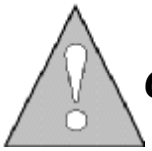
SECTION G5: TROUBLESHOOTING



CAUTION!

Regular inspection of all guards, protective devices, point of operation safeguarding systems and mechanically loaded components is recommended. Component devices or guarding which show signs of wear, fatigue (cracks, distortion), or damage of any type should be replaced immediately.

Problem: Runner tail too long or too short

Cause: Incorrect nozzle temperature balance

The heat balance between the nozzle and the tooling, (nozzle seat), must be correct and relatively consistent for proper system operation.

Nozzle heat balance

During a cycle, molten alloy is pumped from the gooseneck, through the nozzle and into the tool cavity. The tool remains on the nozzle sufficiently long for the alloy to solidify in the cavity and runner. The alloy also freezes slightly into the nozzle before the moving mechanism retracts. When the moving mechanism retracts, this small section of solidified alloy is pulled out of the nozzle. This is referred to as the "tail" of the runner. The length of this tail indicates whether the nozzle is running "cool", "hot" or at the correct temperature. (See "length of runner tail" below.) After the tool is retracted from the nozzle, only a small section of solidified alloy remains in the nozzle.

Heat balance refers to the optimum operating temperature of the system. This temperature is attained by balancing the temperatures of the tool and the nozzle by controlling the time they are in contact with each other, the torch temperature, the coolant and the time delay between cycles.

Adjusting the nozzle heater

The nozzle heater should be adjusted so a soft, blue flame envelops the nozzle. The flame should be aimed towards the base of the nozzle. The torch temperature can then be considered "fixed". The melt pot temperature is also fixed and should be set at 435° C (815° F). As the tooling is water cooled, the coolant supply should be of consistent temperature and flow.

Correct operating temperature

At the beginning of a cycle, the nozzle is hot, and the tool is relatively cool. As soon as the tool comes in contact with the nozzle and an injection takes place, the tool warms up and the nozzle cools down. When the tool retracts from the nozzle, the nozzle heats up, (from conducted heat from the melt pot and the heat of the nozzle heater), and once the hot component is ejected, the tool cools down.

When the system has been cycled 30 - 40 times, an equilibrium temperature will be reached. At this time, several runners should be examined to determine if the system is operating at the correct temperature.

Length of runner tail

The tail on the runner should be between 1 and 2 mm (.040 and .080 inch) long. A "cold" system will have a long tail on the runner. A "hot" system will have a short, or no, tail on the runner.

There are several problems associated with having the runner tail too long or too short.

A cold system

A long runner tail will tend to scrape across the nozzle seat as the component is ejected from the fixed tool. Alloy will build up on the top portion of the nozzle seat and prevent the fixed tool from seating on the nozzle properly. This condition usually results in flash between the nozzle and the seat on the bottom side of the nozzle.

If this "cold" condition is very bad, short shots can result. The small portion of solidified zinc in the nozzle after the tool has been retracted may not have sufficient time, (or heat), to melt before the next cycle. The nozzle becomes clogged with solidified zinc.

To correct a cold condition

1. Check the nozzle heater flame. Be sure a breeze is not blowing on the flame, and it is set correctly. Adjust the torch if necessary or guard the machine from breezes.

2. Cycle the system until the system has reached operating temperature. Check the length of the runner tail. If the tail length is correct, continue. If the tail length is still long, check the tool temperature. The tool should be warm to the touch, but not hot enough to burn. If the tool is too cold, reduce the coolant flow to the tooling. If the tooling temperature is set properly, lower the injection time (to a minimum of approximately 8/100's of a second). Also lower the next timer (Delay Mechanism Retract) to a minimum of 5/100's of a second. If this does not solve the problem, increase the time between cycles (Recycle Time) to allow the nozzle more time to warm up.

