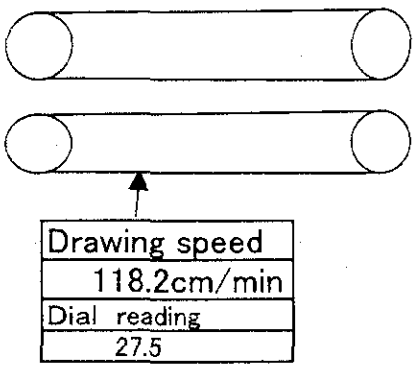
In this machine the screw axle end is not located at outer position.

Drawing speed 0.0094 m/sec
=56.4cm/min

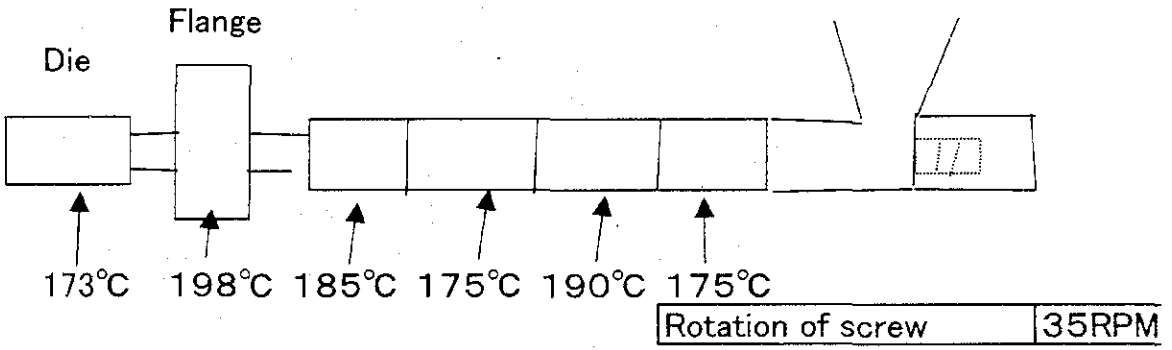
Annex A-1 EXTRUSION MOULDING CONDITIONS (2)

MACINE :EXT 18

PRODUCT NAME :Clip section



Drawing speed
118.2cm/min
Dial reading
27.5



Rotation of screw	35RPM

Note: 4m/3min23sec(Result of measurement)

Note: In this machine the screw axle end is not located at outer position.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-05	Production management	Extrusion	
2nd category		Industry	Sector / Product
Process control		Construction, Electrical work	Guide grooves, Trims, Electric cord covers

Subject

Improvement of a daily production report form

■ Diagnosis:

Management does not receive appropriate production information from shop floor and thus fails to understand the operation status and potential problems accurately. Daily production report is expected to be made using a job card, which should record the production number, delivery schedule, raw material used, material batch number, production start time, end time, mold number, dimensions (key dimensions, A, B and C), and the signature of the machine setter.

■ Guidance:

A job card should be modified for simple entry. The daily production report should record key data only and allow any trouble to be identified easily. The new report form should include the following information:

1) The actual progress of operation by time, including normal production (start and end), changeover, trial operation, and troubleshooting (defect correction), which should be recorded in a bar chart; and

2) Extrusion molding conditions set for the machine.

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

The original form was partially modified.

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

Not all workers can fill out the form and training is currently underway.

1 Case A

Description of Problems

The number of revolutions for the extrusion screw axles and the drawing speed are not recorded.

Diagnosis and Recommendation

The Study Team suggested some points for improvement. The Study Team showed a sample as shown in Annex A-1.

Annex A-1 Job Sheet for Extruding

JOB CARD No. MACHINE No.

QC:	DESCRIPTION	DATE REQUIRED	QTY.
MATERIAL TYPE:	BATCH No.	COLOUR:	RUN TIME

SHIFT A: OPERATOR SHIFT B: OPERATOR

T	A	PLAN	ACT	VAR	COMMENTS	SUP	A	PLAN	ACT	VAR	COMMENTS	SUP
6												
7												
8												
9												
10												
11												
12												
1												
2												
3												
4												
5												
6												

TOTAL PRODECTION SHIFT A: TOTAL PRODECTION SHIFT: B:

1.DETACING DIE etc. AND FIXING NEXT D 2.ADJUSTING AND TRIAL WORKING 3.NORMAL PRODUCTION

4.WORKING. TAKING COUNTER MEASURI 5.STOP OF MACHINE 6.OTHERS

A=ACTIVITY ACT=ACTUAL Z=ZONE

T	TEMP.						DIMENSIONS				TEMP.						DIMENSIONS			
	Z1	Z2	Z3	Z4	Z5	DT	A	B	C	SUP	Z1	Z2	Z3	Z4	Z5	DT	A	B	C	SUP
6																				
7																				
8																				
9																				
10																				
11																				
12																				
1																				
2																				
3																				
4																				
5																				
6																				

Time	Rotation of Screw	Drawing Speed	Time	Rotation of Screw	Drawing Speed

UNIT Rotation of screw : Rotation per minute(RPM)
Drawing speed: cm/sec (In case of rotation of drawer axle : RPM)

PLANNED MATERIAL WEIGHT: _____ ACTUAL WEIGHT _____

WEIGHT OF PRODUCT: _____ TOTAL WEIGHT OF PRODUCT: _____

TOTAL WEIGHT OF DEFECTIVE PRODUCT: _____

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-06	Production management	Inspection	
2nd category		Industry	Sector / Product
Quality control		Accessories	Button manufacturing

Subject

Improvement of Inspection Work

■ Diagnosis:

Completed plastic buttons receive final inspection as they are transported on the conveyor belt. Because they are scatter over the belt in large number, some defects are unnoticed and accepted.

■ Guidance:

Human eyes follow side-to-side movement easily and react slowly to vertical movement. Thus, it is recommended to arrange buttons in one or two row and position inspectors sideway to ensure accurate detection. This way, the conveyor speed can be increased. (See the figure)

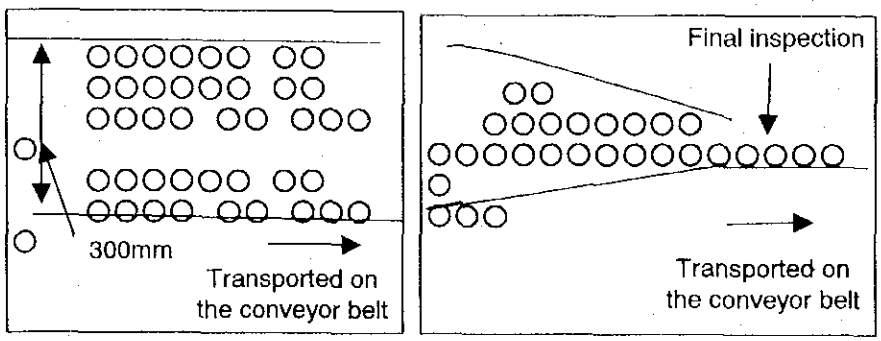
■ Response of the enterprise (as confirmed during the follow-up activity):

Not implemented.

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

Guides should be added to the conveyor belts. Also, some belts are damaged and need to be replaced with new ones.

Figure Improvement of Inspection Work



Before improvement

After improvement

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-07	Production management	Pouring	
2nd category		Industry	Sector / Product
Work management		Accessories	Button manufacturing

Subject

Optimization of timing for stamping of thermoset resin

■ Diagnosis:

Buttons made of thermoset resin are manufactured by stamping them out of a polyester plate. However, its timing is difficult. If the polyester plate is completely hardened, a crack occurs as the plate is pressed. On the other hand, if the plate is largely unhardened, it sticks to a cutting tool of the press.

■ Guidance:

As cure time varies with the quantity of a curative agent used, its optimum quantity and an appropriate range of cure time should be determined through experiments. Then, work procedures should be established to allow the stamping operation to be completed within the time range.

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

Executed

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

It is now important to post work procedures in the shop floor and ensure compliance by workers.

1 Case A

Description of Problems

Some rejects are produced in the blanking process of polyester sheets.

Diagnosis and Recommendation

- To make an instruction sheet for standard time for hardening polyester. (Too hardened polyester is easy to break and damages the cutter edges.)
- To sharpen well the edge of the cutters
- To make the sheets feed at the fixed pitches on the belt conveyors
- To check the blanked sheets if they are punched at equal spaces

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-08	Plastic molding technology
2nd category	
Injection	

Division / Process	
Molding	
Industry	Sector / Product
Electric machinery	Small articles / Lenses

Subject

Provision of slug wells for molds

■ Diagnosis:

No mold made by the company has slug wells, which play a critical role in extrusion molding. The need for slug wells should be realized.

■ *Guidance:*

When injection molding is carried out by keeping the nozzle in contact with the mold, the nozzle end cools down as heat is transferred to the mold and resin in the nozzle end cools down and begins to solidify. If such resin is extruded to mix with the product, a defect occurs. A slug well is provided to catch the cold resin and prevent it from being fed into the mold. (See the figure)

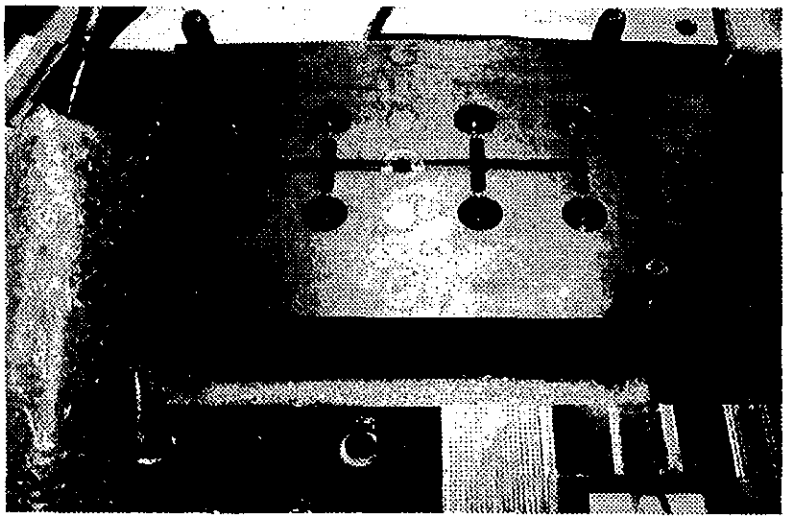
■ Response of the enterprise (as confirmed during the follow-up activity):

This was pointed out during the detailed diagnosis.

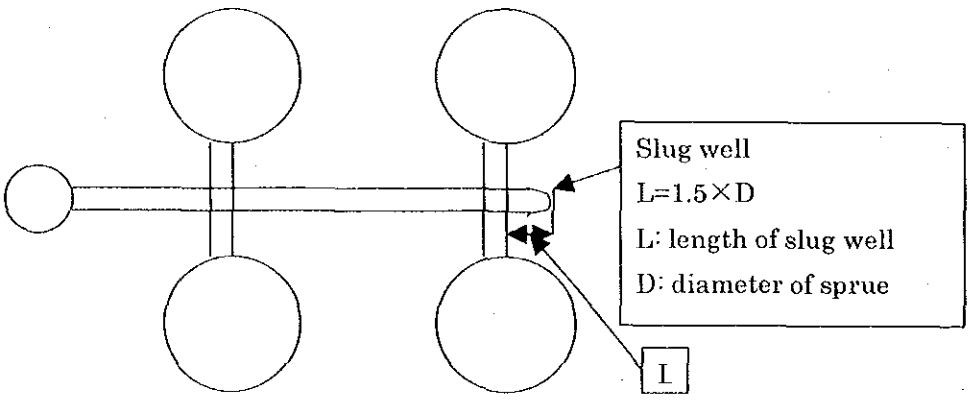
■ Other relevant points (issues to be solved and problems remained):

Slug wells will be provided for new molds as well as currently used molds if feasible.

Attached Figure



Picture



Figure

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-09	Plastic molding technology	Molding	
2nd category		Industry	Sector / Product
Injection		Medical equipment	Medical equipment parts

Subject

Jetting for medical equipment parts

■ Diagnosis:

8 parts for medical equipment are made by one shot of injection molding, but jetting occurs for all of them. As poor jetting is primarily caused by mold construction, it is recommended to modify mold design.

■ Guidance:

This defect occurs when resin injected from the gate into the cavity solidifies in a string form to leave a meandering pattern on the molded surface. Jetting is primarily a phenomenon caused by mold design (gate design in particular), which should therefore be modified as shown in the figure.

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

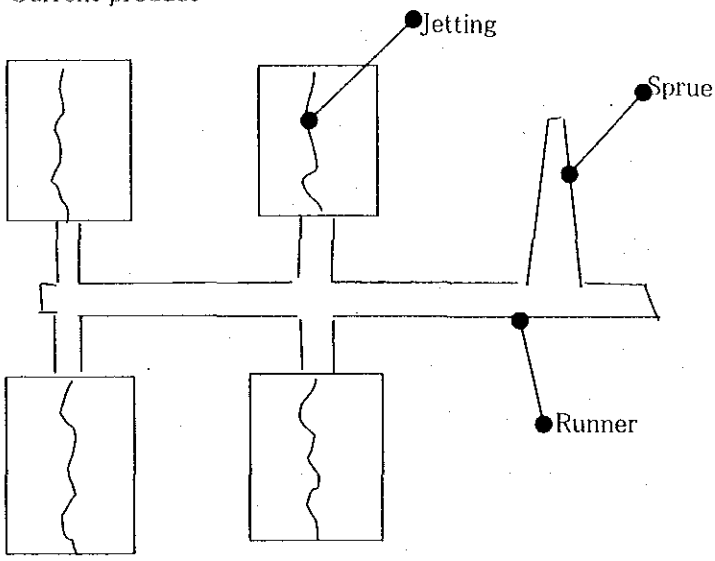
This was pointed out during the detailed diagnosis.

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

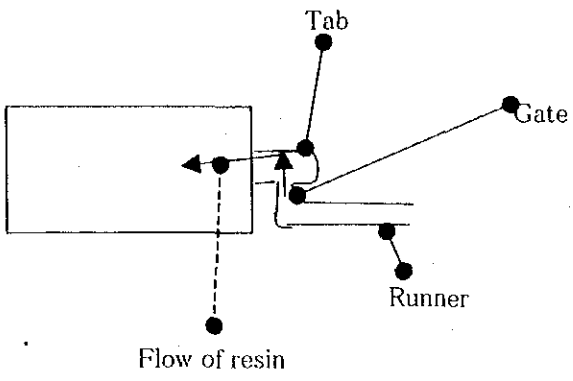
As modification of a mold is costly, it should be carried out in consultation with the affected customer.

Attached Figure

Current product



Countermeasure: To change to the tab gate.



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-10	Plastic molding technology
2nd category	
Injection	

Division / Process	
Molding	
Industry	Sector / Product
Measuring equipment	Measuring equipment / parts

Subject

Modification of mold design for cylindrical containers

■ Diagnosis:

Injection molding of cylindrical containers (conical in upper half), two at time, results in products with a burn at bottom. The burn occurs in a part where a vent hole is provided for molding.

