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Requirements for Resin Molded Products

1. Purpose

To clarify the requirements for maintaining the quality of resin molded products managed by Wiring Harness Components Production Management Division

2. Related documents

Supplier Handbook (Quality Requirements for Suppliers) (SCD-J09)

3. Establishment

Procurement Group, Wiring Harness Components Production Management Division, Quality Assurance Department

4. Scope of Application

Apply to the resin molded products that are produced by the purchasing vendors managed by Wiring Harness Components Production Management Division.

5. Timing of implementation

Apply promptly after the establishment

6. Table of contents

Requirements 001	Raw Material Control
Requirements 002	Control of the material mixed with Flame-retardant MB
Requirements 003	Setting molding conditions (molding parameter)
Requirements 004	Identify the position of short shot
Requirements 005	Process Control
Requirements 006	Control of test shot
Requirements 007	Prevention for the clogged gate
Requirements 008	Setting Runner / Gate
Requirements 009	Mold specification of clip (anchor)
Requirements 010	Setting nozzle touch area
Requirements 011	Control abnormal machine stop (stop for a short period)
Requirements 012	Maintaining the temperature during temporary machine stop
Requirements 013	Check the flow (quantity) of cooling water
Requirements 014	Verification for using the recycled material
Requirements 015	Equipment Inspection
Requirements 016	Mold overhaul

New establishment : Januray 8th, 2021		Revision date	
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Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

001 Raw material control

1. Purpose

To clarify the rule of receiving, storing, and issuing raw material in order to use the raw material whose quality is ensured. Also, to prevent the deterioration of product function which is caused by using wrong material.

2. Application

Apply to all raw materials used for the molding

3. Procedure

1. Receiving raw material

(1) At least the following inspection points need to be checked during receiving inspection.

Inspection point	Inspection method	Requirements
1. Part number, part name, quantity	Cross-check the actual material with order form or delivery slip	Must conform to the order form
2. Packaging condition	Visual check	Abnormality such as, broken material bag, water leak, collapse of cargo etc. is not allowed.
3. Material properties	Check the Inspection Report	Must meet the specification

(2) For the raw material which passed the inspection, clearly indicate the receiving date, and put a pass mark (e.g. using a sticker, stamp etc.) on each material.

(3) Abnormal raw material must be segregated in the designated storage area not to be stored in a warehouse as OK material.

2. Storage of raw material

(1) The storage location needs to be clearly indicated with a map etc.

- Clearly indicate the name of material if its storage location is always the same. If the storage location is not fixed, indicate the address (number) and link it with the name of material to be stored in that location.

(2) The expiration date of raw material is up to 1 year from the receiving date.

Make sure to use up raw materials before it expires.

- a. For the expired raw material, determine the expiration date again if its quality can be guaranteed.
- b. When using the raw material whose expiration date has been extended, check the quality of the molded product based on the Inspection Standard.

3. Issuing raw material for the production

(1) Make sure to use raw materials (including leftover materials) by FIFO .

(2) Clean the material bag if dust or dirt is adhered.

(3) Keep the record of issuing raw materials to the production, and the record must be checked by a leader / manager.

- Record the material name, Lot No., quantity, date, name of operator, purpose of use (mass production, trial)

< Pass mark >



<Storage for abnormal product >



<Storage for raw material >



Requirements for Resin Molded Products

Control No. HCGS-INJ002-00

002 Control of the material mixed with Flame-retardant MB

1. Purpose

To clarify how to control the materials for mixing flame-retardant MB (master batch) to prevent deterioration of product function that is caused by mistakenly using flame-retardant material or non-flame retardant material.

2. Application

Apply to all raw materials for mixing flame-retardant MB

3. Procedure

1. Control of the material mixed with MB

- (1) Make a list of materials which use MB. Indicate the name of raw material, name of MB, color, mixing rate, and the necessary material weight on the list.

(Example) List of mixing rate

No.	Raw material	Master batch			Weight of raw material (kg)	Weight of MB(kg)	Total weight (kg)
	P/N, name	P/N, name	Color	Mixing rate			
1	PP BF970AI	SWS144	Black	100 : 5	50	2.5	52.5
2					75	3.75	78.75
3					100	5	105
4	PP BF970AI	SWS1140	Orange	100 : 7	50	2.5	52.5
5					75	3.75	78.75
6					100	5	105

- (2) Clearly indicate "flame-retardant" or "Non-flame retardant" on the storage area of MB and the mixed materials.

- Separate the storage area by placing them face-to-face or back-to-back. If they are placed next to each other, place a partition in between or display a clear indication.

< Storage area of the mixed material: Partition >



- (3) Prepare raw material and MB based on the list of mixing rate, and mix them based on the conditions at each supplier.

- a. Using the exclusive mixer for each flame-retardant / non-flame retardant material is recommended. Take preventive measure not to mix foreign object.
- b. For the mixed material, obtain and display Lot No. per mixing.

- (4) Clean a mixer of MB after use. Make sure the material is not remained in the mixer.
 - Clarify the position where the resin easily remains in a mixer (Position to be checked and cleaned) on the instruction sheet with pictures.

- (5) Record the mixing of MB with raw material, and the record must be checked by a leader / manager.

- Record the name of raw material, name of MB, Lot No., mixing rate, and material weight.

(Example) Record of mixing MB

Mixer No. No.5 Mixer												Responsible	
Mixing date	Residue check in / around mixer	Raw material				Master Batch			Weight of raw material (kg)	Weight of MB (kg)	LOT NO. of mixed material	Operated by	Checked by
		P/N	LOT NO.	P/N	LOT NO.	Flame retardant or Non-flame retardant	Color	Mixing rate					
4/10	OK	PP BF970AI	4418012	SWS144	77460547	<input checked="" type="checkbox"/> Flame retardant <input type="checkbox"/> Non-flame retardant	Black	5	75	3.75	2020041000	Tanaka	Inoue
4/10	OK	PP BF970AI	4418013	SWS1140	76H51204	<input checked="" type="checkbox"/> Flame retardant <input type="checkbox"/> Non-flame retardant	Orange	7	100	7	2020041001	Tanaka	Inoue
4/10	OK	PA66 CM3006	S642808	M100	6052170	<input type="checkbox"/> Flame retardant <input checked="" type="checkbox"/> Non-flame retardant	B1	1.5	100	1.5	2020041002	Tanaka	Inoue

- (6) If there is a possibility that the wrong material was used, (e.g. mistake between flame-retardant and non-flame retardant, lack of flame-retardant MB), check whether the specified non-flame retardant (Br) was used or not with X-ray fluorescence spectrometers before shipment.

Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

003 Setting molding conditions / parameter

1. Purpose

As the validation of molding conditions (parameter), clarify the method for checking the tolerance of the molding conditions to prevent quality defect.

[Example of defect : Short shot, stretched lance or lock, slanted side wall of PROT etc.]

2. Application

- (1) To be applied when new molding parameter is set.
- (2) To be applied when molding parameter is set again (e.g. renewing mold, adding a mold, changing the molding parameter, changing a machine, number of cavities per mold, material etc.)

3. Procedure

- (1) Check the tolerance of injection conditions
For the condition applicable to mass production, check whether the condition tolerance is satisfied or not based on the setting value in table 1. Check the condition tolerance by item.
(use below confirmation sample for reference)

<Table 1. Items to be checked to check the tolerance of injection condition>

	Check lower limit (short shot direction)	Check upper limit (flash direction)
Injection speed	-10mm/sec or -20%	+5mm/sec or +10%
Maximum injection pressure	-20MPa or -20%	
Holding pressure force	-10MPa or -20%	+5MPa or +10%
Position to switch V/P	+1.5mm or +5%(measured value)	

※ Percentage (%) means the ratio to the setting value of molding parameter

<Check method>

- 1. Set a tentative parameter which will be applied to mass-production
- 2. Change only the injection speed by -10mm/sec (or - 20%) to the lower limit from the tentative parameter. Check if there is no short shot or other molding defect.
Check 3 shots for each condition to make a judgement. Also, check by increasing the speed (+5mm/sec or +10%), and keep a record of verification result as shown below.
- 3. Check the condition tolerance of other items by the same procedure as injection speed, and keep its record.

(e.g.) Verification record of condition tolerance for injection speed

Lower limit

Possible to produce OK part in this range

Upper limit

-10mm/s or -20% +5mm/s or +10%

← [Range to be checked] →

Item		1	2	3	4	5	6	7	8	9	
Molding condition	Injection speed (mm/s)	V1	30	35	40	45	50	55	60	65	70
		V2	10	15	20	25	30	35	40	45	50
		V3	12	14	16	18	20	25	30	35	40
What to evaluate	Short shot	×	○	○	○	○	○	○	○	○	
	Burr	○	○	○	○	○	○	○	○	×	
	Other defect	○	○	○	○	○	○	○	○	○	

↑
Tentative parameter

※ Review the tentative parameter again if the condition tolerance cannot be secured. If it is difficult to secure the condition tolerance by reviewing the tolerance, take countermeasures on the mold. If it is still difficult to secure the condition tolerance, indicate ID and implement Intensive control (double inspection, installing a cavity pressure sensor etc.)

Requirements for Resin Molded Products

Control No.

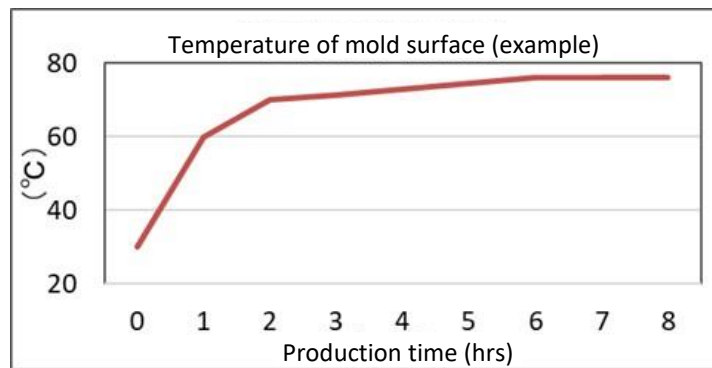
HCGS-INJ002-00

003 Setting molding conditions / parameter

(2) Setting the conditions for cooling mold

Set a cooling time based on the standard of each company. Record how the cooling time was verified and determined, and keep it as an evidence.

- ※ When setting a cooling time, consider the temperature rise of mold during mass-production
- ※ Consider the deviation because the necessary condition tolerance varies depending on the product shape, material or the structure of cooling system etc.



(3) Check the validity of the conditions for cooling mold.

Check the validity of the cooling conditions based on below check method at the first mass-production.

Also, check the validity when changing the conditions, for example, changing the temperature of cylinder which leads to the temperature rise of mold, increasing mold temperature or shortening a cycle time (including dry cycle)

< Check method >

Take the sample after 6 hours of continuous production at the first mass-production, and evaluate them.

After the molding, the sample needs to be left for more than 24 hours under the room temperature. Evaluate the sample based on the Inspection Standard to make sure there is no problem with the continuous production.

- ※ Product appearance needs to be checked with 3 shots or more.
- ※ For the shape of lance, check the angle (make sure it is not slanted), dimension, whether it is stretched or not.

Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

004 Identify the position of short shot

1. Purpose

Identify the position of short shot which is suddenly caused by clogging a gate beforehand, make sure to reflect it to the Inspection Standard not to flow out short shot.

2. Application

Apply to all resin molded product

3. Procedure

-1. Create Appearance Inspection Standard

(1) Understand the Inspection point of short shot by producing the failure mode, and reflect all of them to the Inspection standard. When the molding parameter is changed, identify the position of short shot again.

① Last filling spot

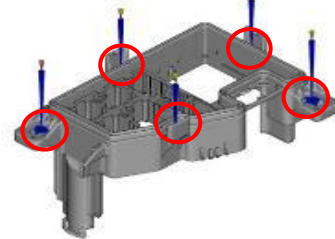
Check the last filling spot of resin when setting the molding parameter. If there may be several last filling spots, reflect all of them to the Inspection standard.

② Clogged gate

If the product has several gates, close each gate one by one and check the position of short shot.

※ If the resin is completely filled even though the gate is closed, produce short shot by shortening the time of holding pressure.

Example: RB with many gates



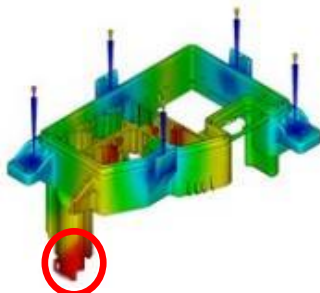
(2) When inspecting short shot, firstly check the usual last filling spot, and then check the last filling spot that is caused by clogging gate. Do not cover the inspection point with hand.

(3) Indicate the position where short shot occurs, picture, and the direction and method for inspecting short shot on the Inspection Standard. Do not try to put all information in 1 page of Instruction sheet. Use appropriate size and pages to be easily understood.