A hot system

A short runner tail presents less of a problem than a long tail on the runner. In the extreme case, the alloy can be "sucked back" out of the cavity because the alloy does not solidify in the nozzle at all. The alloy is injected and as the plunger retracts, the alloy is drawn back out of the cavity and runner. However, even if the condition is not bad enough to allow suck back, a short tail condition can cause flashing on the nozzle. If the tool is retracted and the alloy has not solidified into the nozzle, some molten alloy can end up on the nozzle seat or nozzle tip. During the next cycle, the tool will not seal correctly on the nozzle, resulting in flash.

To correct a hot condition

The nozzle heater should be checked to ensure it is not set too "hot". The flame should be soft and blue in colour. The "on nozzle" time can be increased to allow the tail to freeze sufficiently far into the nozzle.

Operational problems not displayed on the Operator Interface Terminal

For the problems listed below, assume the Setup/Run key selector switch is in the run position and the machine control is on.

1. The melt pot will not heat up.

Check that the melt pot element is connected properly, the melt pot is turned on, the thermocouple for the melt pot control is connected and operating properly and check the condition of the heating element.

2. The machine cycles completely but will not inject.

This problem probably indicates that the plunger is seized in the injection unit, otherwise an alarm would be displayed as to why the injection will not activate. The injection valve is probably activating, but because the plunger is seized, no termination is produced. Check the injection unit and replace it if necessary.

The nozzle could be "frozen" - allow the nozzle heater to "time out" and then ignite the nozzle heater again and begin production.

3. The runner "tail" is too long and is scraping on the nozzle seat as the termination is ejected from the fixed tool.

If the runner tail length is excessive, see the section above entitled Nozzle Heat Balance.

4. The system is not making complete terminations, but rather "short shots".

a. If this problem develops after operating the system for some time, check that the fill gap is set correctly. Setting the fill gap is covered in Section G1: Machine Maintenance.

b. It is possible to set the injection time (Timer 2 on the Process Timers screen) too short. Make sure that the injection time is not set below approximately 8/100's of a second.

c. Short shots are often related to temperature. Check the melt pot temperature to make sure that the indicated temperature is correct. Check the temperature with a separate temperature indicator. The nozzle temperature is also very important.

d. Check the melt pot level, (most of the heat required to keep the nozzle hot comes from the melt pot). The level must be kept up in order to keep the nozzle warm.

e. Also check the nozzle heater adjustment.

f. The plunger can become "tight" in the injection unit. If this appears to be the case, remove the plunger, (if possible), and clean it according to the instructions in Section G1: Machine Maintenance. Ream the sleeve at the same time.

g. The injection pressure can also be set too low. There is a minimum amount of pressure required to move the plunger in the injection unit. Consider 100 kPa (15 psig) to be the minimum.

h. If the cable upset is too far back in the cavity, it can choke off the gate from the runner to the termination. If the machine is casting only runners, this is the problem.

5. The terminations have excessive amounts of flash on them.

The Cable Processor Module Closed switch is not set correctly and an injection is taking place while the tool faces are held apart by debris or a strand of wire. Clean the tool faces thoroughly and reset the Cable Processor Module Closed switch according to the instructions in Section G2: Cable Processor Module Maintenance.

6. Check that the cavity inserts are installed correctly. Remove and check for dirt or burrs before re-installing.

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7. The transfer arm jaws are advancing (closing) before the transfer unit shifts all the way to the left stop.

Check that the flow control valve on the transfer unit has not been tampered with. If the flow control for the left motion of the transfer unit has been adjusted so that the left motion is too slow, the grippers will advance before the transfer unit has moved all the way to the left stop.

If the cycle time, (Timer 1 on the Process Timers screen), is set too low, the grippers will advance before the transfer has hit the left stop. The cycle time must be set to suit how quickly the transfer unit is moving to the left.

8. The terminations are "sticking" on the ejector pins. The terminations are being ejected and then are being pulled back into the cavity.

If the ejector pins are advanced too far into the cavity, the alloy will shrink onto the pins as it solidifies. Adjust the ejector pin height so that the pins are flush with the cavity, or just slightly protruding into the cavity.