■ Guidance:

Molten resin flows first into the cylindrical part of the mold and is joined by other flow in the conical part to form a weld line where air remains. The entrained air is compressed and heats up to burn the resin. As the mold is already in commercial use to prohibit adjustment of the product's thickness, a preliminary solution is to add a gate to the mold. If a burn still occurs, a pin gate should be provided closer to the center of the bottom.

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

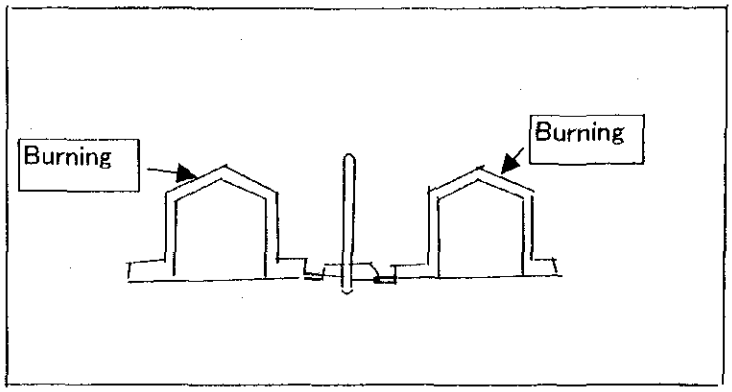
The above advice was put into practice.

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

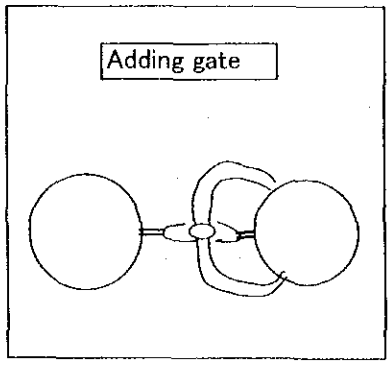
Once a mold is completed and put into use, it is costly to improve it and there is a limitation for improvement. The most effective solution is to design and make a mold with care not to produce a defect by learning basic design and production techniques.

Attached Figure

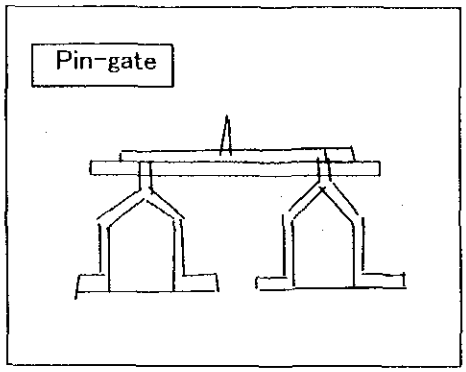
Curent situation



Countermeasure 1



Countermeasure 2



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-11	Plastic molding technology
2nd category	
Injection	

Division / Process	
Molding	
Industry	Sector / Product
Electric appliances	Electric appliances / parts

Subject

Fitting of a mold to an injection molding machine

■ Diagnosis:

1) A mold is set to an injection molding machine without concern about the relationship between the nozzle diameter or the radius (R) of the nozzle end and the radius of the spherical surface of mold spool bushing. In fact, the relationship is a critical factor.
2) Similarly, the relationship between the mold and the clamper (if used) and bolt's tightening depth are important to ensure durability of the molding machine.

■ Guidance:

The following advice was made (See Figures 1 – 5).
1) The relationship between the molding machine's nozzle and the mold spoor bush should be expressed by the following formula:
r = R + (0-1) mm
d = D + 0.5mm
Where,
r: radius of nozzle end
R: radius of spoor bushing
d: diameter of nozzle hole
D: diameter of spool bush

2) When a mold is fixed to a mold plate of an injection molding machine (mobile or fixed type), bolts need to be tightened down to 1.5 – 1.8 times the bolt diameter. If the tightening is shallower, tap holes of the mold plate are damaged to create hazards.

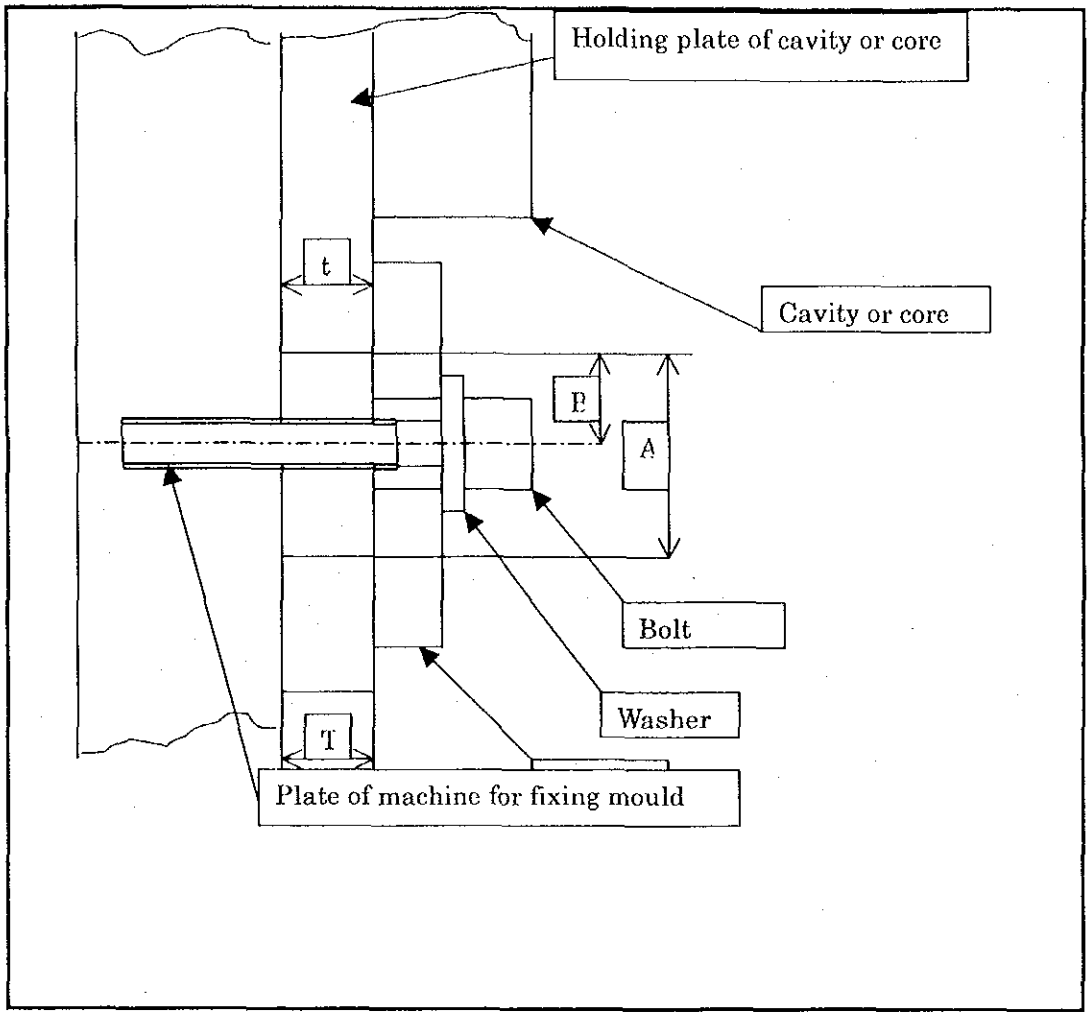
■ Response of the enterprise (as confirmed during the follow-up activity):

These points were made during the detailed diagnosis.

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

The above improvements require additional costs but are strongly recommended because the mold can become loose during operation.

Figure 1



t: Thickness of plate fixing cavity or core

T: Thickness of spacer

$t \leqq T+(0.5mm \sim 1.5\ mm)$

$B \leqq A/2$

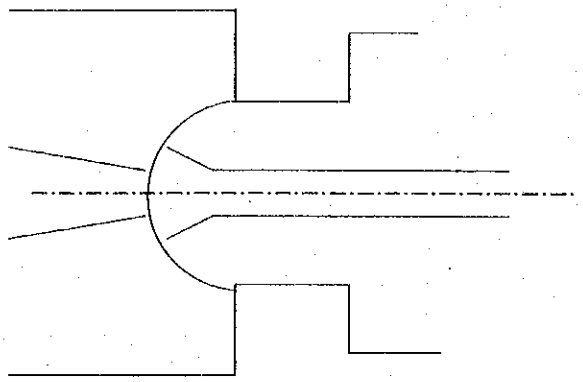


Figure 2

If the diameter of the sprue is smaller than the one of nozzle shown in Figure 2, the moulded portion of the sprue can not be separated from the mould, adheres on the fixed mould and remains at the top of the nozzle even if the moulded portion of the sprue can be separated. So, they are defective conditions for the following moulding operation.

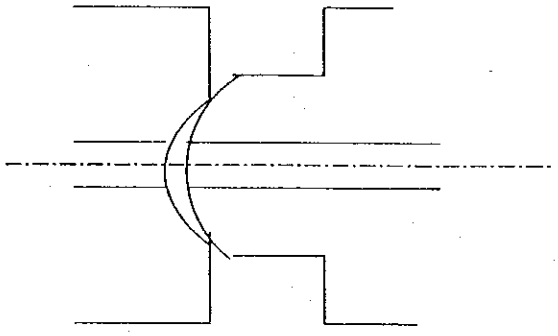


Figure 3

Because the radius of the hemisphere potion in the sprue is smaller than the one of the nozzle in the case "Figure 3", detaching the moulded portion of the sprue is difficult. So

this is the defective situation as same as "Figure 2".

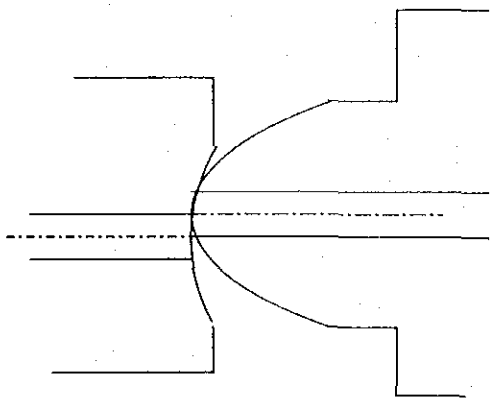


Figure 4

In the case of "Figure 4" the centre line of the mould does not accord with the one of the nozzle, so it is necessary to adjust them before moulding. If not, the melted resin overflows when injecting.

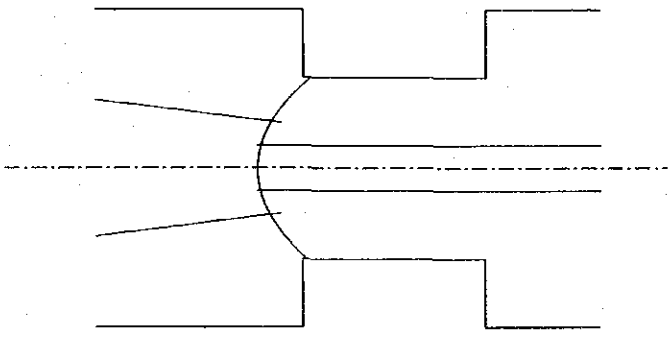


Figure 5

"Figure 5" is the correctly assembled situation.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-12	Plastic molding technology
2nd category	
Injection	

Division / Process	
Molding	
Industry	Sector / Product
Household goods	Buckets

Subject

Defect control: short shot in buckets

■ Diagnosis:

Many short shots occur in buckets made in the injection molding process.

■ Guidance:

Field observation revealed that burrs also occurred on the opposite site of short shot. A product with short shot was cut and thickness was measured. It was found that burrs caused the mold to come off the core angle, and that a short shot occurred first, followed by burrs on the opposite side. Repairing of the mold was advised. (See the figure)

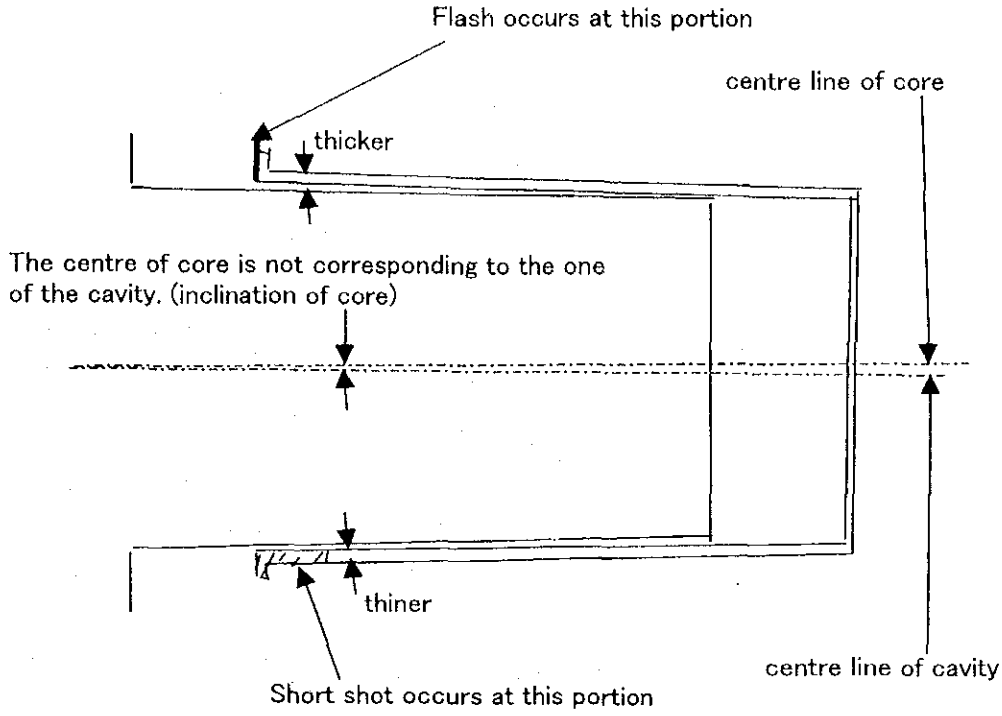
■ Response of the enterprise (as confirmed during the follow-up activity):

This was pointed out during the detailed diagnosis.

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

This is a simple case to determine a cause from the state of burrs very easily. It is important to teach techniques to analyze other defects and identify causes.

Attached Figure



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-13	Plastic molding technology	Molding	
2nd category		Industry	Sector / Product
Injection		Electric energy	Electrical wining / Insulators

Subject

Burning of box-type molding products (insulators)

■ Diagnosis:

Gas burning occurs in injection molding of thick products and cannot be eliminated even when a vent pin is added (6 nylon is used).

■ Guidance:

Field observation indicates that the vent pin is not constructed to work as the vent. The vent pin should be formed to allow smooth exhaustion of air in the mold and gas generated from resin, which should move out of the mold before injection of mold is completed. It is advised to make the vent pin as shown in the figure.