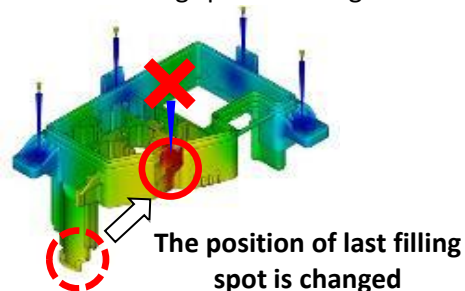
(4) Do not use a picture of large short shot which cannot tell the original product shape. Use a picture of small / subtle short shot which is difficult to detect in inspection.

(5) If there is a risk of breaking mold insert (small pin etc.) during verification by closing gate, it is possible to check the last filling spot by closing gate with resin flow analysis.

【Last filling spot when no gate is closed】



【Last filling spot when 1 gate is closed】



Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

005 Process control

1. Purpose

To clarify which items need to be indicated on the check sheet (Daily operation report) for controlling the molding process

2. Application

Apply to all check sheets (Daily operation report) prepared for molding process.

3. Procedure

Record the followings on the check sheet (Daily operation report) more than 1 time per day such as at production start or end of operation.

- (1) Date of filling a record
- (2) Name of a person in charge
- (2) How many cavities per mold? (How many cavities are in use or closed)
- (4) Molding machine No.
- (5) Mold No.
- (6) Material name
- (7) Monitor control function is turned on (To make an alarm when exceeding the control range)
- (8) The value displayed on a monitor
(Time of primary injection pressure, plasticizing time, cushioning amount)
- (9) Other value on a machine monitor
(Cycle time, cylinder temperature, temperature on a temperature controller etc.)
- (10) Part name, part number (No need if a check sheet is controlled and saved for each mold)
- (11) Lot No.
- (12) Appearance inspection record (patrol inspection)
- (13) Record of changing points
- (14) Abnormality record (record of machine stop for a short period etc.)
- (15) Record of test shot
- (16) Record of checking nozzle land

※ In case there is changing point or abnormality, handle them in accordance with the Changing point Control Standard or Abnormality handling Standard of each company.

Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

006 Control of test shot

1. Purpose

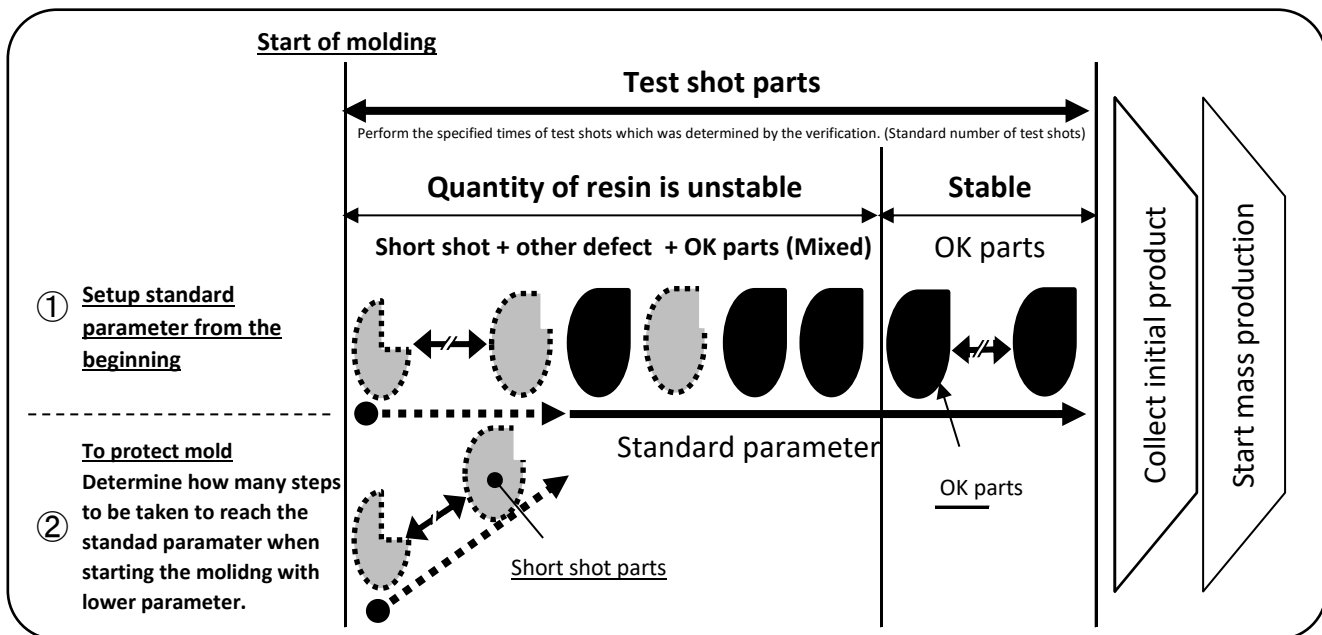
To standardize the control method of test shots in order to prevent the short shot parts which are produced in the early stage of test shots from being mixed in OK parts.

2. Application

Apply to all test shot operation

2. Definition of test short parts

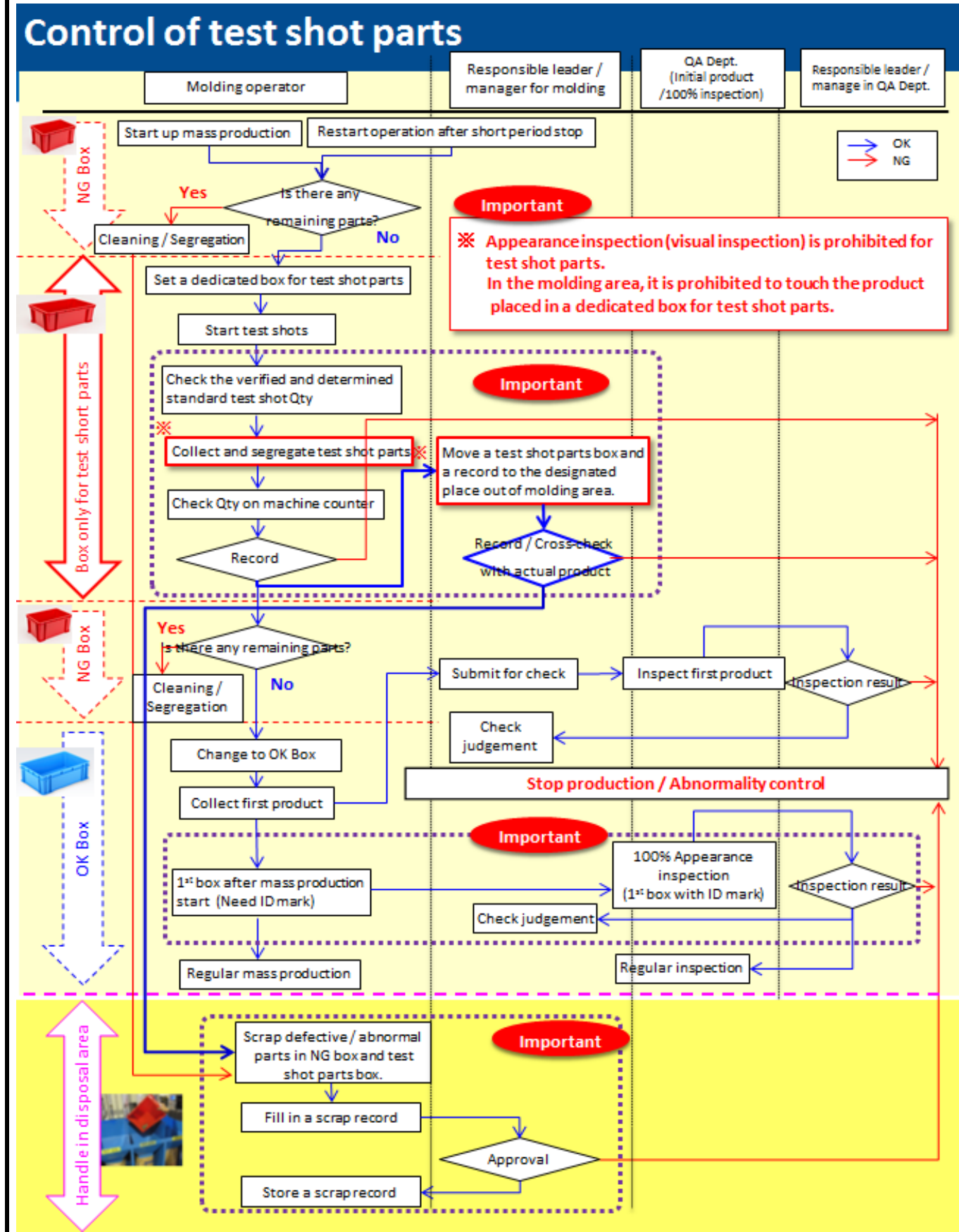
Test shot parts: The parts produced from the start of molding until just before producing the parts applicable for shipping. (OK parts).

**4. Procedure**

- (1) Make sure to perform test shots when starting up mass production and when restarting the production after the short period of machine stop.
- (2) Determine how many test shots to be performed per mold or per material. (Specify **standard number of test shots**)
(Check how many test shots is necessary to produce OK parts when setting up or changing the parameter, and when restarting the production after the short period stop)
Determine the maximum number of test shots. Stop the production as abnormality if the number of test shots exceeds the upper limit.
- (3) Take the preventive measures for hardware not to eject test shot parts in the same route with OK parts. Clearly distinguish the test shot parts from OK parts at the time of ejecting the product from a molding machine, and segregate the test shot parts.
- (4) Use the dedicated box for test shot parts per molding machine (Use a box which is obviously different from OK box), and make sure to segregate all test shot parts without omission.
- (5) The responsible personnel (The dedicated person in charge) checks the quantity by comparing the standard number of test shots, the quantity on a machine counter, the quantity of actual product, and a record. The record and the quantity are to be checked and approved in the area which is far away from the molding machine.
- (6) The test shot parts are to be checked by a manager before scarp (Make sure to keep a record)
If the standard number of test shots does not match with the quantity of actual product to be scrapped, the manager stops the production as abnormality, and perform abnormality control.

006 Control of test shot

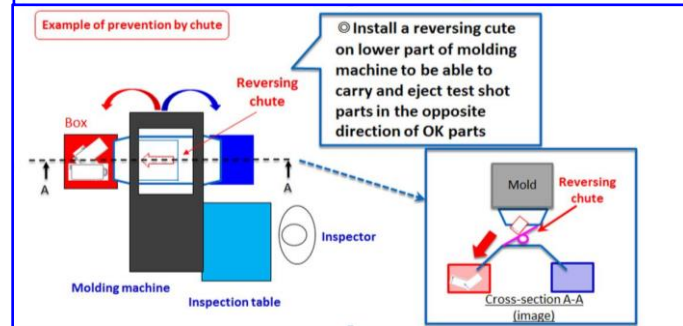
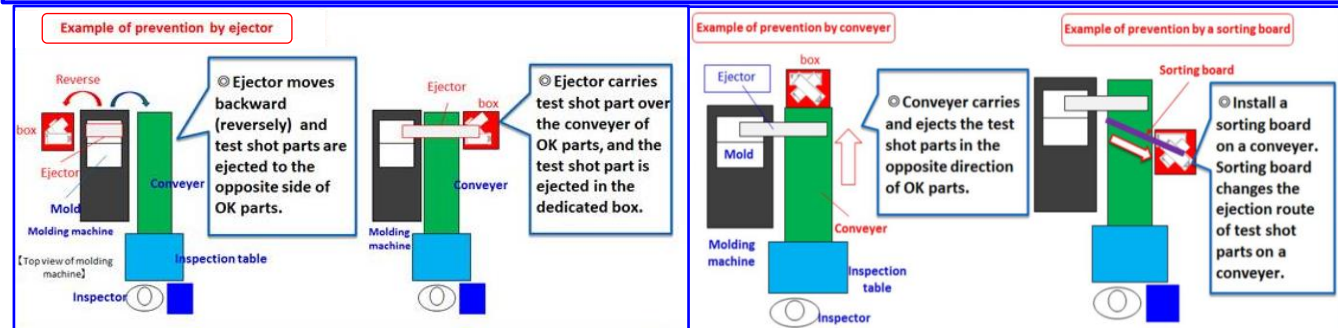
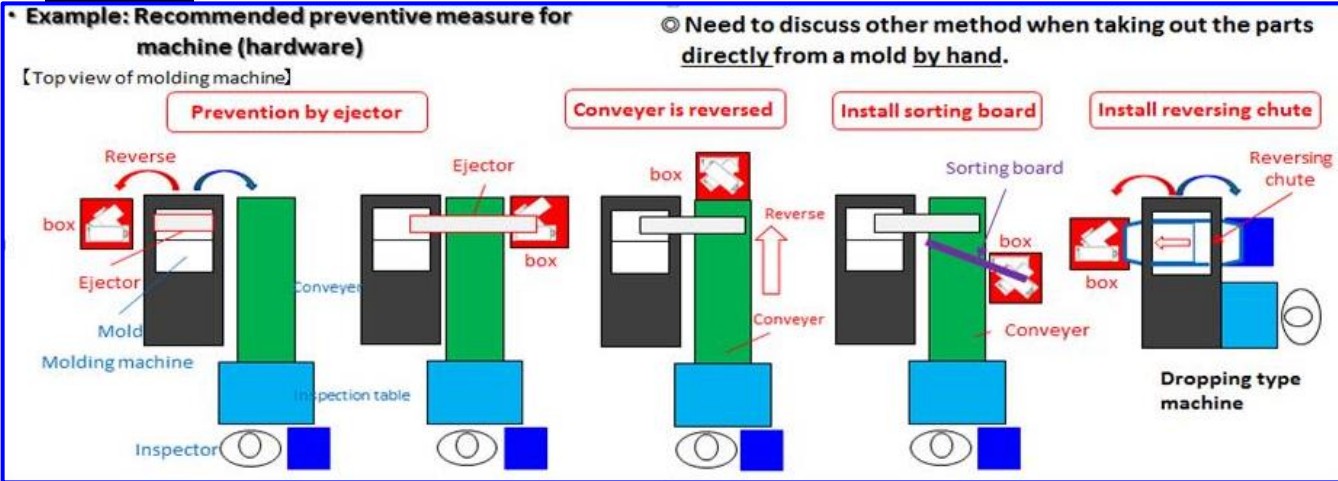
(7) Control flow for test shot parts