When the ejector pins are badly worn, alloy will flash around the ejector pins. If this is the case, fit new ejector pins.

9. There is alloy flashing between the nozzle tip and the nozzle seat.

The most common cause of flash between the nozzle and the seat is a poor nozzle alignment. However, the alignment could be perfect, and either the nozzle seat or the nozzle tip could be damaged. Check the condition of the nozzle seat and nozzle each time a nozzle alignment is done. Lap the nozzle seat and replace or lap the nozzle as required.

If the nozzle is running too hot, the runner will not have sufficient time to solidify. This can lead to alloy "drooling" out of the runner onto the nozzle tip, causing flash on the next cycle.

If the moving mechanism is advanced and retracted on and off of the nozzle too quickly, the machine can "move" enough to cause alloy to spill out of the nozzle. The motion should be smooth, not violent.

10. The runners are breaking off and dropping onto the fixed tool.

This problem is difficult to troubleshoot. If the termination is sticking slightly in the movable tool, the termination could be lifted slightly out of the fixed tool cavity as the movable tool opens. This will weaken the runner attachment. Look for signs of drag on the terminations on the movable tool side. Polish the movable tool to eliminate the drag.

Check that the ejector pins are not sticking into the termination too far. If this is the case, the termination may be sticking on the ejector pins momentarily and then they break free and "flick" the runner off of the assembly. In particular, the ejector pin on the runner should never extend into the runner.

11. Terminations are sticking in the movable tool.

This problem is usually caused by a damaged parting line on the movable tool. Although zinc shrinks when it solidifies, if the parting line is damaged, (peened so that there is a small section of tool extending into the cavity area at the parting line), the termination will not be able to pull out of the cavity. Repair the cavity if there are signs of drag on the movable tool side of the terminations.

If the terminations do not show any signs of drag on the movable tool side, the termination must be "influenced" to remain in the fixed tool as the tooling opens. The easiest method for holding the termination in the fixed tool is to advance the ejector pins into the cavity slightly. This gives the alloy the opportunity to shrink onto the ejector pins, keeping the termination in the fixed tool until it is ejected. There is a limit to how far the ejector pins can be advanced into the cavity. If the terminations are sticking on the ejector pins when the transfer unit moves right, the pins are advanced too far.

12. The terminations are porous, pull-off is low and there is a small hole where the runner is removed from the termination.

These are all indications that alloy is being "sucked" out of the cavity immediately after injection. Check the melt pot temperature with a separate temperature indicator. Check the nozzle heater setting. Adjust the flame if it appears to be set too hot. Make sure the coolant flow is adequate. Finally, the injection time may have to be increased to allow more time for the alloy to freeze before the injection plunger retracts.

13. The cable is not getting upset correctly. The cable is sliding between the upsetter tooling jaws.

If the system has been running for some time and then this problem comes up, there is probably some debris, (usually a wire strand), preventing the upsetter tooling from closing completely. Remove the upsetter tooling and clean it thoroughly.

Check the cable diameter. If it is not to specification, that is, it is smaller than it is supposed to be, the upsetter tooling will not be able to grip the cable.

Reset the cable clamping pressure if this problem occurs right after a new setup.

Operational problems displayed on the Operator Interface Terminal

The Oph Diagnostics screen

Each of the icons displayed on the Oph Diagnostics screen is capable of displaying four different messages - OPEN, CLOSED, FAILURE and TROUBLE. The only exceptions are the Transfer Arm Locked icon which only displays a OPEN or CLOSED message and the Cable Loaded icon which only displays an OPEN, CLOSED or FAILURE signal.

1. The Head Closed icon

OPEN: This indicates that the Cable Processor Module Closed proximity switch is not closed. The Head Closed icon will display the OPEN message when the main slide is not advanced, (i.e. when the tooling is open).