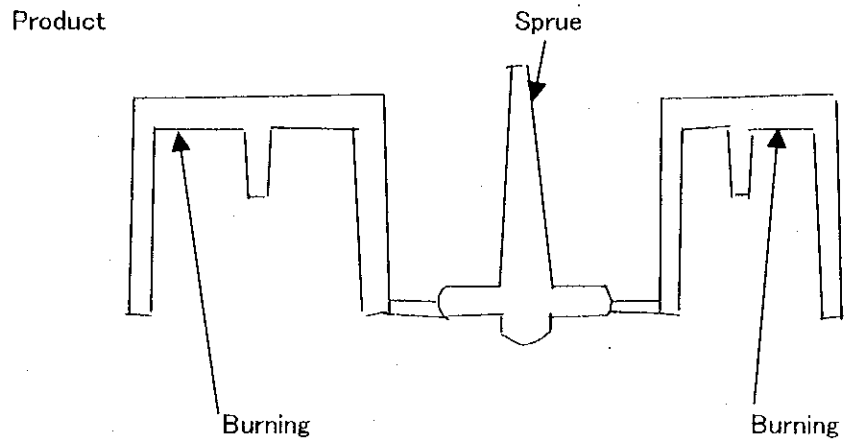
■ Response of the enterprise (as confirmed during the follow-up activity):

This was pointed out during the detailed diagnosis.

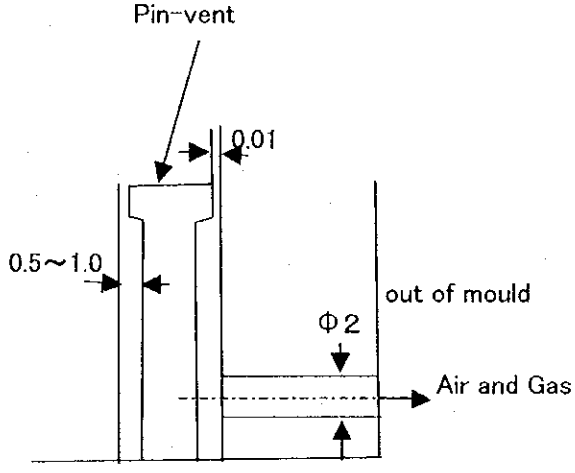
■ Other relevant points (issues to be solved and problems remained):

Education and training is required to learn basic knowledge on mold design and making.

Attached Figure



Pin-vent



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-14	Plastic molding technology	Molding	
2nd category		Industry	Sector / Product
Injection		Household goods	Household goods / Cups

Subject

Defective cups made in the injection molding process

■ Diagnosis:

Acrylonitrile styrene (AS; SAN in the U.S.) cups cannot be made by hot runner injection molding (injected from the bottom), because resin dissolves no matter how high the temperature is raised. Polypropylene (PP) cups were made by the same method.

■ Guidance:

The well type hot runner system is used. It is good for PP (polypropylene) and PE (polyethylene) products, but not suitable for injection molding of PS (polystyrene) and AS (acrylonitrile styrene) products. It is therefore advised to modify the hot runner type that uses a direct nozzle (extension nozzle). (See the figure)

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

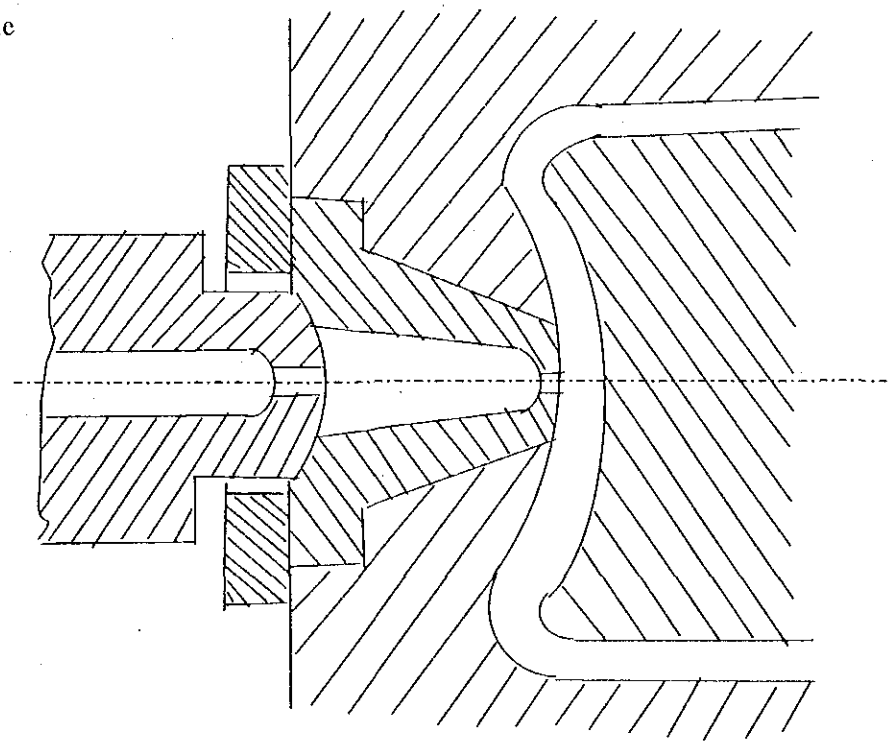
This was pointed out during the detailed diagnosis.

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

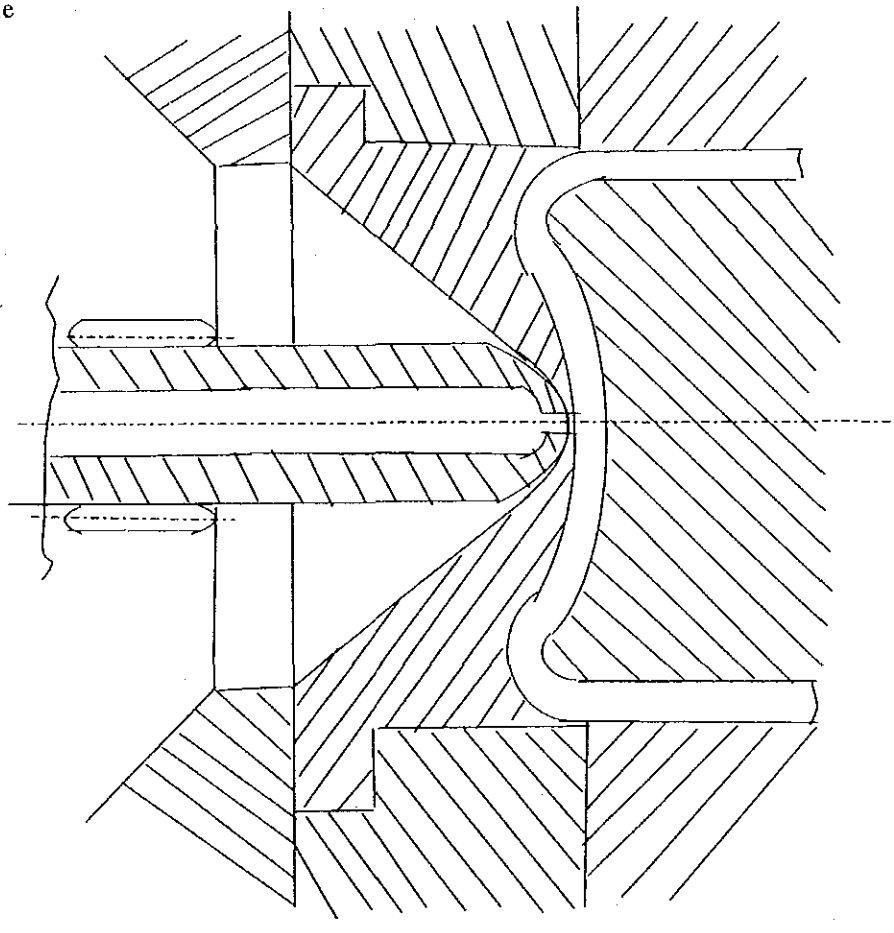
It is important to learn each hot runner type and suitable materials before starting commercial production.

Attached Figure

1) Well type nozzle



2) Extension nozzle



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-15	Production management	Molding	
2nd category		Industry	Sector / Product
Work management		Household goods	Household goods

Subject

Effective use of portable crane for mold changeover

■ Diagnosis:

A portal crane is used to fit a mold to a molding machine, but it is operated inefficiently to create time loss; the crane is used to remove a mold from the machine and transport it to a storage location, then it picks up a new mold and transports it to the machine.

■ *Guidance:*

It is advised to modify the portable crane as shown in the figure in order to install two chain blocks. Chain block B is first used to hoist a new mold for transportation to the molding machine, and chain block A hoists a mold to be removed. Then, the portal crane is operated to fit the new mold held by chain block B to the molding machine and then transport the old mold to a storage location. This way, new and old molds are transported and set in a single operation of the portal crane.

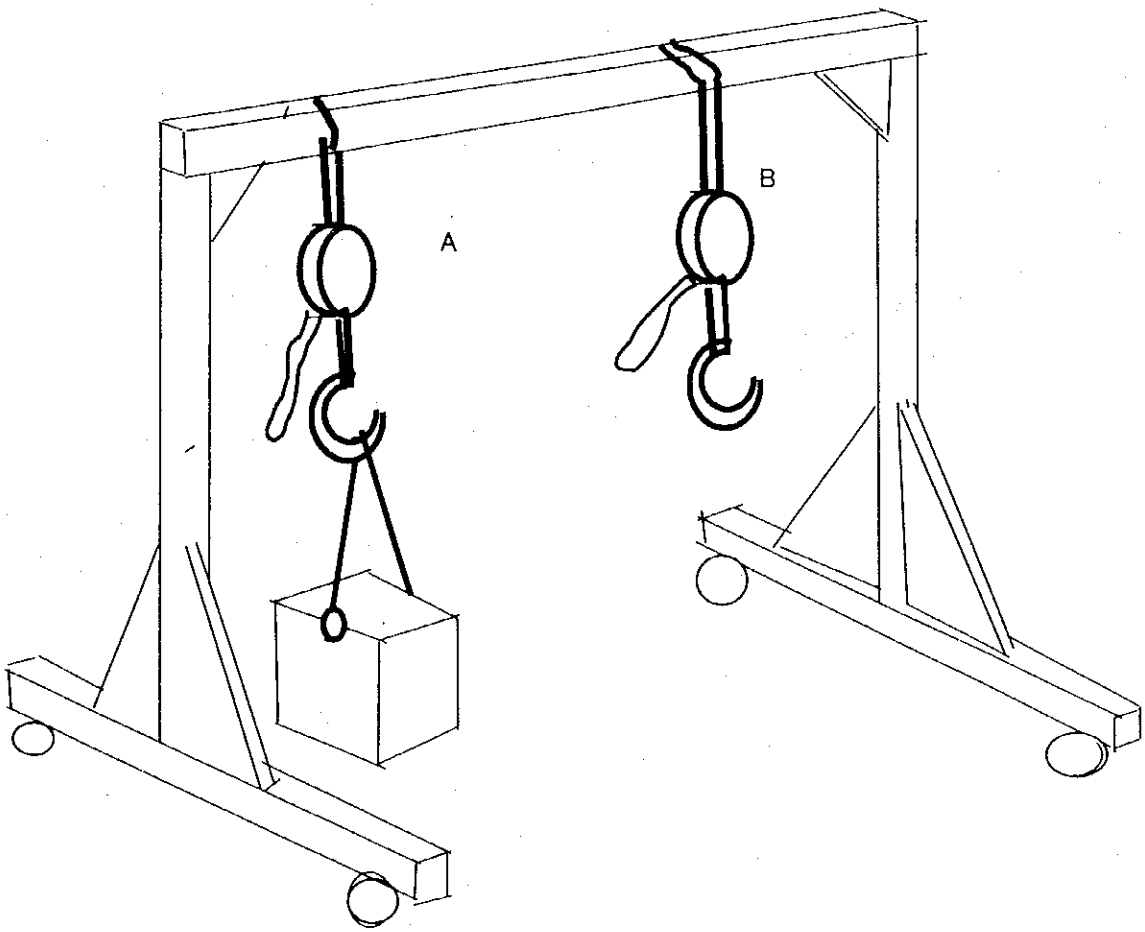
■ Response of the enterprise (as confirmed during the follow-up activity):

This was pointed out during the detailed diagnosis.

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

The present challenge is to reduce time required for mold changeover, which takes 2.5 hours.

Attached Figure



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-16	Plastic molding technology	Molding	
2nd category		Industry	Sector / Product
Injection		Electric appliances	Refrigerator parts

Subject

Reduction of the molding cycle time

■ Diagnosis:

Refrigerator doors (4mm thick) are injection molded by making two units each time. The customer assumes the cycle time of 50 seconds, but it takes 62 seconds in the actual process and does not meet the cost target. The molding material is polypropylene (PP) with 25% talc.

■ Guidance:

In injection molding a thick product, it is important to cool the molten resin in the mold as quickly as possible. As the temperature of the PP resin injected to form a 4mm thick product reaches 220℃, it takes 38 seconds to cool it down to 30℃. Cooling water (15℃) is circulated around the mold, but the actual temperature rises over 30℃ to take long time for cooling.

To achieve the cycle time of 50 seconds or less, it is advised to remove each product from the mold and place it in a water tank for quick cooling.

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

This was pointed out during the detailed diagnosis.
The cycle time of 50 seconds was achieved by soaking each product in water after being removed from the mold.

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

This technique is widely practiced to minimize the cycle time for thick products and is applicable to other thick products.

1 Case A

Description of Problems

The hinge bodies for the refrigerators, whose thickness are 4mm, are being produced by injection moulding with two cavities. But in spite of the requirement of the customer that they should be produced by cycle time of 50 seconds, the actual cycle time is 62 seconds. So the company has difficulty that this product is unprofitable, unless the cycle time is reduced to 50 seconds. The material for moulding is polypropylene containing talc by 25%.

Diagnosis and Recommendation

When moulding the thick product, it is the important point to delete the heat of melted resin quickly injected into the mould. But in the case of polypropylene moulded by 4 mm thick, when resin temperature is 220℃ and mould temperature is 30℃, it takes 38 seconds that the product temperature descends to 70℃ and when mould temperature 45℃, it takes 50 seconds, that the product temperature descends to 70℃. The chilled water of 15℃ circulates in the mould but actually the temperature of water ascends to about 30℃ in the mould, so the longer cooling time is necessary.

Consequently, in order to mould within 50 seconds, it becomes possible by the operation that the product is taken out from the mould and heat is deleted by dipping in the water basin. So, the product should be dropped and dipped in the water basin in the actual operation.

Case Study Summary of Enterprise Diagnosis and Guidance

Case.No.	1st category
PL-17	Production management
2nd category	
Transportation management	

Division / Process	
Finishing	
Industry	Sector / Product
Shoe making	Shoe parts / soles, heels

Subject

Layout improvement for coating, buffing, wiping, and drying of shoe parts

■ Diagnosis:

1) A molding machine (not used in the finishing process) is installed near the entrance of work pieces to prohibit activities around it and prevent reduction of distance for transportation. (Figure 1)
2) A toilet is located near the heal coating process and disturbs with expansion. (Figure 2)
3) Exhaust air ducts are connected to the heel coating and drying processes and it requires additional costs to remove them. (Figures 3 - 4).

■ Guidance:

Layout modification in the following areas is advised by starting from a less costly solution and moving to a complex one:
1) Plan 1: Layout improvement without relocating the molding machine, the heel coating process, and the drying process (Figures 5-7), while moving the heal top stapling and packaging operations to a part of a shipment warehouse.
2) Plan 2: To relocate the heal coating and drying operations. (Figures 8 – 9)
3) Plan 3: To relocate the molding machine. (Figures 10 – 11)

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

Implementation of Plan 1 is under consideration.