006 Control of test shot

5. Explanation of the control point for test shot parts

1. Take the preventive measures for hardware not to eject test shot parts in the same route with OK parts.



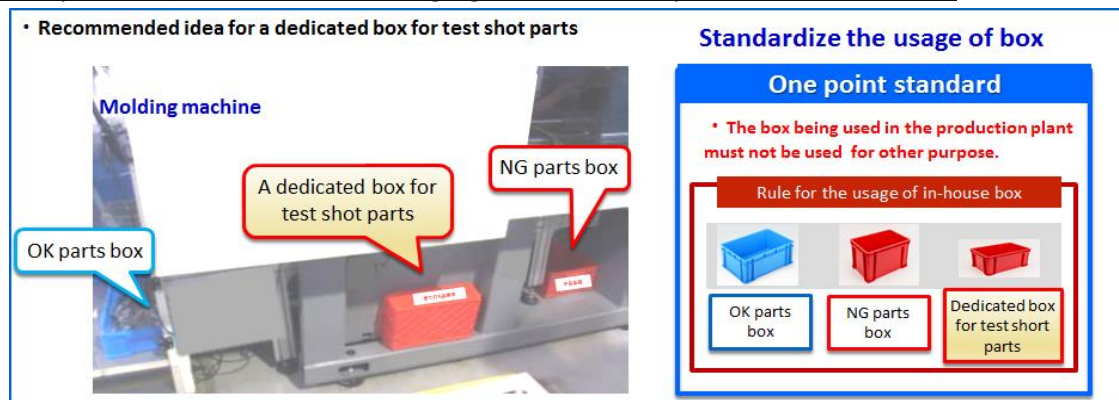
[Important point]

- Putting the test shot parts in a crusher for recycling is prohibited.

[Caution point]

- In case it is difficult to take the preventive measures on hardware, establish the segregation method of test shot parts in your own company, and obtain an approval from SWS

2. Use the dedicated box for test shot parts per molding machine (A box which is obviously different from OK parts box) and make sure to segregate all test shot parts without omission.



[Important point]

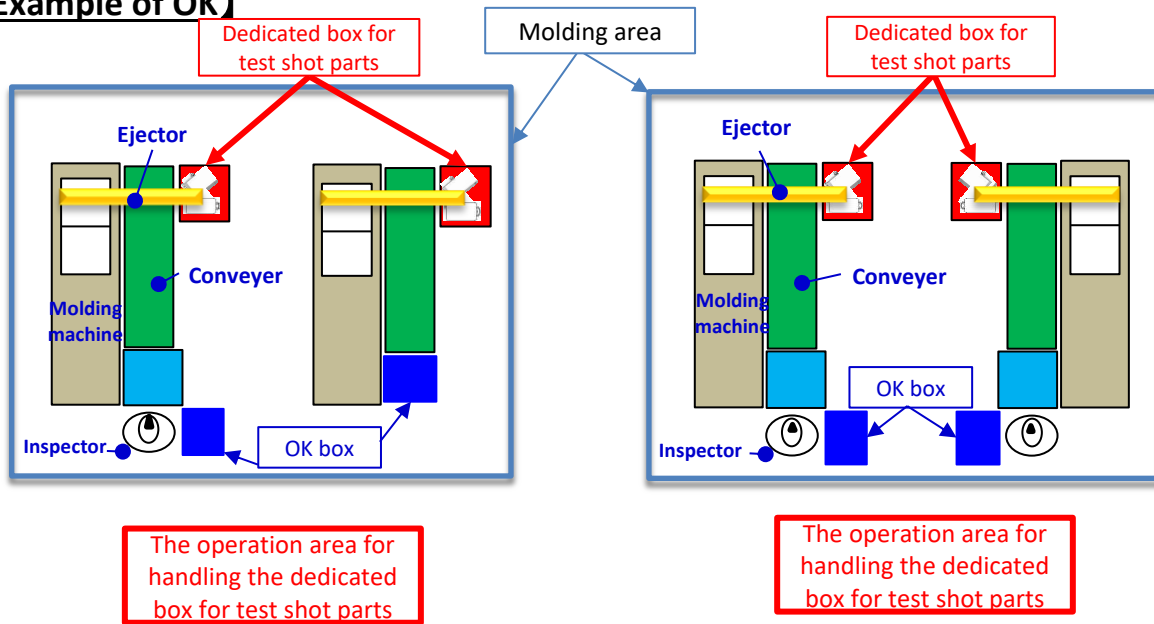
- Make sure to segregate test shot parts in a dedicated box which has a different identification from OK box.
- Clarify the purpose of use for the boxes being used in a production plant.

006 Control of test shot

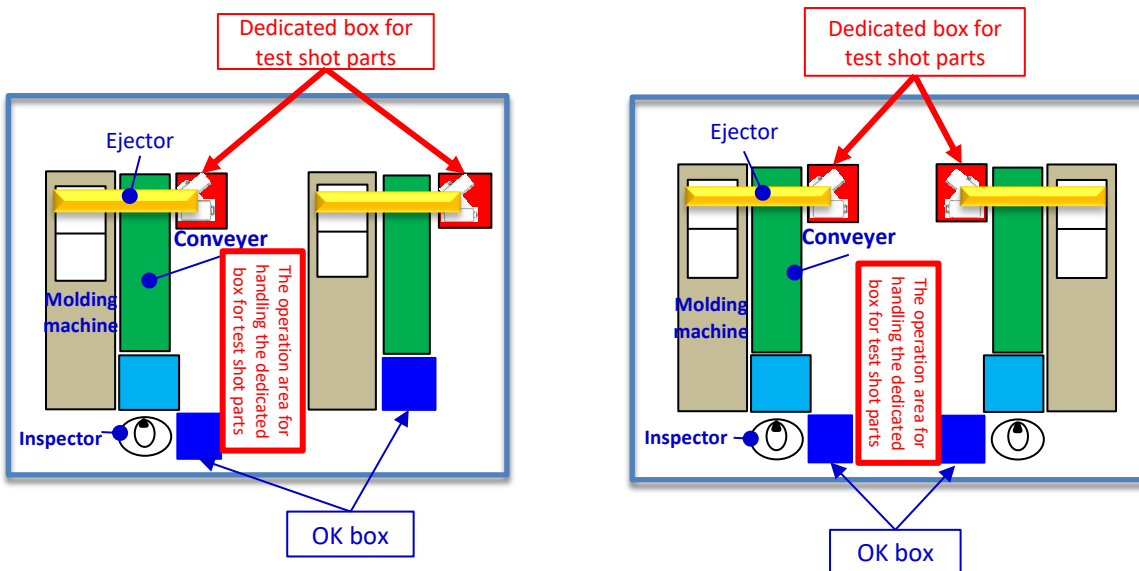
-3. Check the quantity of the segregated test shot parts in the area which is far away from the molding area.

【Important point】 Appearance inspection (visual check) is prohibited for the test shot parts.
In the molding area, it is prohibited to touch the product placed in a dedicated box for test shot parts.

【Example of OK】



【Example of NG】



Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

006 Control of test shot

-4. Make sure to control the test shot when starting up mass-production and when restarting the production after short period of machine stop, and keep a record.

Recommended control record for test shot

The standard for the specified number of test shot

Specified number of test shots

Shot

Molding Operation Dairy report

Control item for each supplier

Control Items for test shot					
指定数	成形機カウンタ	部品数	生産開始品	作業者確認	責任者確認
10	10	10	未	B450	伊藤

【Important point】

- For the confirmation, the record must include "How many test shots were performed by who and when" and "quantity of scrapped parts".
- The standard number of test shots and the quantity of scrapped parts (actual quantity) must be included on a record to be able to cross-check the quantity. Stop the production if there is a mismatch in the quantity.
- For every test shots, the responsible personnel or the dedicated person in charge checks and approves the quantity and the record.

The record of test shot (example)

Control item for each supplier

Control items for test shot parts					
No. of test shot	Machine counter	Qty of parts	Mass production parts	Check by operator	Check by manager
10	10	10	OK 2	B450	伊藤
①	②	③			

- Cross-check by comparing 3 items
- Approval by a manager for each test shots

The scrap record of test shot parts (example)

Defective parts scarp record

Day	Time	P/N	Lot No.	Scrapped	Scrapped item	Check by operator	Check by manager
6/5	10:30	1234-5678	a1232456	12	Test shot parts from	B450	伊藤
				10	Test shot parts after short	A321	伊藤
				16	NG parts with excess material	A38	後藤

- Clarify what was scrapped.
- Approval by a manager

Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

007 Prevention for the clogged gate

1. Purpose

To prevent short shot by preventing "clogging gate" that is caused by the remained resin when changing the material from the resin with high melting temperature with the resin with low melting temperature, or inclusion of foreign material or foreign object.

2. Application

Apply to the material change from the resin with high melting temperature to the resin with low melting temperature.

3. Procedure

-1. Create the standard (rule) for how to clean a screw and cylinder.

(1) Understand the material change from the resin with high melting temperature to the resin with low melting temperature

① Clarify the melting temperature of the material being used in your company to be able to understand the cleaning method.

(2) Create the cleaning procedure

① Determine the frequency of cleaning

a. Cleaning must be performed every time when changing the material from Resin with high melting temperature to Resin with low melting temperature

② Determine the cleaning method

a. Cleaning with the dedicated purging compound

(Use appropriate purging compound for the melting temperature of resin)

b. Cleaning by disassembling a screw

(This cleaning method is desirable for periodic maintenance or when investigating the abnormality)

③ Determine how to check / judge if the material has been changed.

a. Visually check the purging scrap to confirm whether the material from previous production or purging compound has been replaced with the correct material.

b. Prepare a dedicated tray to put the last purging scrap. The purging scrap is to be double-checked by the responsible personnel (the dedicated person in charge).

c. Determine clear judgement criteria

④ Record

a. The task during cleaning must be included in a check sheet to be checked during setup.

b. Must record the result of judging the material change in addition to the implementation of cleaning.

c. Record the name of purging compound (To check whether the used purging compound was appropriate for the melting temperature of resin)

-2. Create the standard (rule) for how to clean the molding machine and the accessory equipment

(1) Create the cleaning procedure

① For the equipment being used, clarify on which part of equipment the resin remains.
(The point where the resin remains)

a. Clarify such points with the pictures.

② Determine the frequency of cleaning

a. Make sure to perform cleaning when changing the material from the resin with high melting temperature to the resin with low melting temperature.

③ Determine the cleaning method.

a. Determine which cleaning tools to be used

b. Take preventive measures not to scatter or mix foreign material during cleaning.

c. It is desirable to clean the equipment in the designated cleaning area.

④ Determine how to check / judge if the material has been changed.

a. The purging scrap is to be double-checked by the responsible personnel.
(the dedicated person in charge)

⑤ Record

a. The task during cleaning must be included in a check sheet to be checked during setup.

b. Must record the result of judging the material change in addition to the implementation of cleaning.

*** As the preventive measures not to include foreign object / foreign material, it is desirable to use the dedicated molding machine and accessory equipment for each material. For a crusher however, use the dedicated crusher as much as possible.**

Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

007 Prevention for the clogged gate

【Example】Clarify the melting temperature of the material

《Example Resin type and melting temperature》

Resin with low melting temperature



Resin with high melting temperature

Resin	Melting temperature
PE (Polyethylene)	95~130℃
PP (Polypropylene)	168℃
PA6 (Nylon 6)	225℃
PBT(Polybutylene terephthalate)	232~267℃
PA66 (Nylon 66)	265℃

《Caution point when changing material》

① Relatively safe

【Melting temperature】

Low resin → High resin

Relatively easy to change the material

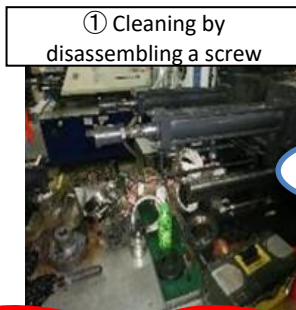
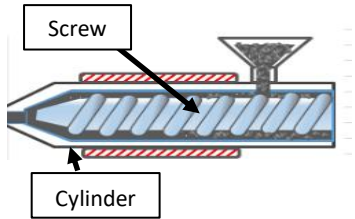
② Dangerous

【Melting temperature】

High resin → Low resin

The resin with high melting temperature easily remains in a cylinder.