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

As layout modification requires significant costs, its effects and benefits should be thoroughly checked before implementation.

Figure 1: The process analysis of the sole process

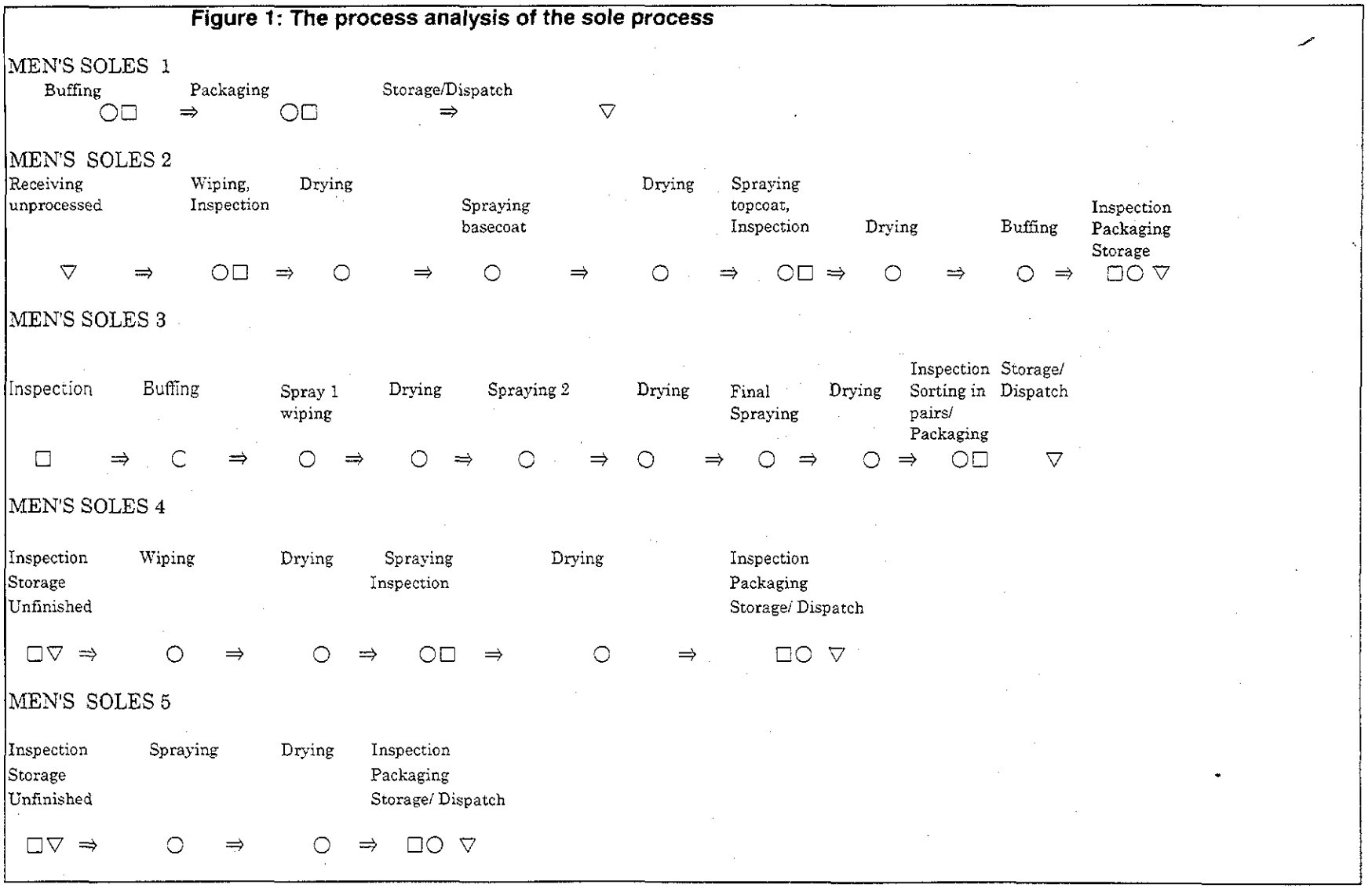


Figure 2: The Process Analysis of the heel process

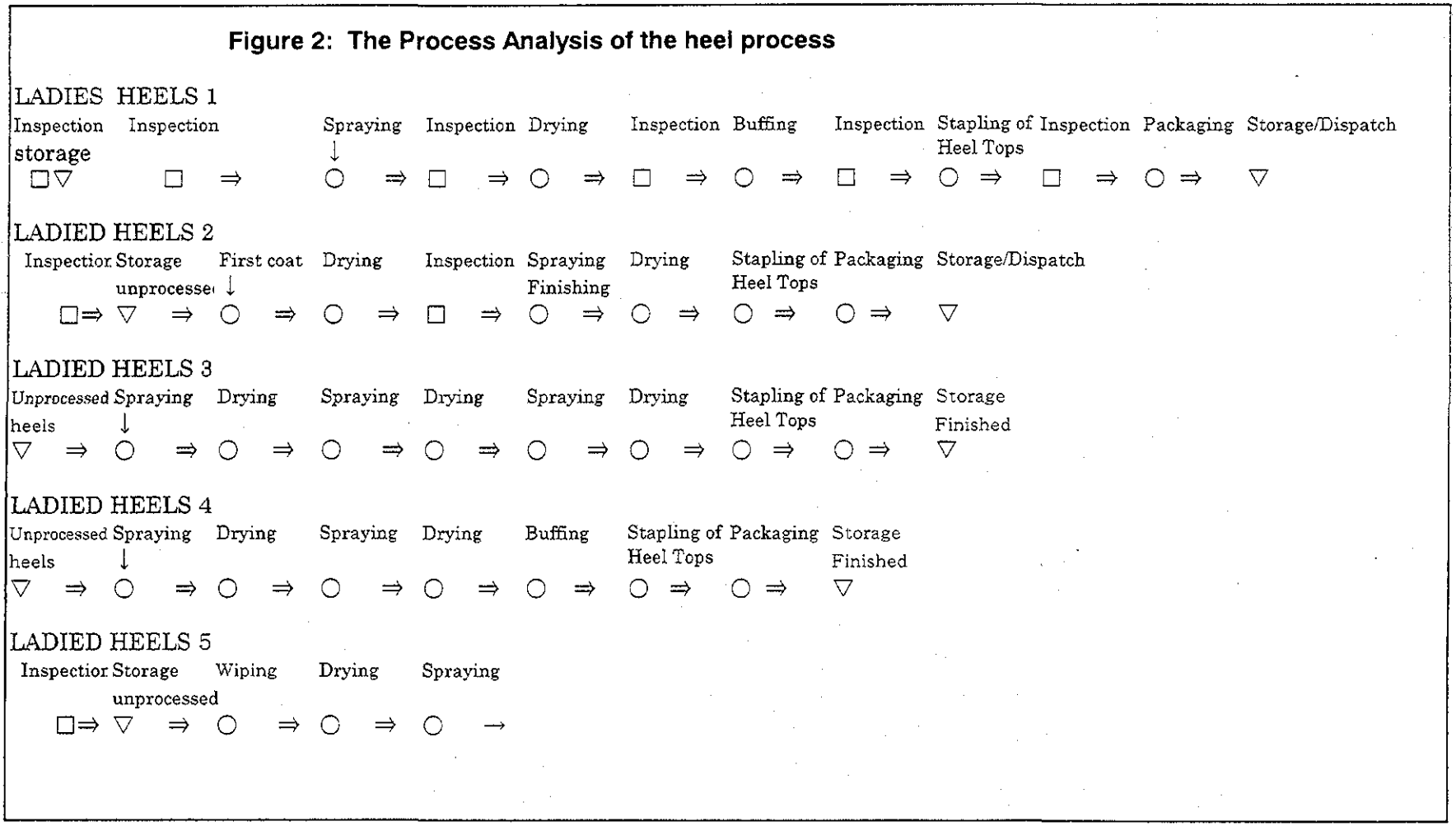
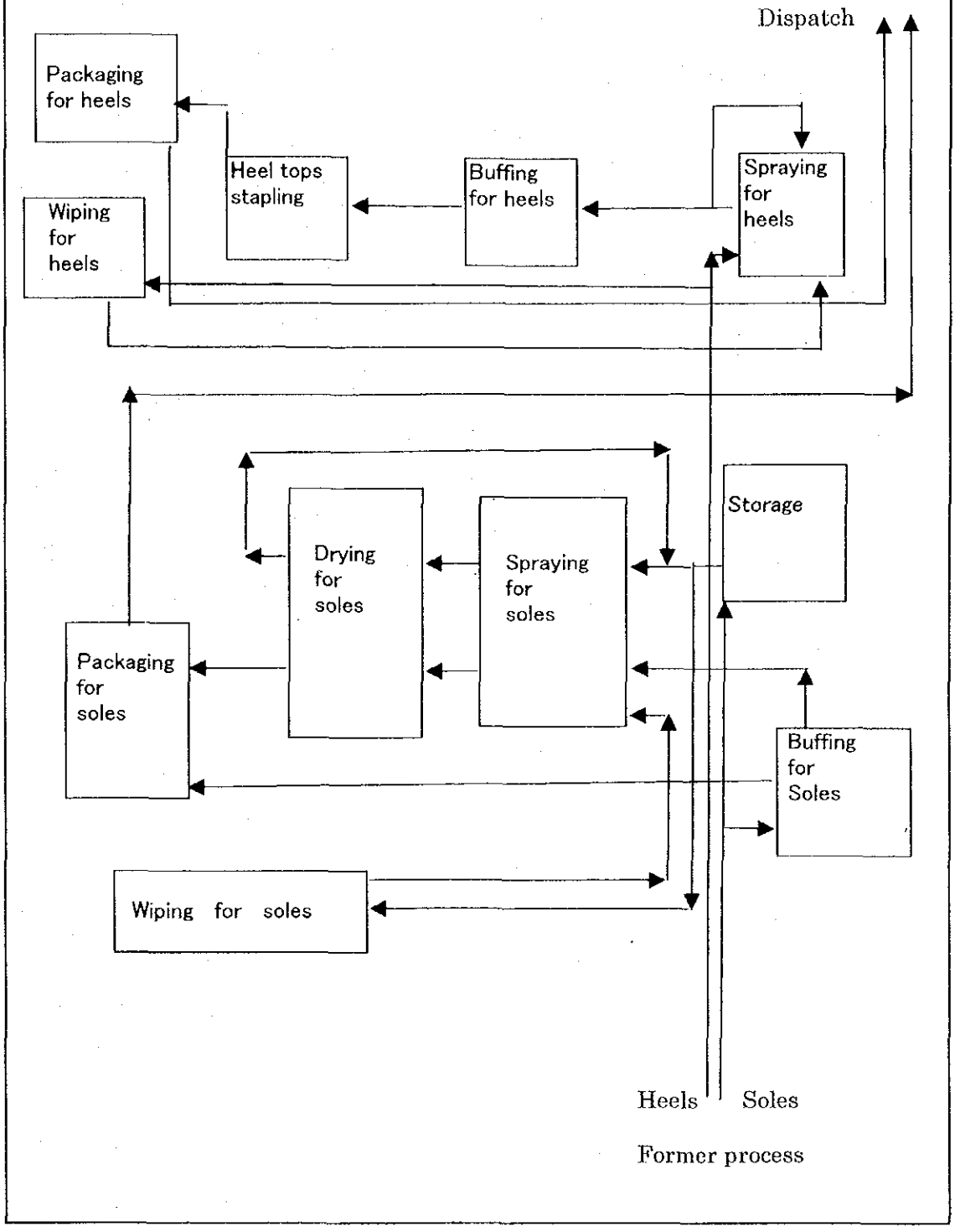


Figure 3: Block diagram of current process



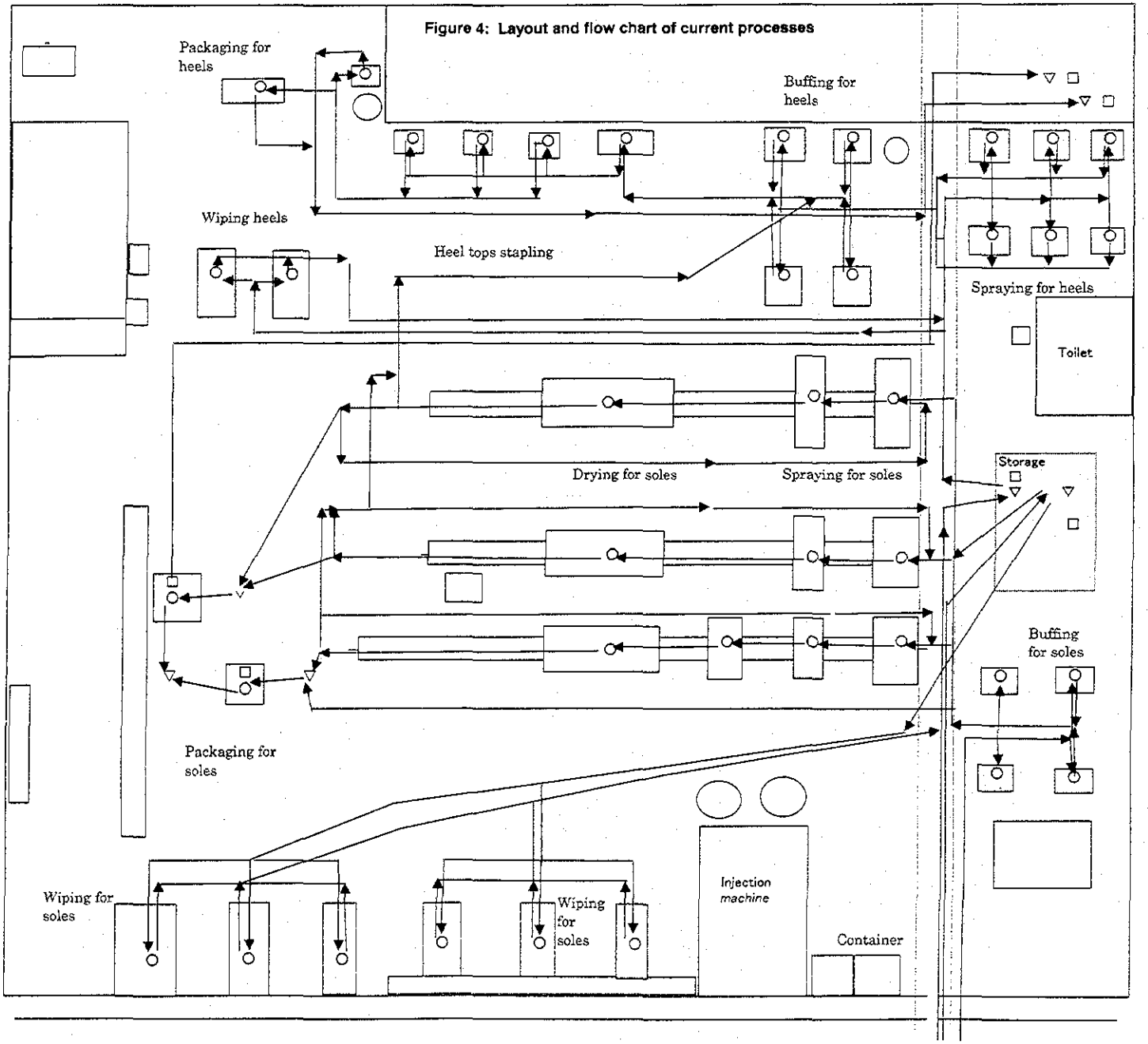
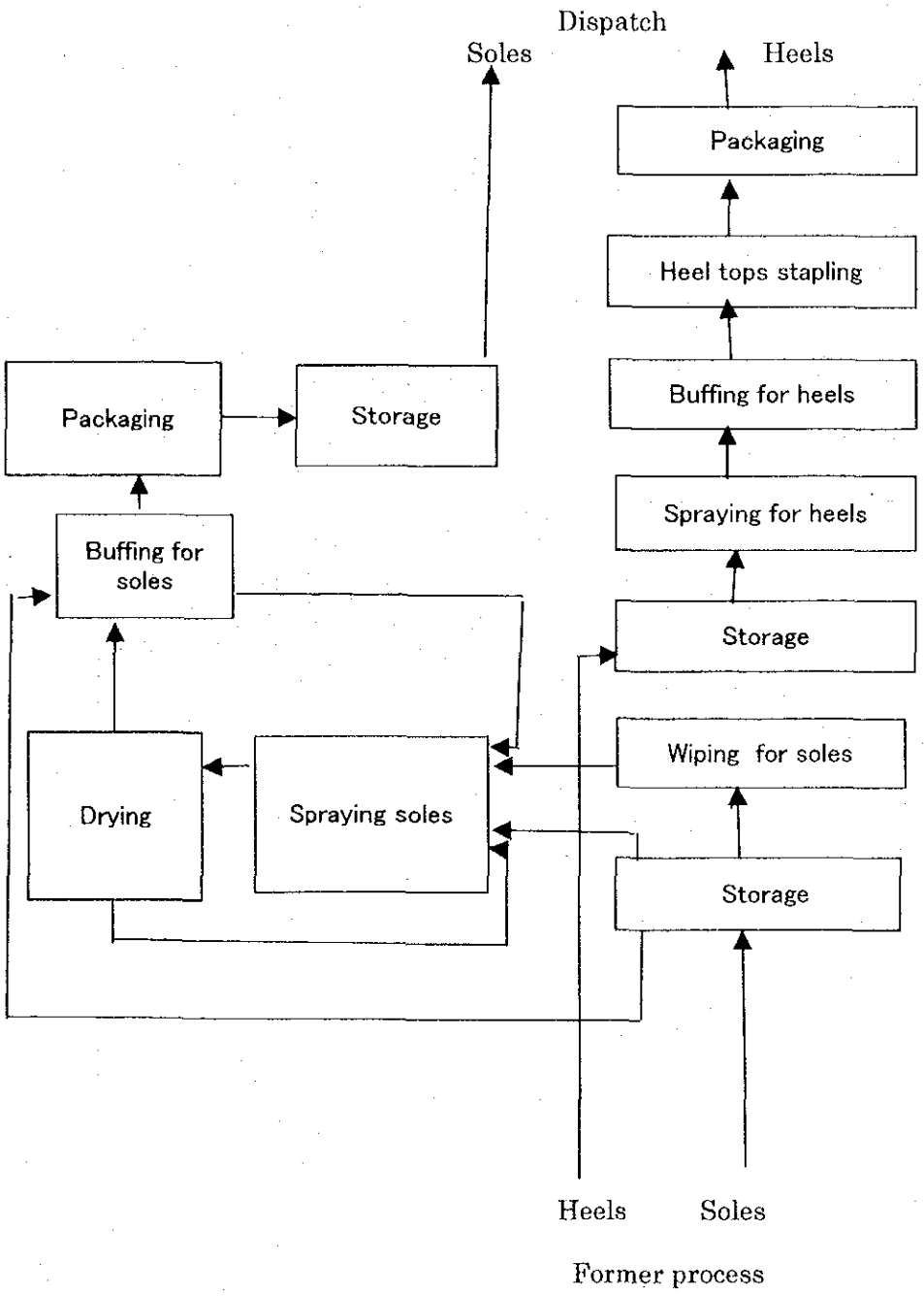


Figure 4: Layout and flow chart of current processes
Packaging for heels
Buffing for heels
Wiping heels
Heel tops stapling
Spraying for heels
Toilet
Drying for soles
Spraying for soles
Storage
Buffing for soles
Packaging for soles
Wiping for soles
Wiping for soles
Injection machine
Container

Figure 5: Block diagram of the 1st step improvement



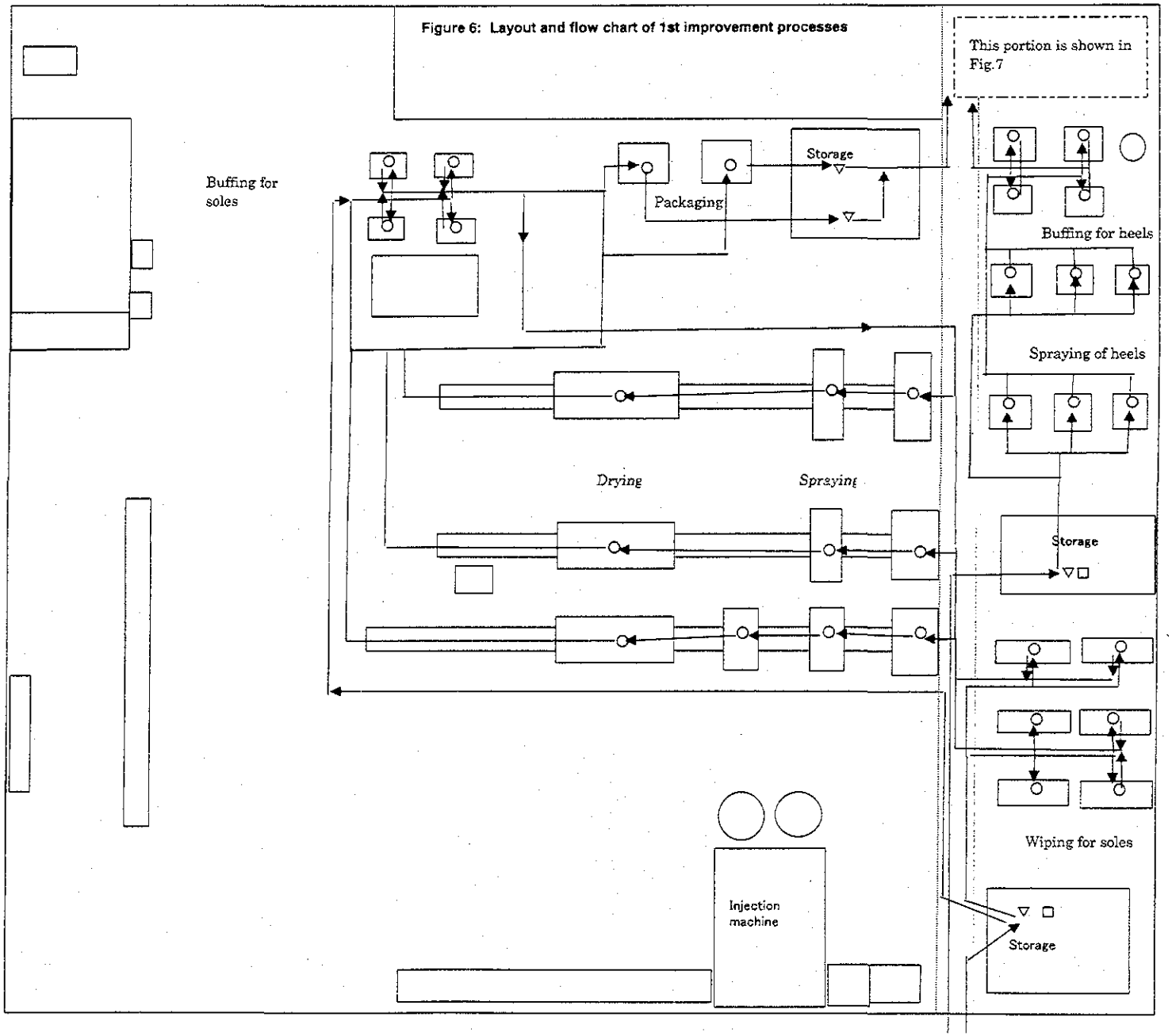


Figure 6: Layout and flow chart of 1st improvement processes

Figure 7: The addition of Figure 6

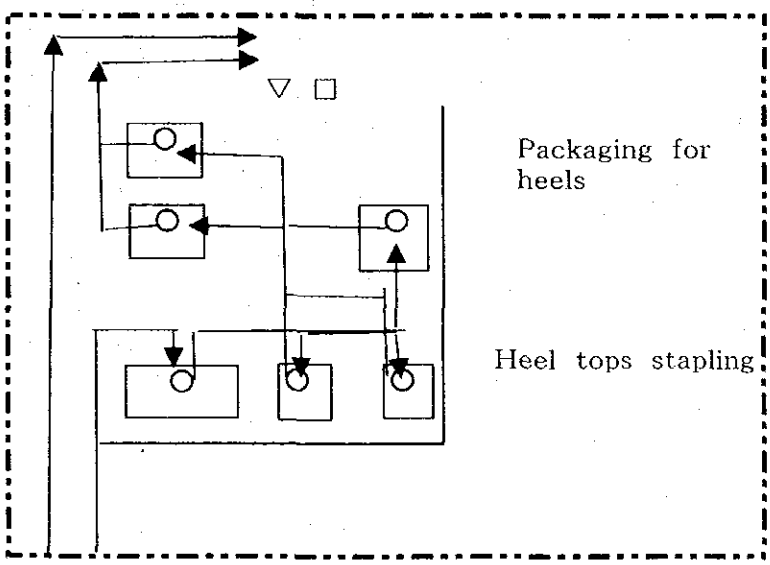
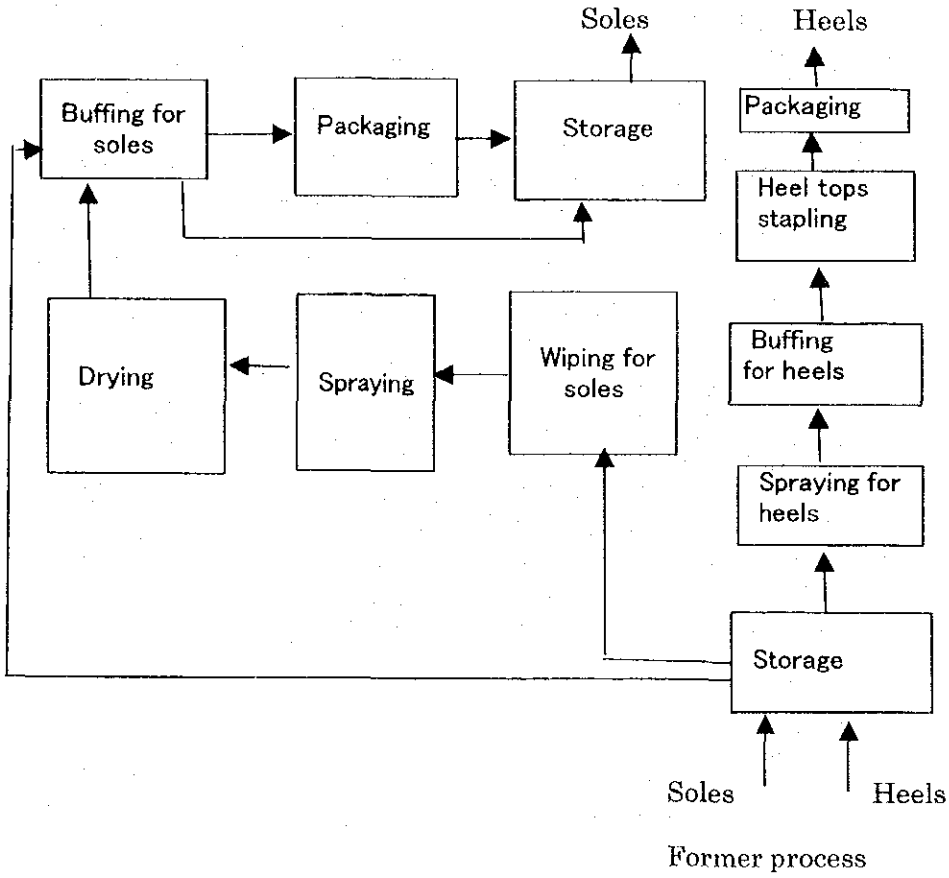