【Example】 How to change the material from the resin with high melting temperature to the resin with low melting temperature



Recommend

Need time and effort
⇒ Risk of neglecting the cleaning

Dedicated purging compound can clean a screw effectively

Before cleaning



After cleaning



Recommend to use the dedicated purging compound which has high detergency and excellence in preventing the material from remaining.

<Example> How to change the material from Resin with high melting temperature → Resin with low melting temperature

- ① Stop molding machine
 - ② Close a shutter on a hopper, remove the remaining material
 - ③ Start purging by keeping high temperature to remove the old material from a cylinder.
 - ④ Feed the purging compound under high temperature to remove the old material.
 - ⑤ Visually check the ejected purging scrap. Check if the old material has been completely ejected and replaced with the purging compound.
 - ⑥ Judge: Check by operator → OK (In case of NG, repeat ④~⑤)
 - ⑦ Lower the cylinder temperature for new material (resin with low melting temperature).
Feed new material to eject the purging compound.
 - ⑧ Visually check the ejected purging scrap. Check if the purging compound is completely ejected and replaced with the resin with low melting temperature.
 - ⑨ Judge: Check by operator → OK → Check by manager or leader → OK → keep a record
- ※ In case of NG, repeat ⑦~⑧.

Requirements for Resin Molded Products

Control No. HCGS-INJ002-00

【Important point】
 •When carrying a material bag from warehouse to molding process
 •Clean the surface of material bag before feeding the material into a material tank etc.

Example of the points where the resin remains

Surface on a material bag

Inside of connection hose

【Important point】
 • No residue in a hose
 • No damage or hole on a hose

Example of the cleaning standard for crusher

Bad example

• Word only
 • The detailed cleaning point is not clear

Good example

3-4 Clean entire equipment by a vacuum cleaner.

Before cleaning

Tools to be used

After cleaning

Conduct abnormality handling, especially when the portion shown in above red circle is damaged.

• Create "easy-to-understand" standard with pictures.
 • Create standard so that anyone can clean the same points.

Requirements for Resin Molded Products

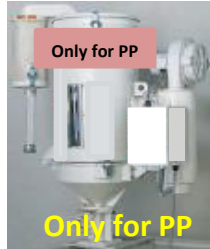
Control No. HCGS-INJ002-00

007 Prevention for the clogged gate

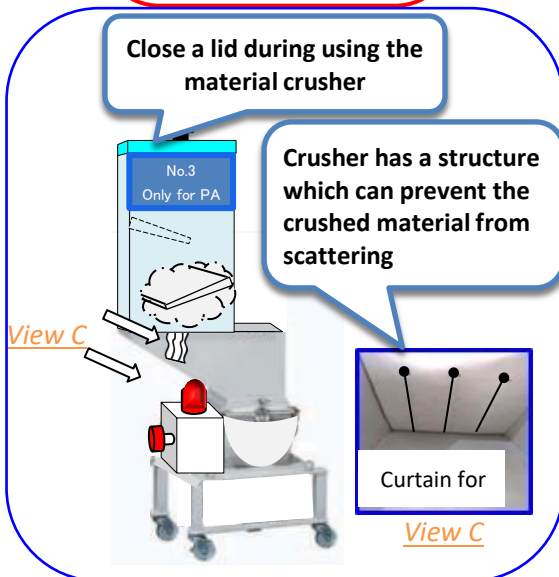
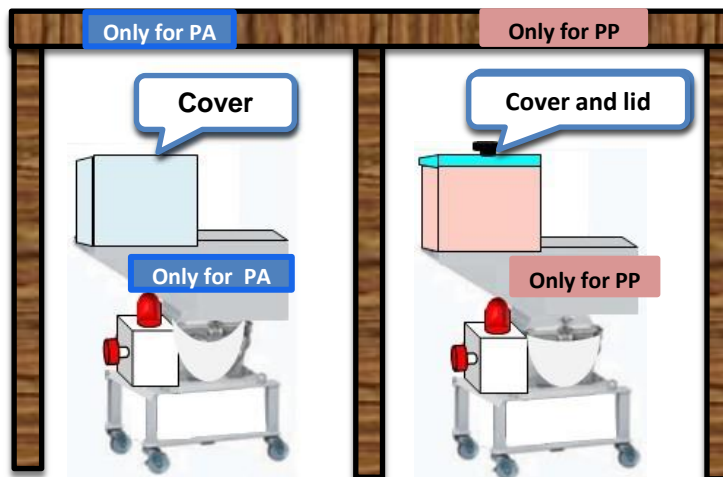
Example of the recommended prevention not to mix foreign material

[Important point]

- It is desirable to designate the material to be used for each equipment.
- Indicate easy-to-understand ID mark on each equipment and place them in the separate area
(Resin with high melting temperature (PA), Resin with low melting temperature (PP), flame-retardant MB, MB)



Example of the recommended prevention not to mix foreign material or foreign object from nearby



008 Setting runner, gate

1. Purpose

To prevent short shot which is caused by clogging gate due to foreign object or cold slug.

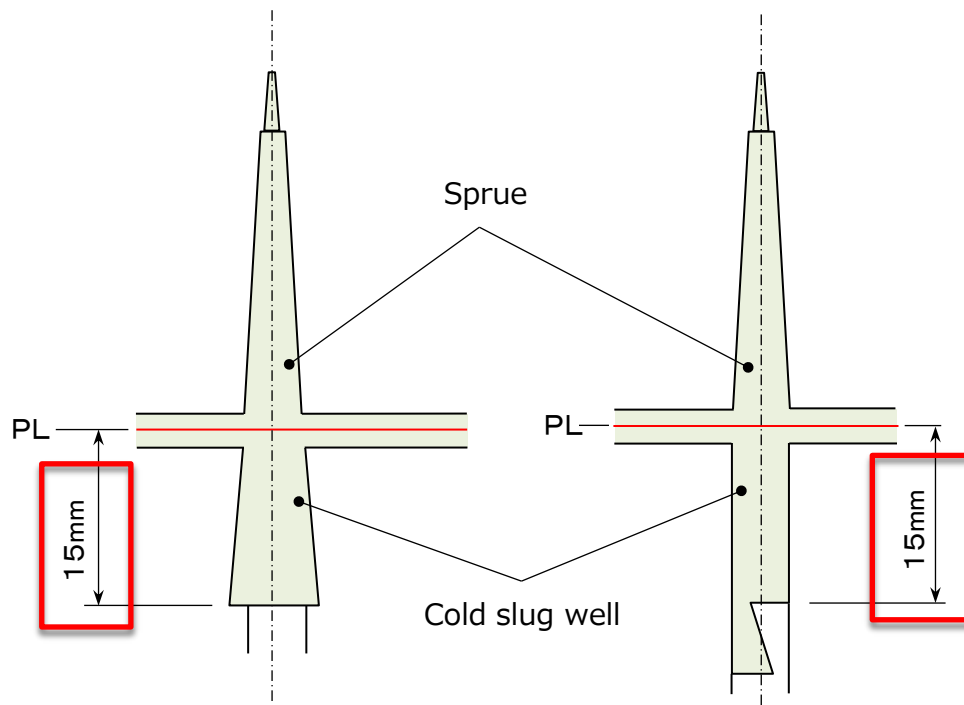
2. Application

This requirements applies to all molds in the molding process

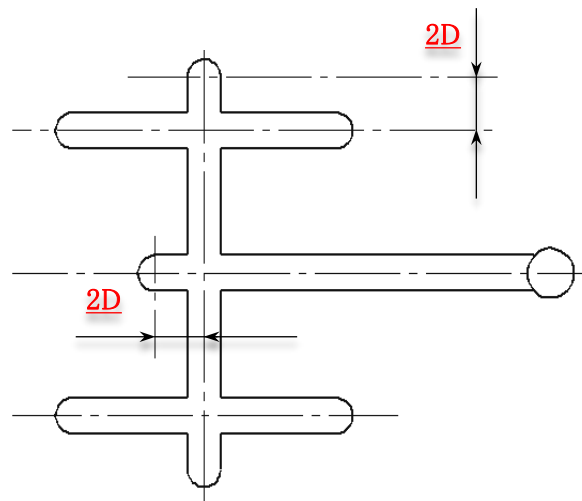
3. Create / operate a rule (Make sure to include the following items)

-1. Create the standard (rule) to set the slug wells when designing a mold.

(1) Basically, the depth of the slug well directly below sprue is 15mm.



(2) Basically, length of slug well on the junction of runner is twice as length of diameter of runner (D).



Requirements for Resin Molded Products

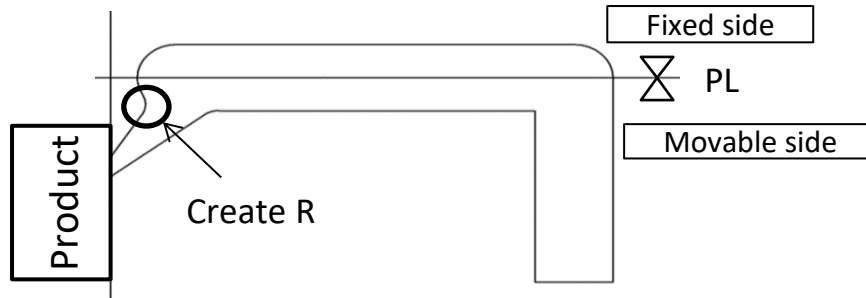
Control No.

HCGS-INJ002-00

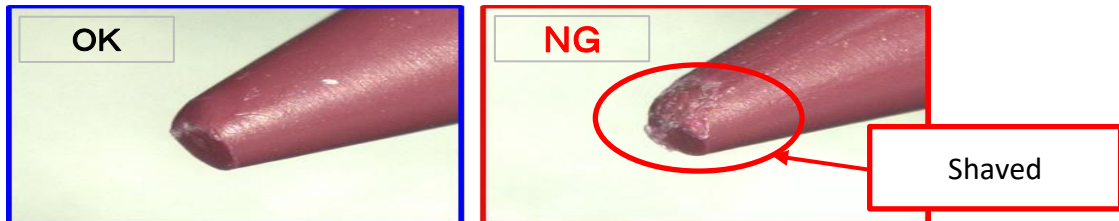
008 Setting runner, gate

-2. Create the standard (rule) about the gate

(1) Create maximum R on the spot which becomes resistant during demolding.



(2) Check the shape of gate tip during mold overhaul.
The mold must be repaired if the gate tip is shaved.



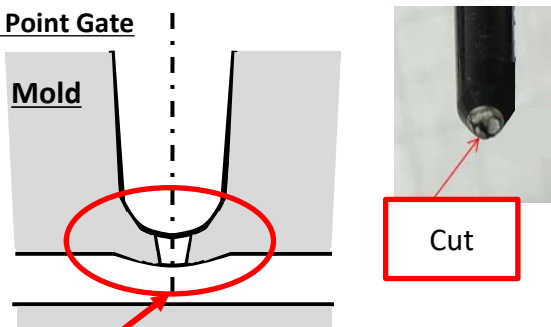
(3) It is desirable to make the replaceable mold structure on the gate.

(Consider the replaceable mold structure when designing a mold, and adopt that design if possible)

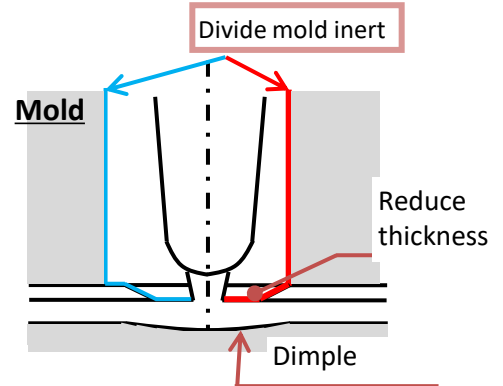
The abrasion on the gate is inevitable. A parts of gate is cut off and clog the gate as a cold slug.