Figure 8: Block diagram of the 2nd step improvement



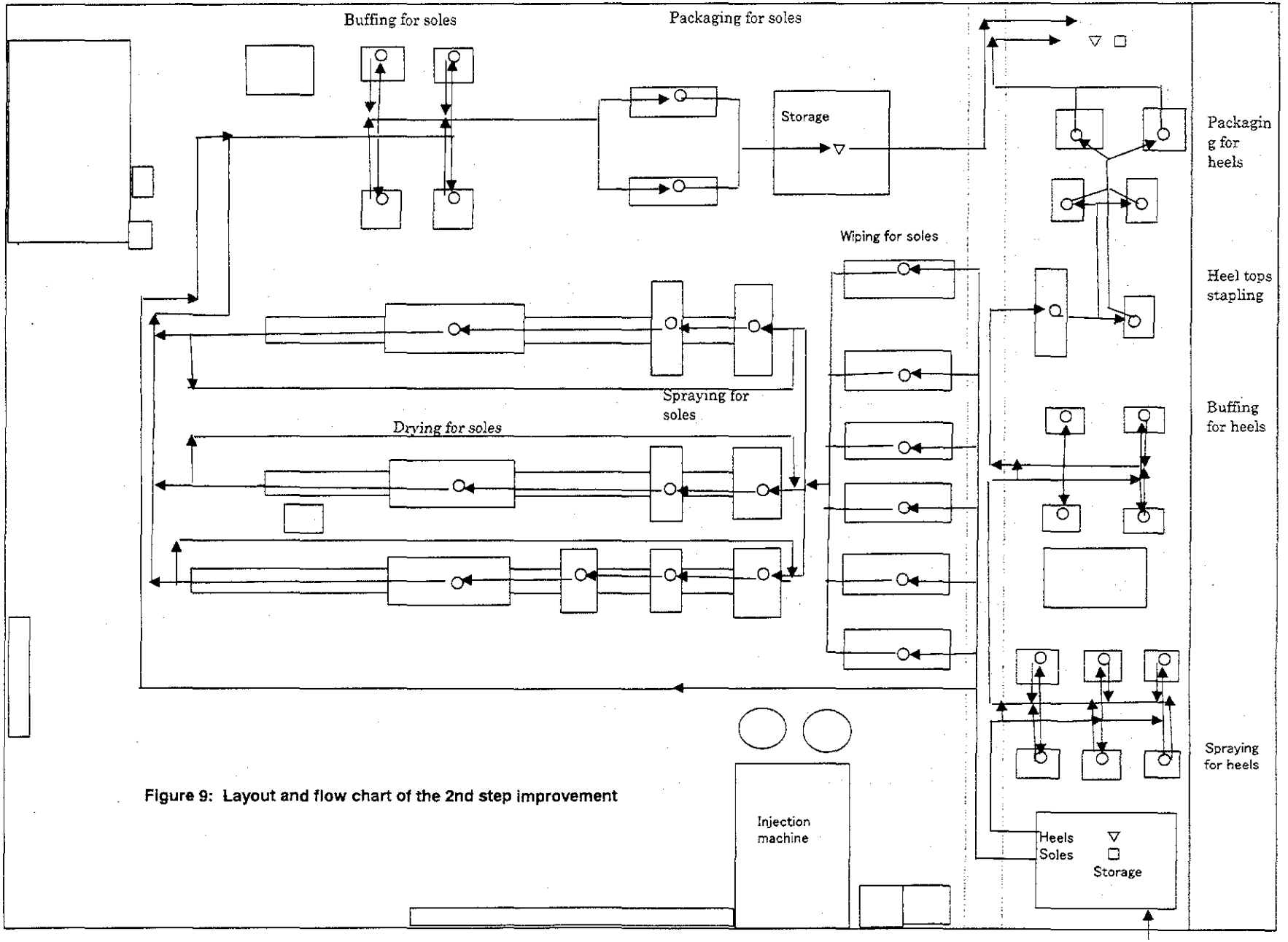
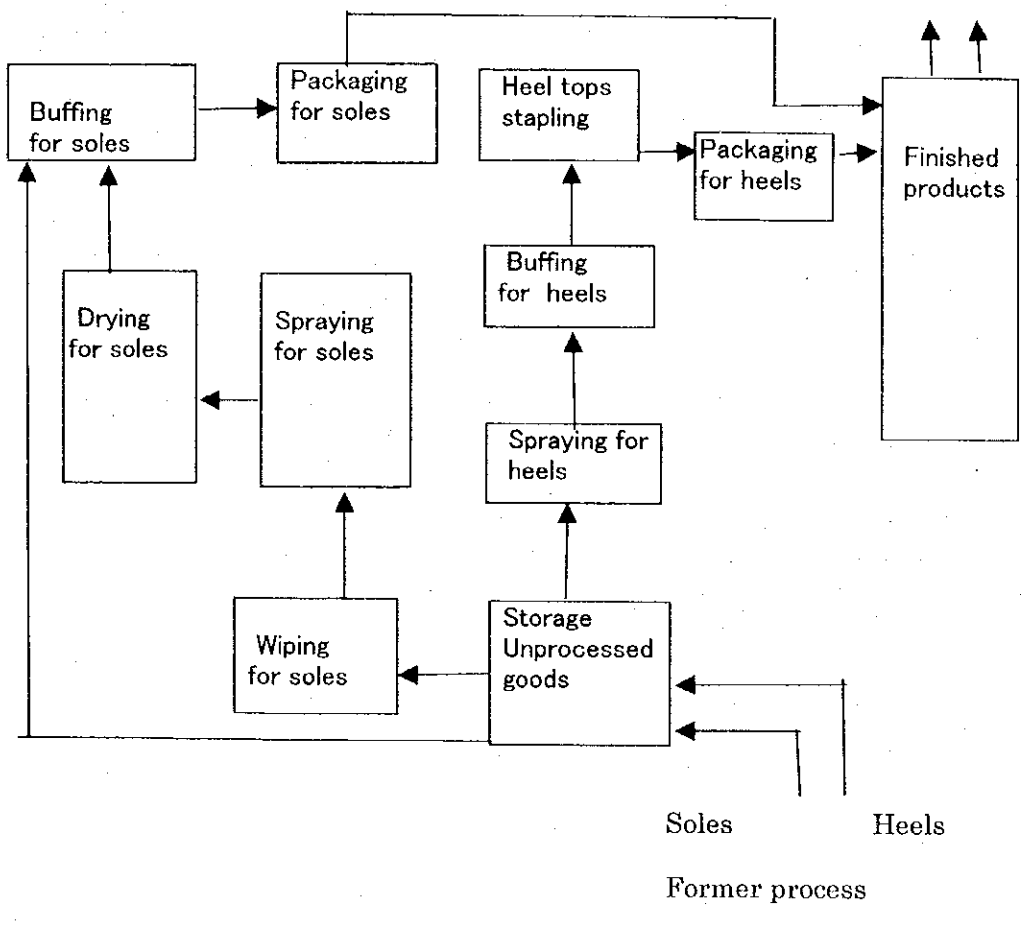


Figure 9: Layout and flow chart of the 2nd step improvement

Figure 10: Block diagram of the 3rd step improvement



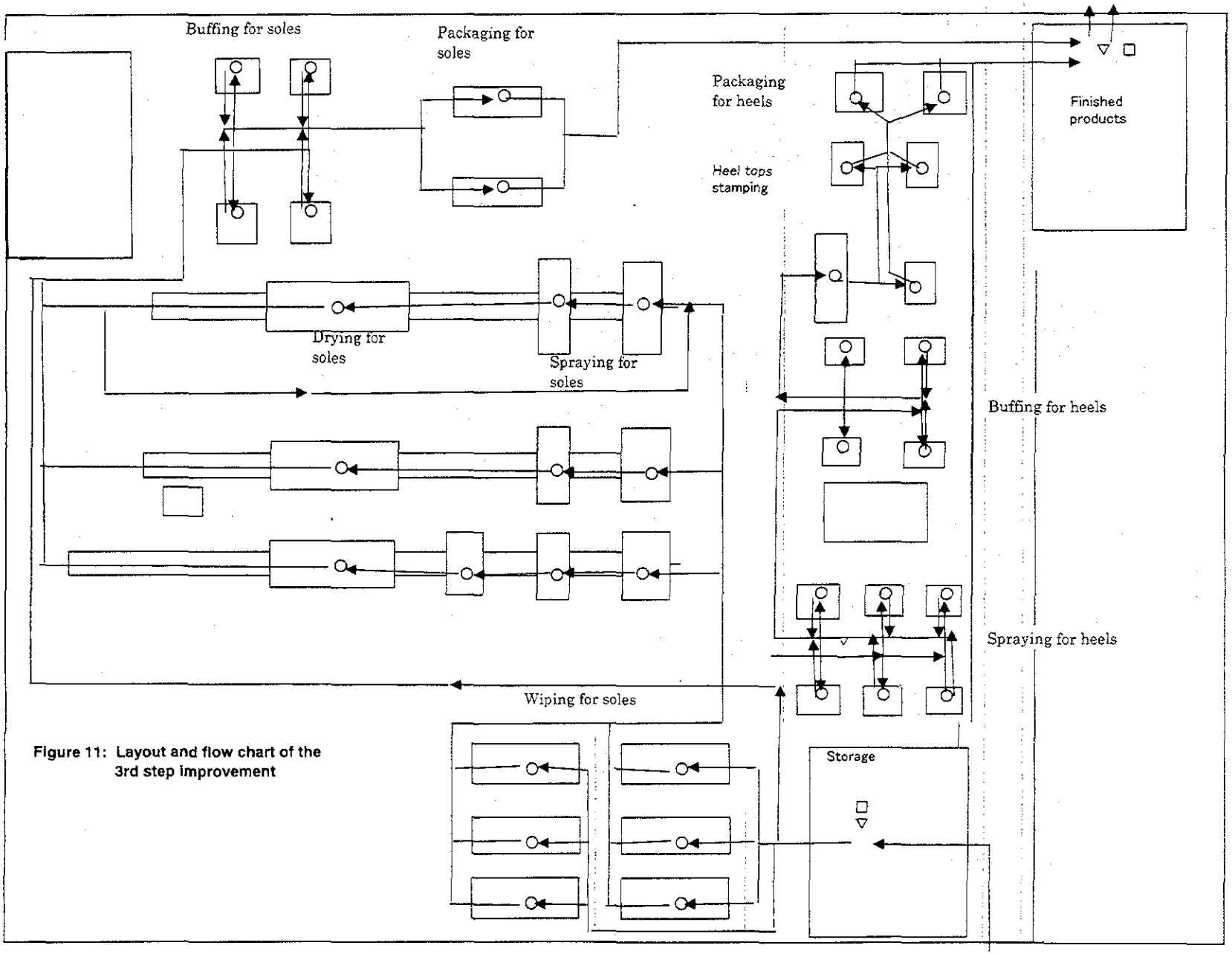


Figure 11: Layout and flow chart of the 3rd step improvement

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-18	Production management
2nd category	
Work management	

Division / Process	
Injection molding	
Industry	Sector / Product
Household goods	Household goods

Subject

Preparation of an injection molding condition table

■ Diagnosis:

An injection molding condition table is not used and molding conditions are set by a factory manager or a QC manager according to personal judgment based on intuition and experience. As these managers do not memorize all molding conditions for a wide range of products, defects often occur until the optimum conditions are found and set.

■ Guidance:

The molding condition table allows an inexperienced operator to set the molding machine correctly and free the managers from judgment based on intuition and experience. As a result, defects can be reduced and profits will increase.

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

This was pointed out during the detailed diagnosis and was partially executed under attendance of the study team.

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

It is strongly recommended because the molding condition table to define the relationship between different types of machines and molds will help reduce time required for machine setting.

1 Case A

Description of Problems

- Making the lists of moulding conditions and making use of them

At present there is no list in which the appropriate moulding conditions are written, so the mould is fixed in the machine and before the production begins, the machine is set up depending on moulding conditions which is in the memory of the supervisor. Consequently it takes long time to begin the normal production.

Diagnosis and Recommendation

The moulding conditions are changed depending on the season but the machine can be set up by slight modification from the standard conditions so it takes far less time compared with setting-up change without standard conditions.

The records based on the form of moulding conditions described in Annex A-1 should be remained as standards, so that setting-up can be completed shorter time.

The supervisor who knows the moulding conditions is absent from the company sometimes because of illness and so on. Some companies train the workers so that they can set up machines by using the lists. Some machines have no meter regarding some items, but records which can be read are remained as standards.

Annex A-1 Conditioning Table for Molding

Serial No. :

Product name: Date of issue:

Machine name & No.: Written by:

Material name & brand: Approved by:

		Unit	Value set-up	Value after changing	Date of changing, reason, name of charge
Temperature of cylinder	Nozzle NH	℃			
	Front N1	℃			
	Centre N2	℃			
	Back N3	℃			
	N4	℃			
Temperature of die	Cavity side	℃			
	Core side	℃			
Temp. of operating oil		℃			
Injection	Pressure	kg/cm² %			
	Speed	mm/sec			
	Time	sec.			
Holding pressure	Pressure	kg/cm² %			
	Time	sec			
	Changing position	mm			
Measuring stroke		mm			
Revolution of screw		rpm			
Back pressure		kg/cm²			
Sack back		mm			
Temperature of cooling water		℃			
Cycle time		sec			
Weight of product		gram			
Production quantity		pieces/hour			

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-19	Production management	Injection molding	
2nd category		Industry	Sector / Product
Work management		Electric appliances	Electric appliances / Parts

Subject

Preparation of an injection molding condition table

■ Diagnosis:

An injection molding condition table is not used and molding conditions are set by the president according to personal judgment based on intuition and experience. As he is unable to memorize all molding conditions for a wide range of products, defects often occur until the optimum conditions are found and set.

■ Guidance:

The molding condition table allows an inexperienced operator to set the molding machine correctly in the absence of the president. As a result, defects can be reduced and profits will increase.

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

This was pointed out during the detailed diagnosis and was partially executed under attendance of the study team.

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

It should be implemented because the molding condition table to define the relationship between different types of machines and molds will help reduce time required for machine setting.

1 Case A

Description of Problems

The list of moulding conditions is not made.

Diagnosis and Recommendation

The list of moulding conditions should be made by moulding machine by mould. When the company changes those initial conditions, it should clarify when they are changed, why they are changed and who changes them (Annex A-1).

Annex A-1 Conditioning Table for Molding

Serial No. : _____

Product name: _____ Date of issue: _____

Machine name & No.: _____ Written by: _____

Material name & brand: _____ Approved by: _____

		Unit	Value set-up	Value after changing	Date of changing, reason, name of charge
Temperature of cylinder	Nozzle NH	℃			
	Front N1	℃			
	Centre N2	℃			
	Back N3	℃			
	N4	℃			
Temperature of die	Cavity side	℃			
	Core side	℃			
Temp. of operating oil		℃			
Injection	Pressure	kg/cm^2 %			
	Speed	mm/sec			
	Time	sec.			
Holding pressure	Pressure	kg/cm^2 %			
	Time	sec			
	Changing position	mm			
Measuring stroke		mm			
Revolution of screw		rpm			
Back pressure		kg/cm^2			
Sack back		mm			
Temperature of cooling water		℃			
Cycle time		sec			
Weight of product		gram			
Production quantity		pieces/hour			

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-20	Production management	Injection molding	
2nd category		Industry	Sector / Product
Work management		Electric appliances	Electric appliances / parts

Subject

Preparation of an injection molding condition table

■ Diagnosis:

An injection molding condition table is not used and molding conditions are set by a supervisor according to personal judgment based on intuition and experience. As the supervisor does not memorize all molding conditions for a wide range of products, defects often occur until the optimum conditions are found and set.

■ Guidance:

The molding condition table allows an inexperienced operator to set the molding machine correctly and free the supervisor from judgment based on intuition and experience. As a result, defects can be reduced and profits will increase.

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

During the follow-up diagnosis, the study team checked the molding condition table prepared by the supervisor.

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

Still, no worker can set the machine using the table made by the supervisor, who is still only one person capable of setting it. If he is absent, the factory will not function. It is important to train workers for proper machine setting.

1 Case A

Description of Problems

The study team has found there are no tables for setting up molding conditions of each product. At the factory, supervisors are making such conditions based on their knowledge and experience. Every time production starts, virtually, they have to make new conditions for molding.

Diagnosis and Recommendation

The company should make conditioning tables for molding. The study team showed an example of such tables (Annex A-1).

By making and using such a table, the company can shorten time needed for setting up the molding conditions. In the future, each operator is expected to set up these molding conditions by themselves.

Annex A-1 Conditioning Table for Molding

Serial No. :

Product name: Date of issue:

Machine name & No.: Written by:

Material name & brand: Approved by:

		Unit	Value set-up	Value after changing	Date of changing, reason, name of charge
Temperature of cylinder	Nozzle NH	℃			
	Front N1	℃			
	Centre N2	℃			
	Back N3	℃			
	N4	℃			
Temperature of die	Cavity side	℃			
	Core side	℃			
Temp. of operating oil		℃			
Injection	Pressure	kg/cm² %			
	Speed	mm/sec			
	Time	sec.			
Holding pressure	Pressure	kg/cm² %			
	Time	sec			
	Changing position	mm			
Measuring stroke		mm			
Revolution of screw		rpm			
Back pressure		kg/cm²			
Sack back		mm			
Temperature of cooling water		℃			
Cycle time		sec			
Weight of product		gram			
Production quantity		pieces/hour			

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-21	Production management	Injection molding	
2nd category		Industry	Sector / Product
Work management		Electric appliances	Electric appliances / parts

Subject

Preparation of an injection molding condition table

■ Diagnosis:

An injection molding condition table is not used and molding conditions are set by the president of the company according to personal judgment based on intuition and experience. As he is not able to memorize all molding conditions for a wide range of products, defects often occur until the optimum conditions are found and set.

■ Guidance:

The molding condition table allows an inexperienced operator to set the molding machine correctly and free the president from judgment based on intuition and experience. As a result, defects can be reduced and profits will increase.

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

During the follow-up diagnosis, the study team checked the molding condition table prepared by the president.

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

The president is expected to delegate authority to prepare and manage the molding condition table by hiring a manager as the company grows, including machine setting operation that should be assigned to a manager or a supervisor.

1 Case A

Description of Problems

There are no tables for setting up molding conditions.

Diagnosis and Recommendation

In order to set up the optimum molding conditions, the study team proposes that the company should use a list of molding conditions to write in the numerical value for setting up molding conditions about each product. When the company changes the initial conditions, it should write in when they are changed, why they are changed and who changes them. An example of the list of molding conditions is shown in Annex A-1.

Annex A-1 Conditioning Table for Molding

Serial No. :

Product name: Date of issue:

Machine name & No.: Written by:

Material name & brand: Approved by:

		Unit	Value set-up	Value after changing	Date of changing, reason, name of charge
Temperature of cylinder	Nozzle NH	℃			
	Front N1	℃			
	Centre N2	℃			
	Back N3	℃			
	N4	℃			
Temperature of die	Cavity side	℃			
	Core side	℃			
Temp. of operating oil		℃			
Injection	Pressure	kg/cm² %			
	Speed	mm/sec			
	Time	sec.			
Holding pressure	Pressure	kg/cm² %			
	Time	sec			
	Changing position	mm			
Measuring stroke		mm			
Revolution of screw		rpm			
Back pressure		kg/cm²			
Sack back		mm			
Temperature of cooling water		℃			
Cycle time		sec			
Weight of product		gram			
Production quantity		pieces/hour			

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-22	Production management	Injection molding & inspection	
2nd category		Industry	Sector / Product
Process control		Household goods	Household goods

Subject

Preparation of a daily production report

■ Diagnosis:

1) A daily production report is not made and the factory does not have data on the total production volume, the number of accepted and rejected products, and defect types.
2) The machine's operation record is not taken.

■ Guidance:

1) It is important to inspect each product when a worker cuts a gate and check defects, and determine the total number of defects.
Workers should be trained to distinguish acceptable products from defective ones.
2) To plot production data in bar charts according to the format in the daily production report.

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

The recommendations not implemented.

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

Smaller products, which are made in the automated process, rarely have defects. Thus, defect data should be collected for products that require careful inspection.

1 Case A

Description of Problems

There are no reports on daily production.

Diagnosis and Recommendation

In order to understand the situation of daily production, the study team proposes that the company should use a job sheet to write in necessary data on production in a work shift, including materials, production plans, production results, and operating situation of machinery. Annex A-1 shows a typical job sheet widely used in Japanese factories.

Annex A-1 Job Sheet

Date _____ Shif _____

Product name & No. _____ Operator _____

Machine name & No. _____

Material name _____ Colour _____

Virgin material	%
Recycled material	%

Today's production plan
Supervisor writes)

Moulding time	sec.
Quantity per 1 h	pieces
Quantity per 12 h	pieces
Weight a product	gram

Result of production

Good products		
Defective	Short shot	
	Dirty	
	Black point	
	Broken	
	others	
	Total	
	Reject rate	

Operation situation of machine

	8	9	10	12	13	14	15	16	17	18	19	20	
	20	21	22	23	24	1	2	3	4	5	6	7	Time
Normal production													
Changing mould													
Changing material													
Stopping by fault													
Stopping by no plan													
Others													

Note 1. In case the operator can not write this sheet, the supervisor should write.
Note 2. In case the supervisor can not wrote this sheet, the manager or equivalent should write.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-23	Production management	Injection molding & inspection	
2nd category		Industry	Sector / Product
Process control		Household goods	Household goods

Subject

Preparation of a daily production report

■ Diagnosis:

1) The president is solely responsible for production management. No daily production record is kept, and the president does not grasp data on the total production volume, the number of accepted and rejected products, and defect types.
2) The machine's operation record is not taken.

■ Guidance:

1) Defect check should be made when the worker takes a product out of the machine. Then, the total number of defectives should be counted and recorded. The total production volume should be read from the counter on the machine. Workers should be trained to distinguish acceptable products from defective ones.
2) To plot production data in bar charts according to the format in the daily production report.

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

This was pointed out during the detailed diagnosis.

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

Defect data should be collected for products that require careful inspection due to the occurrence of frequent defects.

1 Case A

Description of Problems

There are no job sheets for daily production.

Diagnosis and Recommendation

The company should make use of a job sheet to understand the situation of daily production (Annex A-1).

Annex A-1 Job Sheet

Date _____ Shif _____

Product name & No. _____ Operator _____

Machine name & No. _____

Material name _____ Colour _____

Virgin material	%
Recycled material	%

Today's production plan
Supervisor writes)

Moulding time	sec.
Quantity per 1 h	pieces
Quantity per 12 h	pieces
Weight a product	gram

Result of production

Good products		
Defective	Short shot	
	Dirty	
	Black point	
	Broken	
	others	
	Total	
	Reject rate	

Operation situation of machine

	8	9	10	12	13	14	15	16	17	18	19	20	
	20	21	22	23	24	1	2	3	4	5	6	7	Time
Normal production													
Changing mould													
Changing material													
Stopping by fault													
Stopping by no plan													
Others													

Note 1. *In case the operator can not write this sheet, the supervisor should write.*
Note 2. In case the supervisor can not wrote this sheet, the manager or equivalent should write.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-24	Production management	Injection molding & inspection	
2nd category		Industry	Sector / Product
Process control		Household goods	Household goods

Subject

Preparation of a daily production report

■ Diagnosis:

1) No daily production record is kept and two managers under the present (injection molding and extrusion molding departments) do not know the total production volume, the number of accepted and rejected products, and defect types.
2) The machine's operation record is not taken.

■ Guidance:

1) Defect check should be made when the worker takes a product out of the machine. Then, the total number of defectives should be counted and recorded. The total production volume should be read from the counter on the machine. Workers should be trained to distinguish acceptable products from defective ones.
2) To plot production data in bar charts according to the format in the daily production report.

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

This was pointed out during the detailed diagnosis.

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

Defect data should be collected for products that require careful inspection due to the occurrence of frequent defects.

1 Case A

Description of Problems

There are neither job sheets nor check lists for defects.

Diagnosis and Recommendation

A job sheet (a daily report of production) is necessary to grasp daily situation of production and to pursue the past records. A check list should be used for grasping the number of defects and their reasons.

Annex A-1; Check list

Annex A-2; Check list (Example)

Annex A-3; Job sheet

Annex A-1: Check List

Product name and No. _____ Date _____ Shift _____

Machine name and No. _____ Operator _____

Items	10	20	30	40	50	60	70	80	90	100	Total

Annex A-2: Check List (Example)

Product name and No. B.Bath | Date 9.Aug. 2001 | Shift A

Machine name and No. BMI | Operator Welcome

Items	10	20	30	40	50	60	70	80	90	100	Total
Short shot	𝍸										5
Dirty	||										2
Black point	||||										4
Broken	|										1

Annex A-3 Job Sheet

Date _____ Shif _____

Product name & No. _____ Operator _____

Machine name & No. _____

Material name _____ Colour _____

Virgin material	%
Recycled material	%

Today's production plan
Supervisor writes)

Moulding time	sec.
Quantity per 1 h	pieces
Quantity per 12 h	pieces
Weight a product	gram

Result of production

Good products		
Defective	Short shot	
	Dirty	
	Black point	
	Broken	
	others	
	Total	
	Reject rate	

Operation situation of machine

	8	9	10	12	13	14	15	16	17	18	19	20		
	20	21	22	23	24	1	2	3	4	5	6	7		Time
Normal production														
Changing mould														
Changing material														
Stopping by fault														
Stopping by no plan														
Others														

Note 1. In case the operator can not write this sheet, the supervisor should write.
Note 2. In case the supervisor can not wrote this sheet, the manager or equivalent should write.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-25	Production management	Injection molding & inspection	
2nd category		Industry	Sector / Product
Process control		Household goods	Household goods

Subject

Preparation of a daily production report

■ Diagnosis:

The current production report (job sheet) records vital data, such as the customer name, material, machine name, product name, and order number, but it is difficult to determine the time required for mold change or production.

■ Guidance:

A modified form of daily production report is shown in the table, which covers minimum required items as follows:

1) Production plan: Molding time, production per hour or 12 hours, and product weight
2) Production results: The number of products accepted/rejected, and percentage defective
3) Machine status: The time required for mold changeover, trial operation after material changeover, idle time, and time not included in the production plan are to be shown in bar charts.

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

The number of products rejected and the percentage defective are already recorded.

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

Defect data should be collected for products that require careful inspection due to the occurrence of frequent defects.

1 Case A

Description of Problems

The study team has found the current job sheets do not clarify the actual production time including loss time for die changing, material changing, test working, and mechanical troubles.

Diagnosis and Recommendation

The company should record the basic data on production plan, actual production, and working situation of injection machines. The basic data on production plan should include molding time, production volume per hour, production volume for twelve hours, weight of the products. The basic data on actual production should be the number of acceptable products and rejects, the producing rate of rejects, and causes for rejects.

Moreover, the company should use bar charts to clearly understand the actual working situation of injection machines. The study team showed an example of the job sheets which includes those above-mentioned points (Annex A-1).

In order to record rejects, many factories in Japan are using several counters. When each operator finds a reject, he puts a knob to show if it is due to short shot, dirt, black points, or breakage. The study team showed an example of a check list for counting the number of rejects using counters. Acceptable products can be counted by taking away the number of reject products from the total production number (Annex A-2).

Annex A-1 Job Sheet

Date _____ Shif _____

Product name & No. _____ Operator _____

Machine name & No. _____

Material name _____ Colour _____

Virgin material	%
Recycled material	%

Today's production plan
Supervisor writes)

Moulding time	sec.
Quantity per 1 h	pieces
Quantity per 12 h	pieces
Weight a product	gram

Result of production

Good products		
Defective	Short shot	
	Dirty	
	Black point	
	Broken	
	others	
	Total	
	Reject rate	

Operation situation of machine

	8	9	10	12	13	14	15	16	17	18	19	20	
	20	21	22	23	24	1	2	3	4	5	6	7	Time
Normal production													
Changing mould													
Changing material													
Stopping by fault													
Stopping by no plan													
Others													

Note 1. In case the operator can not write this sheet, the supervisor should write.
Note 2. In case the supervisor can not wrote this sheet, the manager or equivalent should write.

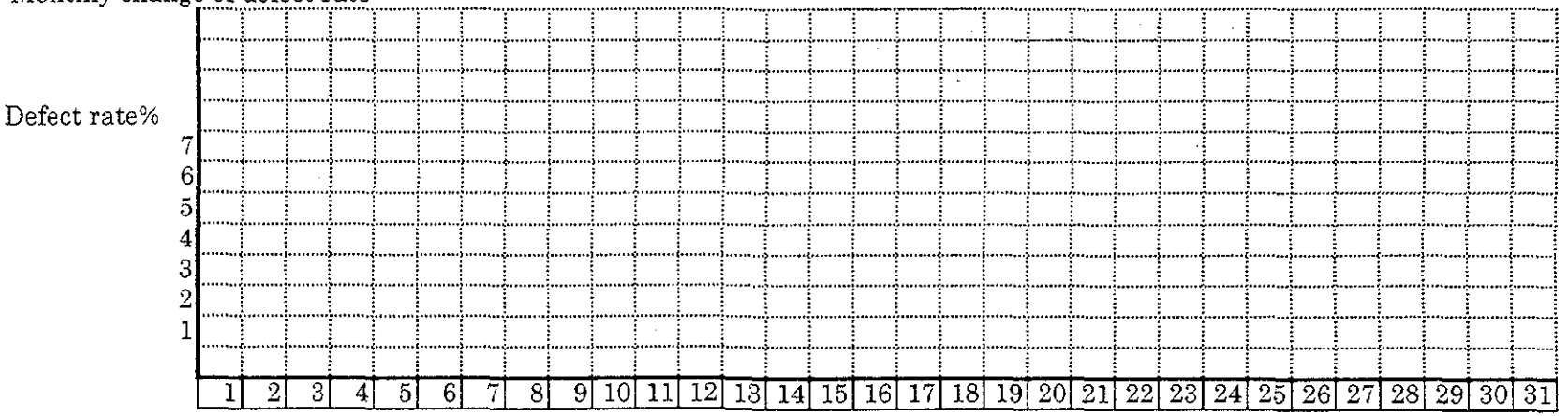
Annex A-2 Monthly Table and Graph for Rejects

Month:

Product name & No. Machine name & No.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Good																															
Short shot																															
Dirty																															
Black point																															
Broken																															
Total																															
Defect rate																															

Monthly change of defect rate



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-26	Sales / Marketing
2nd category	
Sales promotion	

Division / Process	
Marketing / Sales	
Industry	Sector / Product
Household goods	Household goods

Subject

Sales activity

■ Diagnosis:

Customer order decreases and the factory's operating rate has fallen to 50%, which is very low. No sales activity is made due to the absence of sales personnel.

■ Guidance:

As the company is not a subcontractor and makes its own products, it is vital to promote them actively to customers.

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

Sales promotion was carried out by visiting customers and significant orders were received.

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

It is important to contact customers regularly and promote the company and its products.

1 Case A

Description of Problems

Orders are decreasing and the company has a few staff for sales and marketing.

Diagnosis and Recommendation

The company should put more stress on sales promotion for your products. At first the company should make an analysis on the causes for the decline of its sales.

<Items for Analysis>:

- Total market demand
- Price competitiveness
- Quality competitiveness
- Design competitiveness

The company should gather information on competing products.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-27	Production management
2nd category	
Work management	

Division / Process	
Injection molding & blow molding	
Industry	Sector / Product
Household goods	Household goods

Subject

Layout improvement

■ Diagnosis:

1) The molding process is not separated from a storage yard for auxiliary materials.
2) Some molds are kept on floor.

■ Guidance:

1) Storage of auxiliary materials near the molding process creates a risk of contamination by particulate produced from the materials (such as corrugated cardboard).
2) Molds should be kept on a workbench or in a rack.

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

1) Not implemented
2) Executed

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

It is important that these activities are practiced by workers, with minimum costs.

1 Case A

Description of Problems

- Some products or raw materials are placed in molding sites.
- Some molds are laid on the floor. Some dissolved molds are also laid on the floor.

Diagnosis and Recommendation

The study team recommends the company to increase the shelves for storing molds and to place dissolved molds on working stands or tables.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-28	Production management
2nd category	
Quality control	

Division / Process	
Injection molding & inspection	
Industry	Sector / Product
Household goods	*Household goods*

Subject

Development of quality standards

■ Diagnosis:

There is no quality standard that is required to distinguish acceptable products from defectives in the inspection process. Inspection criteria are orally communicated to workers.

Informal quality standards, which vary with persons, create a risk of accepting a defective and vice versa. If a defective product is mistakenly accepted and shipped to the market, a customer claim will occur.