(Example)

Pin Point Gate



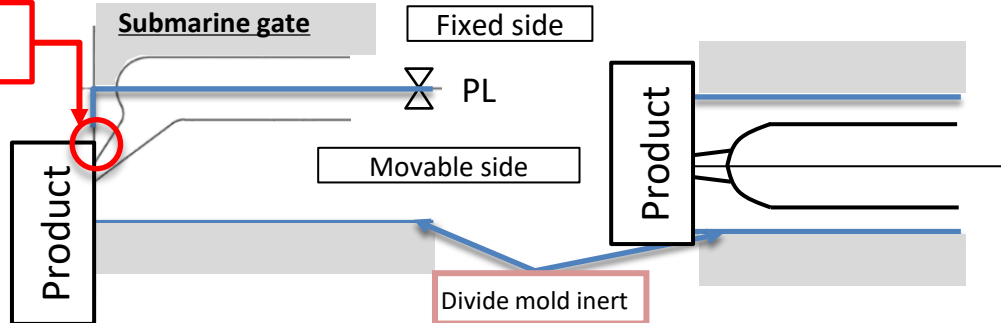
Divide mold inert



Gate is worn out

Submarine gate

Fixed side



009 Mold specification of clip (anchor)

1. Purpose

For the protector with clip (anchor), specify the mold specification to improve the capability of filling the resin until the top of clip head, and to prevent the clip from breaking due to lack of releasing gas.

2. Application

All protectors which have a clip (anchor)

3. Procedure

-1. The basic mold structure of clip is shown below.

【Basic structure】

Mold parts which form a clip
 • Core side : Mold parts is divided / Air vent is made

Core side Cavity side

PL (parting line) on mold

Pin for releasing gas

1. Air vent on all circumferences (Depth 0.005~0.010)
(Caution : No burr is allowed)
2. Concaved section on all circumferences of air vent (Depth = 0.20)
3. Make a groove for releasing air /gas until outside of mold
(Caution : Make sure to maintain the strength of mold)

【Example of NG】

Air cannot be released from the top of clip

Mold parts which form a clip
 • Core side : Mold parts is not divided

PL

There is a pin for releasing gas. However, there is no air vent or groove which can release air or gas to the outside of mold.
 (Cavity side : Pin for releasing gas)

-2. If the mold needs modification, make sure to reflect the detail of modification to the drawing of mold and the record of mold repair. When needed, divide mold parts, use mold insert, or make air vent or groove for releasing air etc. Make sure to design air vent so that the gas/air can be surely released to the outside of mold.

010 Setting nozzle touch area

1. Purpose

Maintain appropriate condition on the nozzle touch area in order prevent short shot caused by the clogged gate due to cold slug and foreign object.

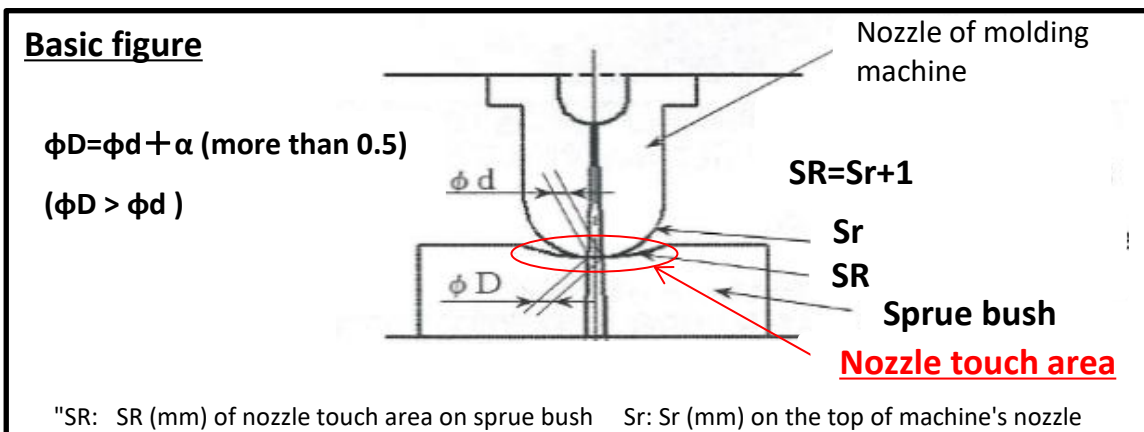
2. Application

This requirements applies to all molds in the molding process

Create / operate a rule (Make sure to include the following items)

-1. Check if the nozzle touch area is correctly setup when designing a mold, selecting a molding machine and during mass-production.

(1) The area where a nozzle of molding machine touches a sprue bush is called "Nozzle touch area". Basically, the dimension of nozzle touch area (dimension relating to a nozzle and sprue bush) is to be set up as follows.



(2) Clarify the setup value of nozzle touch area on the Mold Specification, drawing of mold, or the documents for transferring a mold. (documents for hand over) etc.

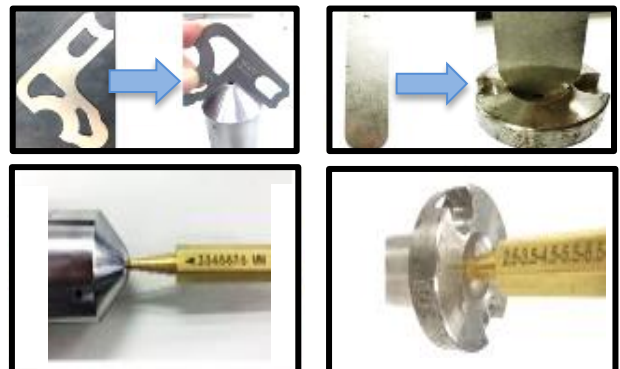
-2. Measure the dimension of nozzle touch area to verify if the setup value is correct or not.

(1) Clarify the measurement method.

- ① Select the measurement tool (gauge).
- (2) Determine the frequency of inspection.
 - ① Visually check the condition of Land on a daily basis. Measure the dimension when abnormality is detected.
 - ② Measure the dimension during periodic maintenance
 - a. Nozzle : once a year
 - b. Sprue bush: Every mold maintenance
 - ③ Measure the dimension when transferring a mold.

- (3) Determine the judgement criteria for abnormality
 - ① Clarify the abnormal condition with the pictures.
- (4) Determine appropriate handling method of abnormality.
 - ① Replace or repair the nozzle / sprue bush
 - ② Inspection by retracing the produced product
- (5) Record
 - ① The result of visually checking the condition of Land on a dairy basis.
 - ② The result of measuring the dimension during periodic inspection.
 - ③ Replacement record (Conduct appropriate handling "abnormality control, changing point control" at the time of replacement.

Measurement method (example)



【Example】

SR, Sr : Radius gauge, R gauge
 φD, φd : Nozzle gauge

010 Setting nozzle touch area

-3 Check the condition of nozzle touch area to maintain the appropriate condition.

(1) Determine check method.

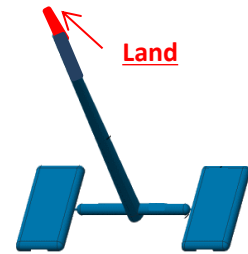
- ① Judge the condition of nozzle touch area by visually checking a Land.

(2) Determine the frequency of inspection.

- ① Inspection before starting operation
- ② Periodic maintenance (Create annual plan)

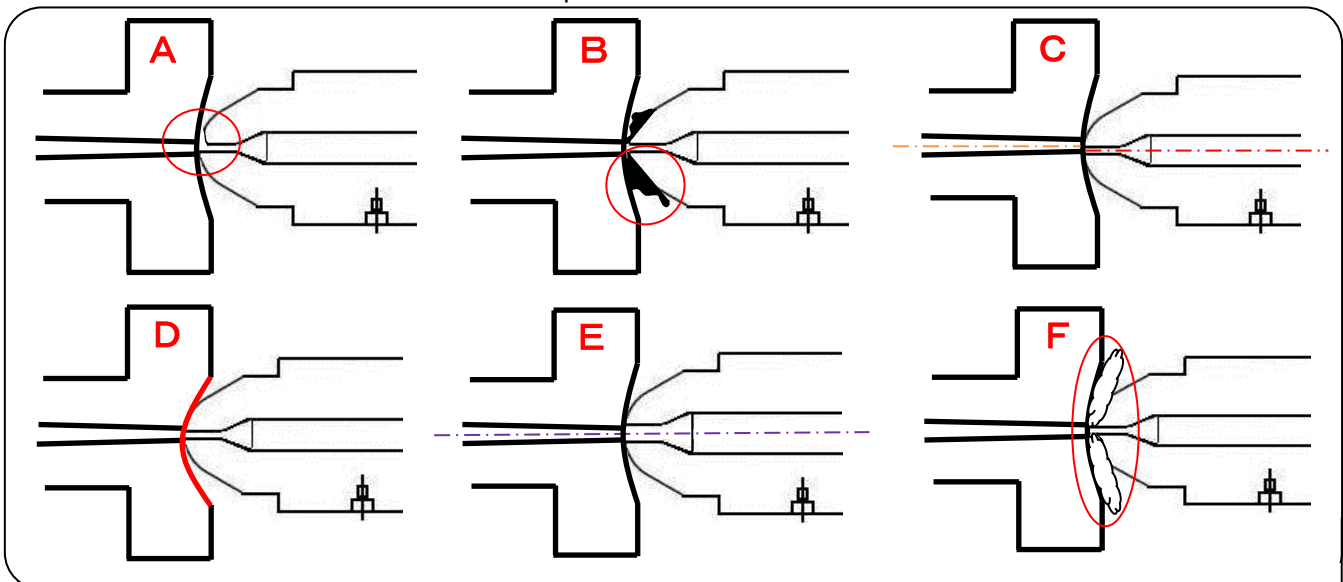
(3) Determine the judgement criteria for abnormality

- ① Clarify the abnormal condition with the pictures.
Refer to "Example of defect on the nozzle touch area".
- ② Determine what to be checked when abnormality occurs, and check those check points.



【Example of the check points】

- A Is the top of nozzle or Land abnormally worn out or broken?
- B Is the resin adhered on the top of nozzle?
- C Does the center of nozzle match with the center of sprue bush? (Must be aligned)
- D Is the top of sprue bush (SR) damaged or dented?
- E Is the diameter of Land and sprue correctly set up? Must be ϕD (sprue) > ϕd (Nozzle top)
- F Is there any foreign object between Land and sprue?
(Intentionally putting a foreign object between sprue and Land to prevent resin leak is prohibited)
- G Is there a crack at the base of sprue bush?

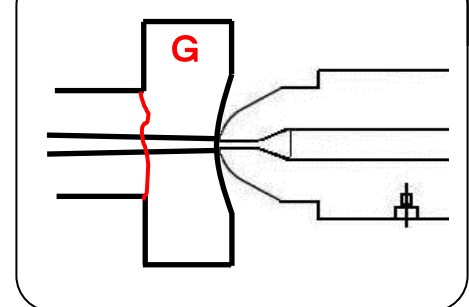


(4) Determine appropriate handling method of abnormality

- ① Conduct "abnormality control" and "changing point control".
- ② Inspection by retracing the produced product.
- ③ Replace or repair the nozzle / sprue bush

(5) Record

- ① Record of "abnormality control" and "changing point control" until closure.
- ② Record of inspection by retracing the produced product.
- ③ Record of replacing or repairing the nozzle / sprue bush



Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

010 Setting nozzle touch area

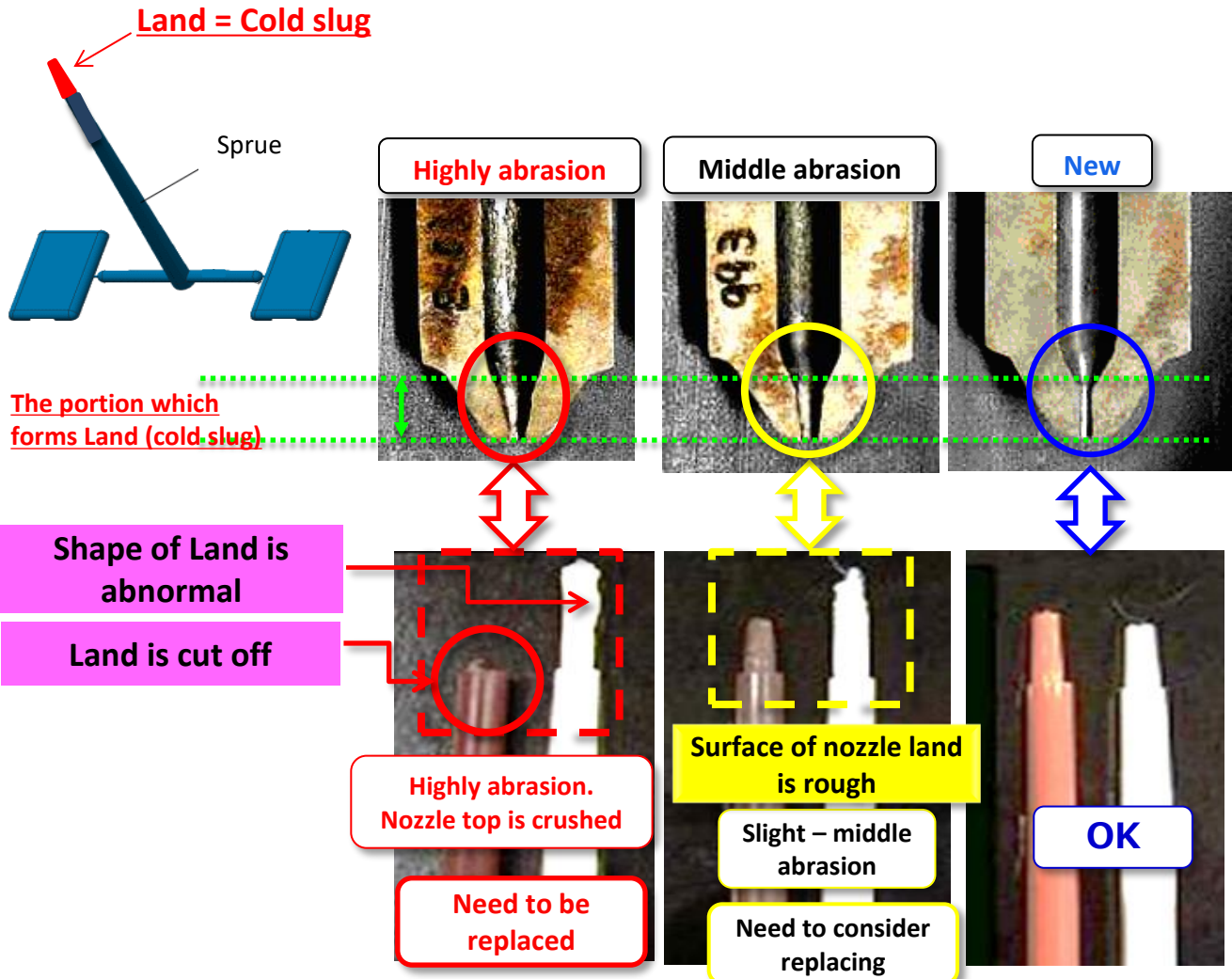
Make sure to check Land periodically since the condition of Land tells the abnormality on the equipment, such as abrasion or breakage.

【Example of defect on the nozzle touch area】

A-1: Is the top of nozzle or land abnormally worn out or broken ?

It is not possible to cut the nozzle. Therefore, judge the degree of abrasion by visually checking the condition of Land.

Highly worn-out nozzle needs to be replaced with new one to prevent abnormal cold slug.



Highly abrasion Surface of nozzle land is rough. Land becomes longer than the normal length "approximately 10mm" or forms largely abnormal shape.

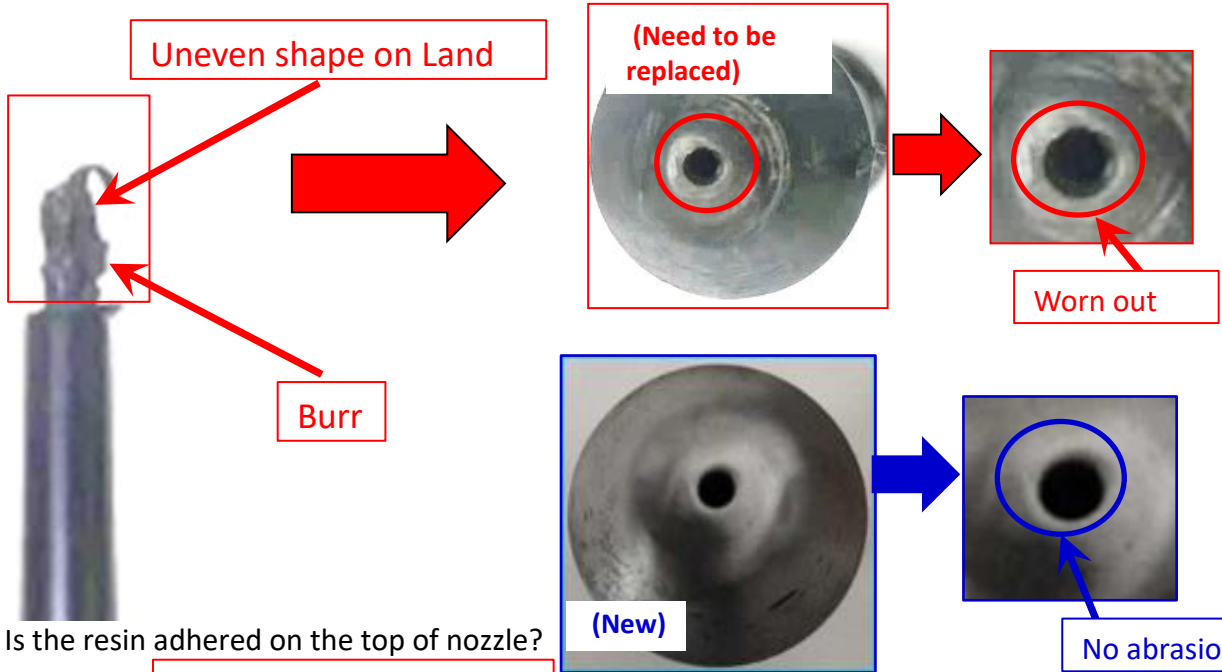
Crushed Nozzle top is crushed inward and forms a protrusion inside a nozzle. Due to this, Land is cut during demolding and remains inside a nozzle as an abnormal cold slug.

Handling method Conduct appropriate handling (Abnormality control, changing point control) when abnormality is detected. (Inspection by retracing the produced product. Replace or repair the nozzle)

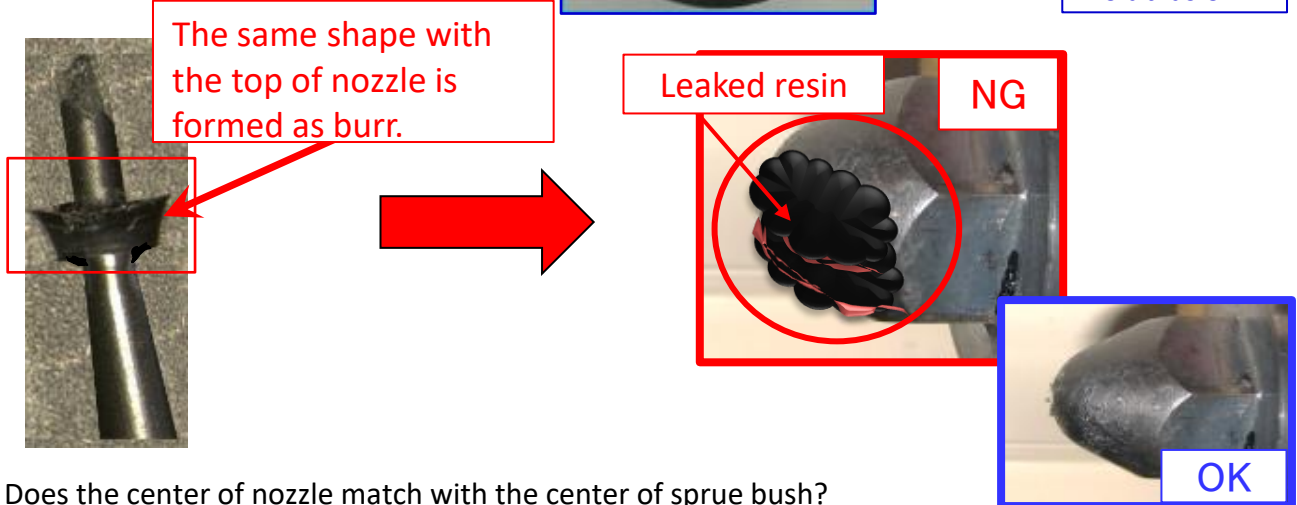
010 Setting nozzle touch area

【Example of defect on the nozzle touch area】

A-2: Is the top of nozzle or land abnormally worn out or broken?

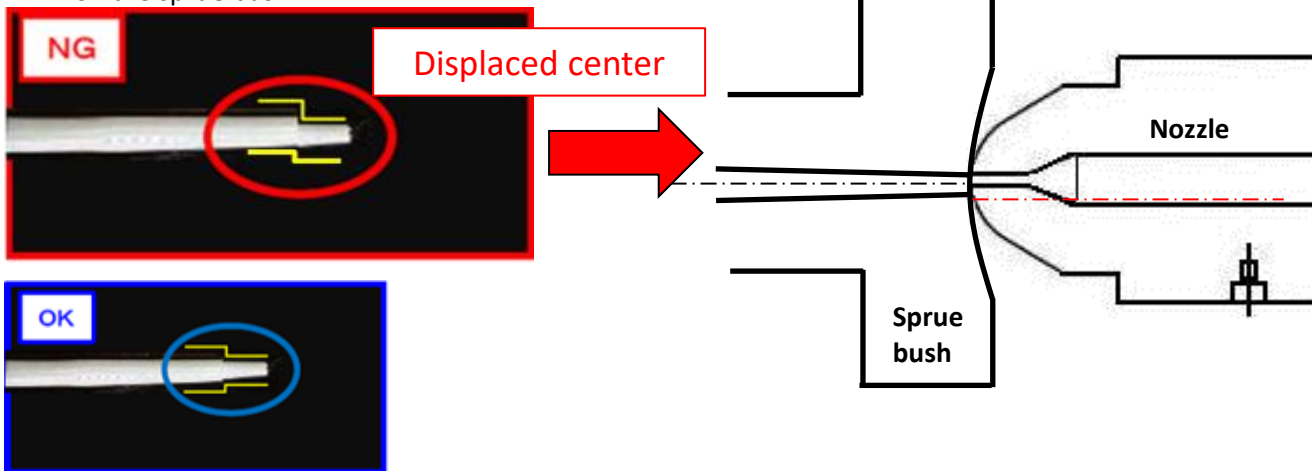


B: Is the resin adhered on the top of nozzle?



C: Does the center of nozzle match with the center of sprue bush?

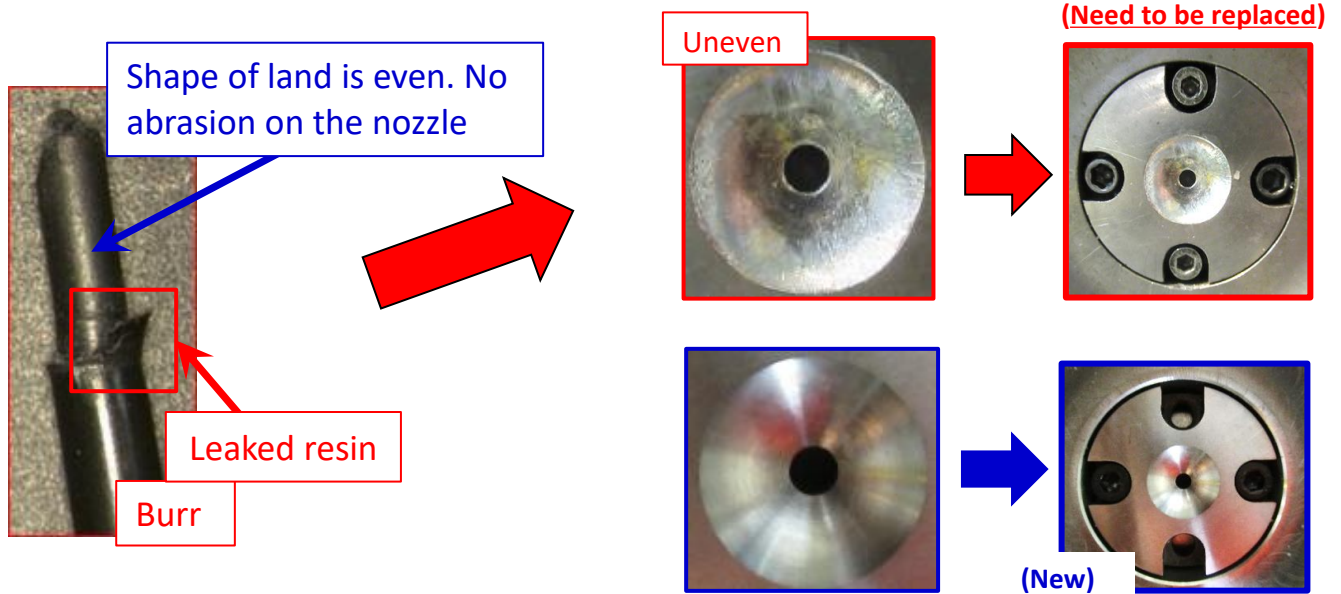
The center of nozzle and sprue bush is not aligned. Nozzle cannot touch the correct position on the sprue bush.