■ Guidance:

Formal quality standards should be developed and enforced. They may be expressed in a text, chart, graph, or product itself (to show a boundary sample for appearance). A defective should be selected and marked on its defect. An acceptable product that has a minor defect should also be marked accordingly. Furthermore, a small product should be affixed to a cardboard with indication to specify whether it is a sample for a defective or an acceptable product. In the case of a large product, a tag is provided to specify the name and a label is attached to a defect or a part representing a boundary sample with appropriate description.

Quality standards should be kept or posted in the shop floor and their compliance should be properly checked. It is important to establish quality standards in consultation with an affected customer.

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

For a product which is difficult to judge, a boundary sample is provided to the worker. However, an actual defect is not marked.

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

Smaller products often have few defects. Thus defect data should be collected for larger products that require careful inspection and products which external appearance is important.

1 Case A

Description of Problems

The company has no clear standards for distinguishing quality products from others.

Diagnosis and Recommendation

The quality standards should be shown in a written form. It is possible to use the product itself as a good sample or a bad sample. In such cases, it is necessary to specify whether it is a good sample or a bad one, and why it is bad in case of a bad sample. The standard table or sample should be displayed in a place where workers can see it easily.

The quality standards for a product should be made by mutual agreement with its client.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-29	Production management	Injection molding	
2nd category		Industry	Sector / Product
Work management		Household goods	Household goods

Subject

Proper storage of molds

■ Diagnosis:

Molds are kept in a rack (placed on a wood base) Some of them are color coded according to the type of industry, although no indication is made in the storage. Also, no mold number is indicated on each mold or rack. Thus, it takes time to find a specific mold for changeover.

■ Guidance:

To indicate a serial number (name) on the side of each mold, together with a respective rack and wood base. Then, it is required to place a mold in right place. This way, considerable time can be saved to find a new mold for changeover.

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

Not implemented

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

As the company is small in size and the president knows everything, he does not feel the need for proper storage. Now he intends to increase business size. If the company grows to become a larger organization, systematic management of molds will be required.

1 Case A

Description of Problems

Molds are not numbered. Some molds are laid on the floor. Some dissolved molds are also laid on the floor.

Diagnosis and Recommendation

The study team proposes that the company should number the molds so that operators can distinguish them easily. The study team recommends the company to increase the shelves for storing molds and to place dissolved molds on working stands or tables.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-30	Production management
2nd category	
Quality control	

Division / Process	
Injection molding	
Industry	Sector / Product
Household goods	Household goods

Subject

Collection of monthly defect data and preparation of a percentage defective graph

■ Diagnosis:

No defect data is collected, including daily occurrence of defects and percentage defective. Thus, the nature and degree of defect is unknown.

■ Guidance:

To collect defect data by item for each product and record them in a summary table, followed by estimation of a daily percentage defective that should be plotted on a graph. Collection and recording of daily data helps identify quality problems and devise corrective measures according to the type of defect.

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

Not implemented

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

Data collection should start from products with many defects.

1 Case A

Description of Problems

There are no records on reject.

Diagnosis and Recommendation

In order to take effective measures against reject, the study team proposes that the company should use a check list to count the number of rejects and record them. A format of the check list is shown in Annex A-1. The company should list various kinds of rejects such as short shots, dirt, black points, and breakage to count the number of rejects by kind, as shown in Annex A-2.

The study team also recommends the company to make a monthly table for rejects as shown in Annex A-3. The company can get the number of good quality products by subtracting the number of rejects from total production volume. The company can make a graph of reject rate to understand its daily changes. On the basis of those statistical data, the company will be able to take effective measures to reduce the reject rate.

Annex A-1: Check List

Product name and No. __________ Date __________ Shift __________

Machine name and No. __________ Operator __________

Items	10	20	30	40	50	60	70	80	90	100	Total

Annex A-2: Check List (Example)

Product name and No. B.Bath Date 9.Aug. 2001 Shift A

Machine name and No. BMI Operator Welcome

Items	10	20	30	40	50	60	70	80	90	100	Total
Short shot	++++										5
Dirty	||										2
Black point	||||										4
Broken	|										1

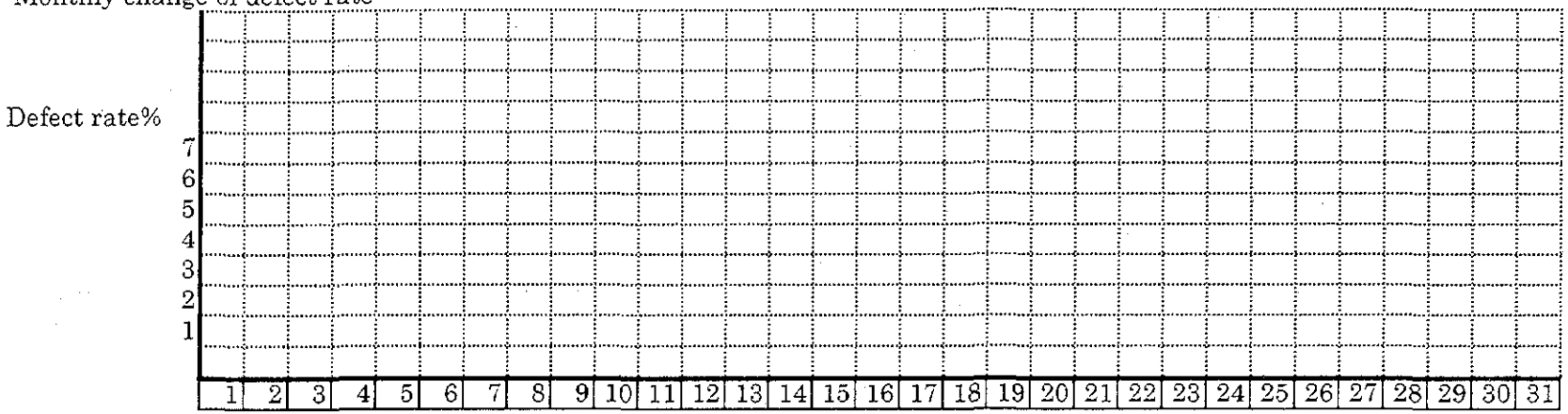
Annex A-3 Monthly Table and Graph for Rejects

Month:

Product name & No. Machine name & No.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Good																															
Short shot																															
Dirty																															
Black point																															
Broken																															
Total																															
Defect rate																															

Monthly change of defect rate



Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-31	Production management
2nd category	
Work management	

Division / Process	
Extrusion	
Industry	Sector / Product
Construction, Electrical work	Guide grooves, Trims, Electric cord covers

Subject

Proper storage of molds

■ Diagnosis:

Extrusion molds are kept in designated racks, but the name and number are not indicated. As many extrusion molds have similar appearances, it is difficult to distinguish one from another and thus it takes time to find a proper mold for changeover.

■ Guidance:

The mold number should be marked on each mold and a respective rack where it is kept, and care should be take to keep each mold in right place. This way, a correct mold can be found quickly from its number.

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

Executed before the follow-up diagnosis.

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

It is important to clean each mold after use, rust proof it, and place it in a rack where a correct number is marked.

1 Case A

Description of Problems

Since the extrusion molds have neither names nor numbers, operators have much difficulty in finding out the molds they want to use.

Diagnosis and Recommendation

The company should give the same number to each mold and a storing place for it. The company should instruct operators to store the mold in the fixed place with the same number. The company should keep its molds from rust.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-32	Production management
2nd category	
Work management	

Division / Process	
Finishing	
Industry	Sector / Product
Shoe making	Shoe parts

Subject

Improvement of environmental conditions in the shoe parts cleaning process

■ Diagnosis:

The cleaning of shoe parts after the production process is carried out using DMK (di-methyl ketone: or acetone), which generates a pungent odor and requires workers to wear a mask.

■ Guidance:

To use a less pungent chemical or provide adequate ventilation.

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

Not implemented

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

In consideration of workers' health, corrective measures should be taken as soon as possible.

1 Case A

Description of Problems

The study team has found that the company is using DMK with strong smell in the wiping section. Although the operators are wearing masks, they are exposed to DMK during their working hours. The study team presumes that the use of DMK may be an obstacle to the improvement of the morale and productivity of the operators.

Diagnosis and Recommendation

The study team proposes that the company should examine to use another solvent with weaker smell and to install an exhausting equipment, from the standpoint of improving the working conditions of operators and raising productivity.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-33	Production management
2nd category	
5S	

Division / Process	
Finishing	
Industry	Sector / Product
Shoe making	Shoe parts

Subject

3S Practice

■ Diagnosis:

In the molding and subsequent processes, 3S activities are not practiced. In the molding shop, there are water paddles and dusts on the floor.

■ Guidance:

3S activities – seiri (arrangement), seiton (tidying) and seiso (cleaning) – are the fundamentals of shop floor management. Practicing them everyday and everywhere brings a number of benefits, including work safety, elimination of a risk of mixing good products with defectives, and the improvement of work efficiency.

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

No significant improvement was observed.

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

It is imperative to promote 3S activities by communicating their effectiveness (efficacy) to management and workers.

1 Case A

Description of Problems

The study team has found that unprocessed goods and semi-finished products are put in disorder in some places and the workshop is not kept clean well.

Diagnosis and Recommendation

Disorder and dirtiness is the first problem to tackle to raise productivity. The study team proposes that the company should carry out a 3S drive. 3S stands for the three Japanese words meaning rearrangement (Seiri), putting in good order (Seiton), and cleaning (Seisou).

The implementing steps for the 3S drive are as follows.

- To separate necessary goods from unnecessary goods and waste
- To dump waste and put away unnecessary goods in the warehouse
- To put raw materials, unprocessed goods, semi-finished products, final products, and tools, in good order
- To number and color the tools so that operators can find out and take out them easily
- To carry out cleaning always to keep the workshop clean

By carrying out a 3S drive, the company can reduce useless work, loss of time, and rejects. As a result, production cost will be reduced and time for delivery will be shortened. The study team proposes that the company should take the initiative in encouraging the workers to carry out a 3S drive.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-34	Production management
2nd category	
5S	

Division / Process	
Button processing & molding	
Industry	Sector / Product
Accessories	Button manufacturing

Subject

3S Practice

■ Diagnosis:

In the molding and button making processes, 3S activities are not practiced. In every shop, there are water paddles and dusts on the floor, and dust deposits on each machine.

■ Guidance:

3S activities – seiri (arrangement), seiton (tidying) and seiso (cleaning) – are the fundamentals of shop floor management. Practicing them everyday and everywhere brings a number of benefits, including work safety, elimination of a risk of mixing good products with defectives, and the improvement of work efficiency.

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

No significant improvement was observed.

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

It is imperative to promote 3S activities by communicating their effectiveness (efficacy) to management and workers.

1 Case A

Description of Problems

The Study team has found that unprocessed goods and semi-finished products are put in disorder in some places and the workshop is not kept clean well.

Diagnosis and Recommendation

Disorder and dirtiness is the first problem to tackle to raise productivity. The study team proposes that the company should carry out a 3S drive. 3S stands for the three Japanese words meaning rearrangement (Seiri), putting in good order (Seiton), and cleaning (Seisou).

The study team showed the implementing steps for a 3S drive.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-35	Production management	Plastic injection molding	
2nd category		Industry	Sector / Product
5S		Household goods	Household goods

Subject

3S Practice

■ Diagnosis:

In the molding process, 3S activities are not practiced. There are water paddles and dusts on the floor. Finished products are kept disorderly in the process.

■ Guidance:

Among 3S activities, seiri (arrangement), seiton (tidying) and seiso (cleaning), the first two activities are not sufficient and should be practiced systematically. Practicing them everyday and everywhere brings a number of benefits, including work safety, elimination of a risk of mixing good products with defectives, and the improvement of work efficiency.

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

No significant improvement was observed.

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

It is imperative to promote 3S activities by communicating their effectiveness (efficacy) to management and workers.

1 Case A

Description of Problems

The shop floor is dirty and not cleaned.

Diagnosis and Recommendation

The study team explained the ways of carrying out a 3S Drive at the factory and its effects.

First, separate necessary goods from unnecessary goods or waste, and dump waste and put away unnecessary good in the warehouse. Second, put raw materials, unprocessed products, semi-finished products, final products, and tools in good order. As for tools, put them in good order and number or color them so that operators can easily find and take out them. Third, clean the workshop always to keep it clean.

By carrying out the 3S Drive, the company will be able to reduce useless work, loss time, the number of reject products. As a result, production cost will be reduced and time for delivery will be shortened.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category	Division / Process	
PL-36	Production management	Plastic injection molding	
2nd category		Industry	Sector / Product
5S		Household goods	Household goods

Subject

3S Practice

■ Diagnosis:

In the molding process, 3S activities are not well practiced. While the floor is thoroughly cleaned, storages for finished products and raw materials are not kept in good order and no systematic arrangement is practiced.

■ Guidance:

Among 3S activities, seiri (arrangement), seiton (tidying) and seiso (cleaning), the first two activities should be practiced systematically. Practicing them everyday and everywhere brings a number of benefits, including work safety, elimination of a risk of mixing good products with defectives, and the improvement of work efficiency.

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

No significant improvement was observed.

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

It is imperative to promote 3S activities by communicating their effectiveness (efficacy) to management and workers.

1 Case A

Description of Problems

Unprocessed goods and semi-finished products are laid in disorder in some places.

Diagnosis and Recommendation

The study team proposes that the company should carry out a 3S drive. 3S stands for three Japanese words meaning rearrangement (Seiri), putting in good order (Seiton), and cleaning (Seisou).

The implementing steps for the 3S drive are as follows.

- To separate necessary goods from unnecessary goods and waste
- To dump waste and put away unnecessary goods in the warehouse
- To put raw materials, unprocessed goods, semi-finished products, final products, and tools, in good order
- To carry out cleaning always to keep the workshop clean

By carrying out a 3S drive, the company can reduce useless work, loss of time, and rejects. As a result, production cost will be reduced and time for delivery will be shortened. The study team proposes that the company should take the initiative in encouraging the workers to carry out a 3S drive.

Case Study Summary of Enterprise Diagnosis and Guidance

Case No.	1st category
PL-37	Production management
2nd category	
5S	

Division / Process	
Plastic extrusion	
Industry	Sector / Product
Construction, Electric work	Guide grooves, Trims, Electric cord covers

Subject

3S Practice

■ Diagnosis:

In the molding process, 3S activities are not practiced. There are water paddles and dusts on the floor. Finished products are kept disorderly in the process.

■ Guidance:

Among 3S activities, seiri (arrangement), seiton (tidying) and seiso (cleaning), cleaning should be given of first priority to dispose wastes and other articles not in use. Then, remaining materials, products and tools should be kept in good order. Practicing 3S activities everyday and everywhere brings a number of benefits, including work safety, elimination of a risk of mixing good products with defectives, and the improvement of work efficiency.

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

No significant improvement was observed.

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

It is imperative to promote 3S activities by communicating their effectiveness (efficacy) to management and workers.

1 Case A

Description of Problems

The shop floor is dirty and not cleaned.

Diagnosis and Recommendation

"3S" should be implemented. Unnecessary articles should be dumped, dust on the machines and equipment should be removed, and the shop floor should be kept clean.