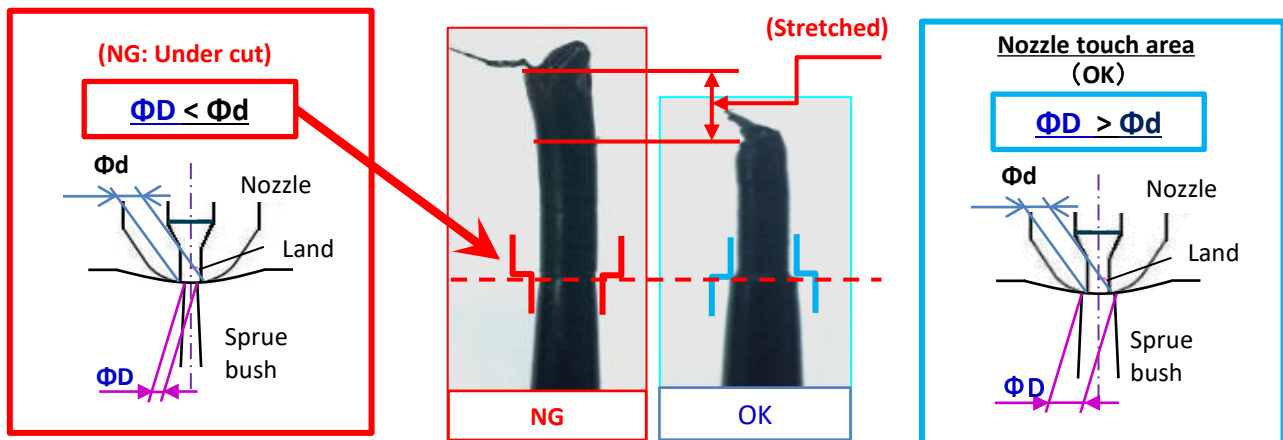
010 Setting nozzle touch area

【Example of defect on the nozzle touch area】

D: Is the top of sprue bush (SR) damage or dented?

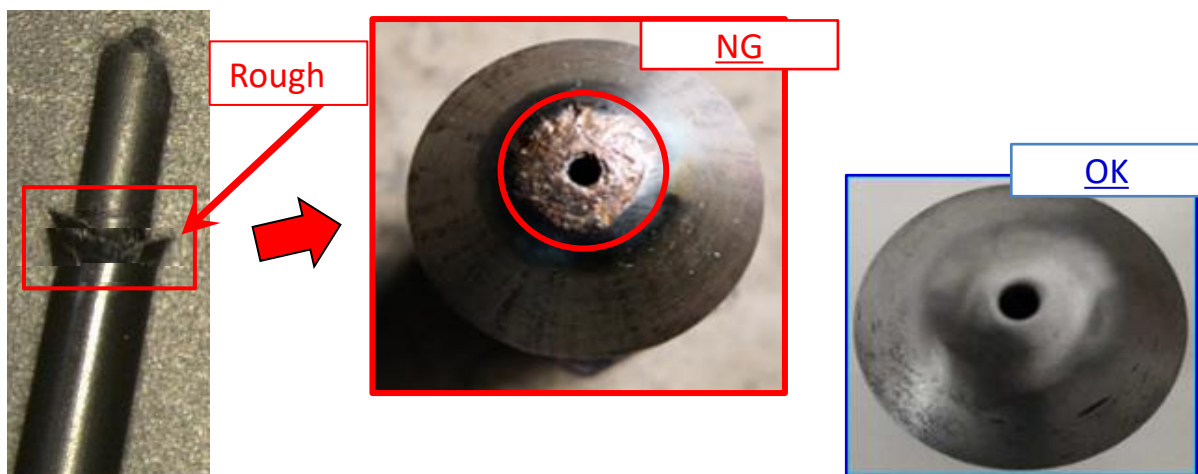


E: Is the diameter of land and sprue correctly set up ?



F: Is there any foreign object between land and sprue?

(Intentionally putting a foreign object between sprue and Land to prevent resin leak is prohibited)



Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

010 Setting nozzle touch area

-4. Check the condition of locating ring to maintain appropriate condition

(1) Determine check method

1. Make sure a locating ring is attached.
2. Measure the outer diameter of locating ring and the hole diameter of platen on the fixing side of molding machine to make sure they match with each other.
3. Visually check the condition of locating ring to judge if it is usable.

(2) Determine the frequency of inspection

1. Inspection before starting operation
2. Every mold maintenance

(3) Determine the judgement criteria of abnormality

1. Clarify the abnormal condition with pictures . Refer to 【Example of check point 】
2. Determine what to check during abnormality (check point), and check them.

【Example of check point】

A: No locating ring

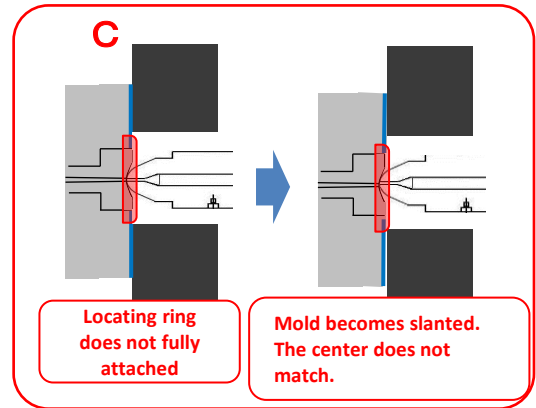
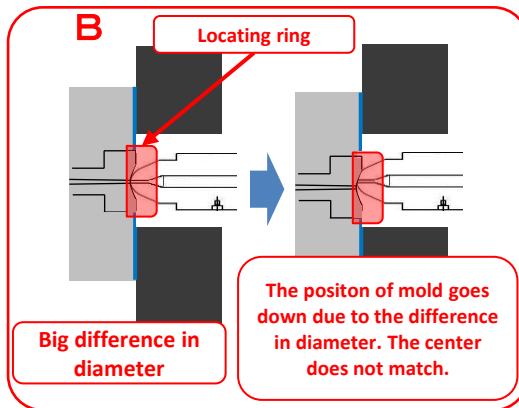
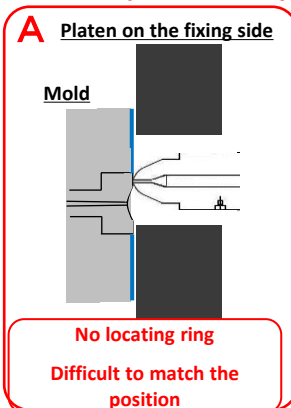
B: Outer diameter of locating ring does not match with the hole diameter of platen on the fixing side of molding machine.

C: Locating ring is not fully attached on a platen

D: The edge of locating ring is abnormally damaged (swelled) and the outer diameter becomes bigger.

E: Damage on the hole diameter of platen on the fixing side of molding machine

【Example of check point】

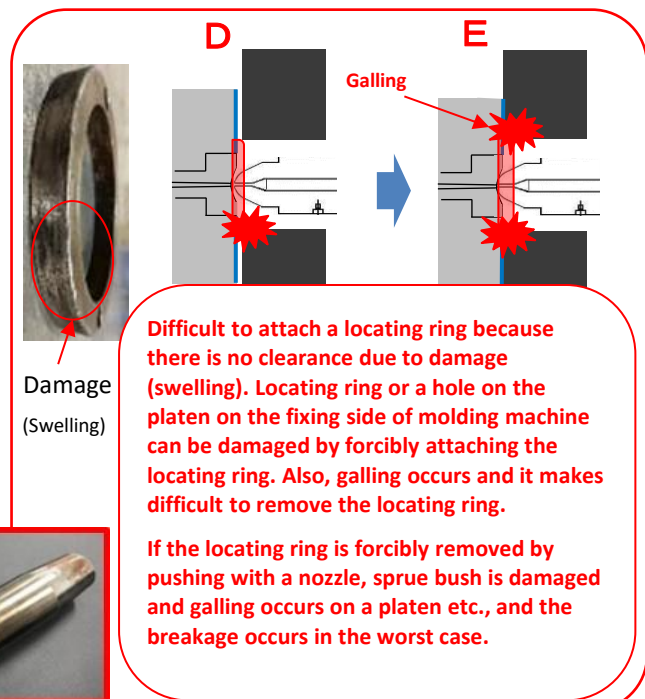


(4) Determine appropriate handling method in case of abnormality

1. Perform Abnormality control, Changing point control
2. Inspection by retracing the produced parts
3. Replace, repair, attach the locating ring,
4. Repair the hole on a platen on the fixing side

(5) Record

1. Record of Abnormality control / Changing point control until closure
2. Record of checking the produced parts by retracing.
3. Record of replacing / repairing the locating ring
4. Record of repairing a hole on a platen on the fixing side



Requirements for Resin Molded Products

Control No. HCGS-INJ002-00

011 Control abnormal machine stop (stop for a short period)

1. Purpose

Clarify how to handle abnormal machine stop (stop for a short period) in the molding process in order to avoid mixing abnormal parts in OK parts, for example, a residue in a mold, test shot parts (short shot) produced when restarting the production.

2. Application

Apply to all molding process

3. Definition

Abnormal machine stop (Stop for a short period)

: When molding machine stops or a machine is stopped by man during mass production due to abnormality.

Residue in a mold

: Product or runner that is remaining in a mold

4. Procedure

-1. Set up a molding machine

(1) Monitor control function must be turned on during mass-production

(2) During abnormality, stop a molding machine without opening mold and without ejecting the product

-2. Handling abnormality

(1) If there is OK box under the molding machine, place a red box (NG box) before ejecting the product.

- OK box placed under the molding machine and the uninspected parts on a conveyor must be segregated from OK parts or scrapped

(2) Make sure to collect the residue in a mold, and control them not to be mixed in OK parts

-3. Operation when restarting the production

(1) Create a handling rule for restarting the production at each company.

(2) Perform purging and test shot based on the handling rule.

Control test shot parts based on "006 Control of test shot " not to mix them in OK parts.

- In principle, changing the molding parameter during short period of machine stop is prohibited. If the molding parameter needed to be changed, make sure to check whether it has been changed back to the original mass-production parameter before restarting the production.

-4. Record

(1) Keep a record on the Abnormal machine stop Check sheet. The check sheet must be checked by a leader or manager.

The record must include the followings;

- Date, machine counter, quantity of residues in a mold, cause of machine stop, handling method, handled by who.

Abnormal machine stop (for a short period) check sheet

															Responsible	
04/2020			Molding machine No. No.5													

Molding process

Date	Machine stop								Purging	Operation check								
	Time	Machine counter	P/N	No. of cavity per mold	Reason	Reason / situation of machine stop	Handling	Residue in a mold		Residue around machine	Molding parameter	Production start time	Machine counter	Display of changing point	Abnormality control	First product when starting mass-production	Operated by	Checked by
4/10	11:10	692,450	1234-5678	1	H	Product remained in a mold	Removed product on the machine	1	Yes	Yes / No	OK	11:30	692,461	OK	-	OK	Tanaka	Inoue

Requirements for Resin Molded Products

Control No. HCGS-INJ002-00

012 Maintaining the temperature during temporary machine stop

1. Purpose

Clarify the rule for maintaining the temperature during temporary machine stop due to machine trouble etc. in order to prevent a defect that is caused by the remaining resin in a cylinder, and to secure the safety of operators.

2. Application

Apply to temporary stop of all molding machine

3. Procedure

- 1. Maintain the temperature during temporary stop of molding machine and restart the production
 - (1) When temporarily stopping a machine while the temperature of cylinder is increasing, manually turn off the heater or set at "Keep warm" (below 150°C).
 - (2) If the molding machine has a function for automatically maintaining the temperature, use such function. Set a timer so that the function for automatically maintaining the temperature is activated within 30 minutes from the machine stop. The temperature must be set below 150°C.
 - (3) Perform the following operation ①~② when restarting the operation
 - ① Record the time (duration) of temporary machine stop, and the temperature during machine stop.
 - ② Perform purging before restarting the production

< Reference : Oxidation / deterioration of material >

Example of purging compound : ASACLEAN New EX			
Temporal change on the appearance due to the reaction of thermo-oxidative degradation (Temperature at 330°C , observed in test tube)			
0 min.	5 min.	10 min.	30 min.
PA			
Temporal change on the appearance due to the reaction of thermo-oxidative degradation (Temperature at 300°C , observed in test tube)			
0 min.	5 min.	10 min.	30 min.
PP			
Temporal change on the appearance due to the reaction of thermo-oxidative degradation (Temperature at 300°C , observed in test tube)			
0 min.	5 min.	10 min.	30 min.

013 Check the flow (quantity) of cooling water

1. Purpose

Check the flow (quantity) of cooling water in the molding process in order to prevent a defect caused by the temperature rise of mold due to lack of water flow, for example, slanted lock, warpage, stretched lance, sink mark etc.

2. Application

Apply to all molding process

3. Procedure

-1. Check the flow of cooling water for controlling the mold temperature

Each company must have a rule for checking the abnormality on the circulation of cooling water and clogging of water pipe. Inspection is to be conducted at the start and end of production, more than 1 time per day. The result must be kept on the Daily inspection report.

※Check with flowmeter (recommended) or measure the mold temperature etc.

-2. Maintenance of water pipe

The frequency of contamination on the water pipe of cooling water greatly varies depending on the quality of water. Determine appropriate maintenance frequency at each company based on the quality of water and the condition of water pipe.




-3. Control with a flowmeter **【Recommended】**

It is recommended to control with a flowmeter which allows you to check the water flow quantitatively.

(1) Choosing a flowmeter

Choose a flowmeter from digital-type, analog-type, or float-type. Digital-type is preferable because it is possible to make an alarm at the time of abnormality by linking with a molding machine, also the detection accuracy is high.

< Example : Flowmeter >

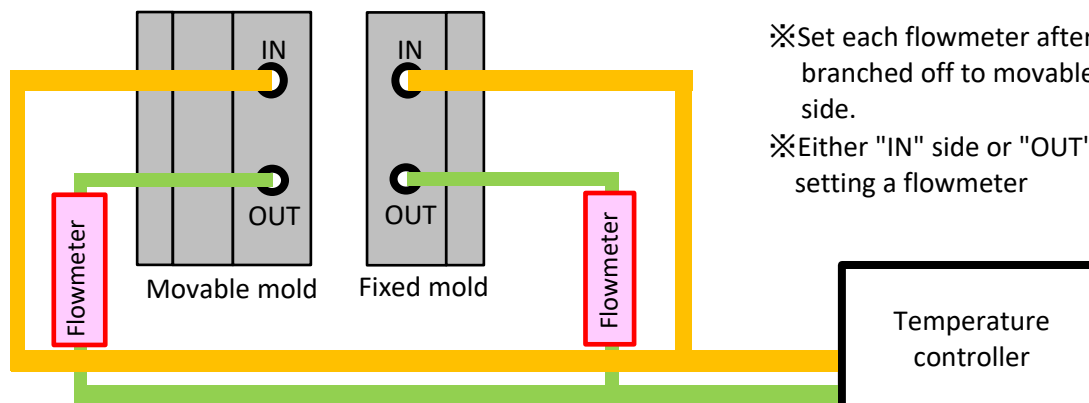
Digital-type	Analog-type	Float-type
		

(2) Setting the control range of water flow

Set an appropriate tolerance for controlling the quantity of water flow to be able to detect the decrease of water flow. Determine the tolerance which can produce OK parts based on the justified grounds.

(3) Position for setting a flowmeter

Set a flowmeter to be able to individually check the quantity of water flow at the fixing side of mold and the movable side of mold.



※Set each flowmeter after cooling pipe is branched off to movable side and fixed side.

※Either "IN" side or "OUT" side is OK for setting a flowmeter

014 Verification for using the recycled material

1. Purpose

Clarify the verification method not to flow out a defect which is caused by using the recycled material

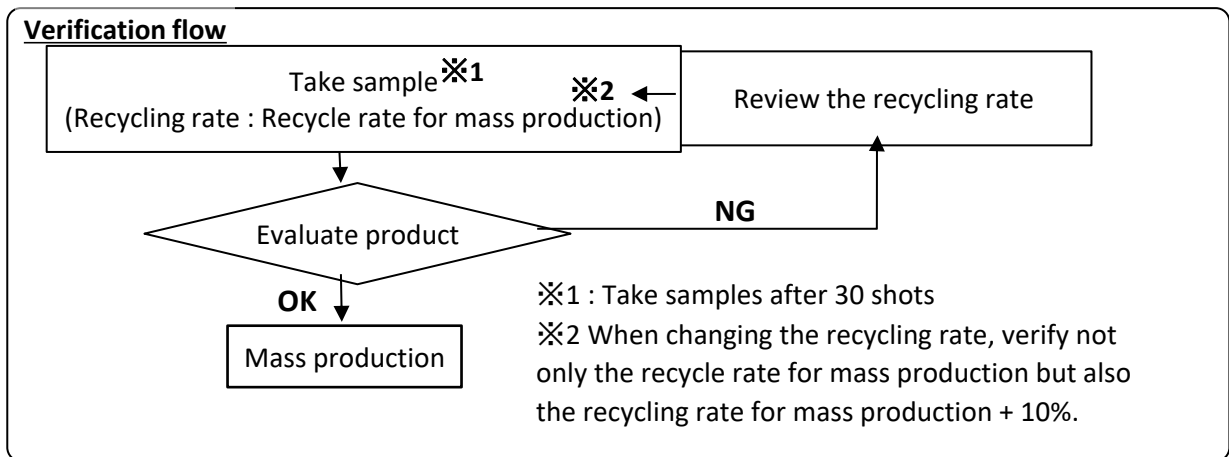
2. Application

Apply to all resin molded products which use the recycled material

3. Procedure

-1. Verification method for using the recycled material

(1) When using the recycled material, determine the recycling rate based on the following verification flow



Evaluate the product based on the Inspection Standard, and check the product appearance with 3 shots or more.
 When changing the recycling rate, make sure that the evaluation result is equivalent to the evaluation data of current production parts.

(2) Control changing point

When changing the recycling rate of mass production parts or when starting recycle, check whether there is any impact on the product during initial production period (Approximately 3 month) after the change. If the product is affected, conduct "Abnormality control" without omission.

Requirements for Resin Molded Products

Control No.

HCGS-INJ002-00

015 Equipment Inspection

1. Purpose

To conduct daily and periodic inspection to maintain the equipment in the molding process in good condition.

2. Application

Apply to all daily and periodic equipment inspection in the molding process

3. Procedure

-1. Inspection point and frequency of daily inspection

(1) Check at least the following points in daily inspection, and keep a record.

No.	Molding machine	Inspection frequency
①	Safety device (interlock, emergency switch)	Start-up equipment
②	Abnormal sounds/vibration	Once a day or more
③	Oil temperature (only for hydraulic type)	
④	Oil leakage	
⑤	Appearance (damage on safety cover, indicators, etc.)	

No.	Auxiliary equipment	Inspection frequency
⑥	Safety device (interlock, emergency switch)	Start-up equipment
⑦	Dryer temperature	Every set-up,
⑧	Thermostat temperature	Once a day or more during continuous production
⑨	Air pressure (leakage, gauge, sound)	Once a day or more
⑩	Appearance (damage on safety cover, indicators, etc.)	
⑪	Water flow, water leakage	Every set-up, Start/end of production Once a day or more during continuous production

No.	Overall	Inspection frequency
⑫	The slack of hook (regrinders, hoppers)	Every set-up
⑬	The looseness /omission of bolt	Every set-up, after machine repair ※1
⑭	Cooling water valve (Check if the water flows to the necessary area such as oil cooler, the area in a cylinder where the resin drops from hopper etc.)	Once a month, after long absence or after machine maintenance

*1: Check the positions where a metal chip may be mixed into the product by dropping a bolt.
Clarify the positions of bolt to be checked with a picture / figure etc.

-2. Periodic inspection

(1) Check at least the following point in periodic inspection.

No.	Inspection point	Inspection frequency	Inspection method
①	Check backflow prevention (Check material backflow)	Once a year or more	Next page
②	Nozzle touch area (Nozzle tip)	Once a year or more	Refer to Requirements 010
③	Nozzle touch area (Sprue bush)	Every mold maintenance	

(2) Inspect the molding machine based on a manual from a machine maker.
Record the inspection result and the result of corrective action.

Requirements for Resin Molded Products

Control No. HCGS-INJ002-00

015 Equipment Inspection

Check against material backflow

4-1. Purpose

To prevent the molding conditions from becoming unstable due to backflow of resin, and to maintain stable production.

4-2. Application

Apply to all molding machines in the molding process.

4-3. Cautions for inspection

If the material backflow is checked under the parameter which is more excessive than the mass production parameter, the material flows back even a screw / cylinder is in good condition. Cost may be increased due to unnecessary replacement of machine components. Therefore, determine the parameter for checking material backflow for each molding machine based on the mass production parameter.

4-4. Procedure

-1. The parameter is shown below.

No	Item	Parameter
①	Material to use	The same material as mass production
②	Temperature of resin	The same temperature as mass production
③	Primary injection pressure	Peak pressure during mass production (Set per molding machine)
④	Injection speed	50mm/s
⑤	VP change position	0mm

-2. Method

Item	Description
Preparation of inspection	Make sure the temperature of cylinder has completely risen.
	Prepare a copper plate
	Manual measuring / purging for 2 or 3 times
Amount of screw advancement	Close the mold at high pressure
	Set the parameter per machine based on the above parameter.
	Insert a copper plate between nozzle and sprue bush.
	Measure the material and advance the screw. Measure how much the screw moved forward.
	※Measure the amount of screw advancement after the pressure reaches to the peak.
※Measure at least 3 places ; front, middle, and rear zone of cylinder.	

-3. Judgement criteria

Item	Description
Amount of screw advancement	3mm or less / 30 sec.

-4. Handling method of abnormality

Take the following corrective action when abnormality is found.

Item	Description
Abnormality handling	Replace a cylinder when the backflow check area is partially abnormal
	Replace the worn-out parts of cylinder, nozzle and sprue bush when the backflow check area is entirely abnormal

Requirements for Resin Molded Products

Control No. HCGS-INJ002-00

016 Mold overhaul

1. Purpose

To clarify the control method of periodic mold overhaul (O/H)

2. Application

Apply to all mold in the molding process

3. Procedure

-1. First mold O/H, addition of the number of shot to be monitored.

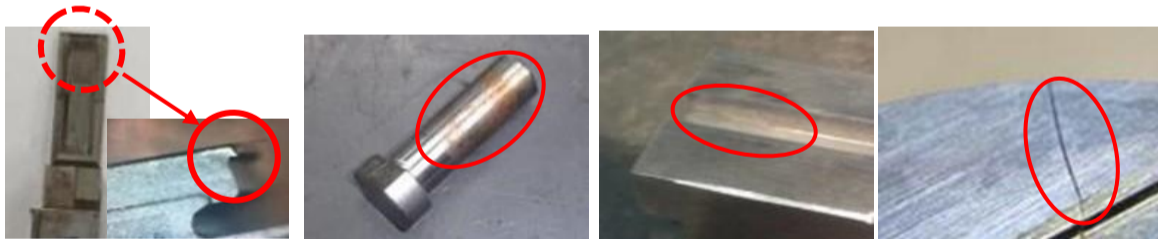
- (1) First mold O/H must be conducted when the number of total shot reaches the maximum number of shot shown in below table.
 - ※ Monitor the number of shot not to exceed the maximum number of shot. The number of shot must be traceable.
 - ※ Overhaul a mold if a defect relating to overhaul occurs before reaching the maximum number of shot which requires first O/H.
- (2) If there is no problem with the condition of mold and the molded product during periodic O/H, it is possible to increase the maximum number of shot based on below table.
 - ※ In case a defect occurs, monitor the number of shot based on the original number of shot (before addition)

<Table : Maximum number of shot for first O/H and additional shot >

Product	Max. number of shot for first O/H	The number of shot which can be added per O/H
RB with lock such as lance etc.	10,000 shots	+ 5,000 shots
Other RB, cover, protector, clip etc.	30,000 shots	+ 20,000 shots

-2. About mold overhaul

- (1) If there is a possibility of damaging a mold during disassembling / assembling a mold, and it affects the product quality, Use a tool (copper, brass rod) which is softer than the mold.
- (2) For the position where the mold parts may be broken, check with a magnifier to make sure there is no breakage. Make sure the air vent is not clogged, no galling on the sliding mold, no crack on the mold parts.



Deformation on the tip of pin

Dirt on mold insert due to gas

Galling on the sliding mold

Crack on mold parts

- (3) Record the result of mold overhaul on the maintenance record of each mold. The record must be checked by a leader or manager
The record must include the followings.
 - The number of shot when a mold is overhauled, condition of mold and how it was handled, check result of last product produced before O/H, check result of sprue bush, gate, dirt on the water pipe, abnormality handling etc.

SWS Harness Components Group Global Standard

Requirements for Resin Molded Products	Control No. HCGS-INJ002-00
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Revision history

New establishment	Release date	08/01/2021	Established by: Procurement Gr. Wiring Harness Components Production Management Div., Quality Assurance Dept.		
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Revision contents	Approved by	Hideki Nemoto	Checked by	Masakazu Sano	Prepared by	Koji Kobayashi
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Establish new global standard of "Requirements for Resin Molded Products : HSCG-INJ002" for the molded products controlled by W/H Components Production Management Div.
 ⇒ From now on, control all molded products controlled by W/H Components Production Management Div based on this new standard instead of "GS No. CGS-INJ001" issued by Components Div.
 GS "Requirements for injection molding : HCGS-INJ001" will be abolished because all of the contents are included in this new GS : HCGS-INJ002.

1st revision	Revision date	DD/MM/YY	Revised by :			
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Revision contents	Approved by		Checked by		Prepared by	
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2nd revision	Revision date	DD/MM/YY	Revised by :			
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Revision contents	Approved by		Checked by		Prepared by	
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3rd revision	Revision date	DD/MM/YY	Revised by :			
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Revision contents	Approved by		Checked by		Prepared by	
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4th revision	Revision date	DD/MM/YY	Revised by :			
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Revision contents	Approved by		Checked by		Prepared by	
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5th revision	Revision date	DD/MM/YY	Revised by :			
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Revision contents	Approved by		Checked by		Prepared by	
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6th revision	Revision date	DD/MM/YY	Revised by :			
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Revision contents	Approved by		Checked by		Prepared by	
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7th revision	Revision date	DD/MM/YY	Revised by :			
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Revision contents	Approved by		Checked by		Prepared by	
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8th revision	Revision date	DD/MM/YY	Revised by :			
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Revision contents	Approved by		Checked by		Prepared by	
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