CLOSED: The CLOSED signal indicates that the main slide is advanced and the movable tool and the fixed tool are together. If a wire strand or piece of zinc hold the tool faces apart, the Cable Processor Module Closed switch will not close, leading to an alarm situation.

TROUBLE: The Head Closed icon will display a flashing TROUBLE signal if, while the system is being cycled, the Cable Processor Module Closed switch does not close when it is supposed to. The cycle is stopped at this point. Acknowledge the alarm, reset it and return the Cable Processor Module to the home position by touching the Go Home icon. If the TROUBLE signal is flashing, something has prevented the tooling from closing completely.

FAILURE: The FAILURE signal indicates that the Cable Processor Module Closed switch did not open when the main slide (tooling) retracted or opened. This is a very rare alarm. The only way this alarm will be displayed is if the tooling would not open for some reason, or the proximity switch failed completely and needs replacing. Usually, a wire strand out of place prevents the tooling from closing. Zinc flash between the tooling faces can also cause this problem. In these cases, remove the damaged wire or clean the tooling as necessary.

If the TROUBLE message is occurring consistently, recheck the Cable Processor Module Closed switch setting. Also check to see if the wire strand is too large for the cable channel through the tooling. If this is the case, the strand will prevent the tooling from closing completely.

Acknowledge and reset the alarm in order to start production again.

2. The Cable Upset icon

OPEN: The OPEN signal indicates that the Upset Sensor proximity switch is not closed. When setting the Upset Sensor switch, the OPEN signal should be displayed before an upset cable is introduced to the upset sensor.

CLOSED: During system operation, the CLOSED signal will be displayed (and maintained for a cycle) every time an upset cable closes the Upset Sensor switch. When setting the Upset Sensor switch, the CLOSED signal should be momentarily displayed when a correctly upset cable is passed through the upset sensor.

TROUBLE: The PLC has a built in counter which increments each time an upset is not detected during cycling.

Note: The counter is only enabled if the injection is turned on. When this counter reaches four, a flashing TROUBLE alarm will be displayed and the system will stop cycling. If the TROUBLE alarm is triggered in a very short time, it would be wise to find out why immediately. If the cables which the upset sensor rejected do have good upsets, check the setting of the upset sensor. It is probably set too fine. If the upsets are smaller than normal, the upset sensor has been doing its job perfectly. Check the cable upsetter to ensure the cables are not slipping in the upsetter tooling jaws. Reset the jaw clamping force or clean the tooling as required. Adjust the upset size if required.

If the TROUBLE alarm is triggered after operating the system for an entire shift, do not adjust anything. The cables which were rejected by the upset sensor where probably slightly small. Either run them through the system again in Run Semi-automatic mode or switch to Run Manual mode and run the cables through.

Acknowledge and reset the alarm in order to start production again.

FAILURE: The FAILURE alarm will be triggered if the Upset Sensor switch does not open when it should. This is usually caused by excessive amounts of lubricant getting on the upset sensor flapper. Remove the upset sensor and clean it thoroughly.

Acknowledge and reset the alarm in order to start production again.

3. The Mechanism Advanced icon

OPEN: The OPEN message indicates that the mechanism is not advanced

CLOSED: The CLOSED message indicates that the Moving Mechanism Advanced limit switch is closed. If the moving mechanism advances and the Moving Mechanism Advanced switch does not close, an alarm is triggered.

TROUBLE: If the Moving Mechanism Advanced switch does not close after the mechanism has advanced onto the nozzle, a flashing TROUBLE alarm is displayed and the cycle stops. The alarm must be acknowledged, reset and the Cable Processor Module put back in the home position.

This alarm is rare. The usual cause is a build up of zinc on the nozzle which prevents the moving mechanism from advancing completely. However, runners or other debris can fall into the moving mechanism handwheel and prevent the mechanism from advancing. Remove the handwheel and clean the area behind it. Take this opportunity to grease the link bearing. If the Moving Mechanism Advanced switch fails or the wire connector falls off, the alarm will be triggered. Check the switch operation and wire connections.

FAILURE: A flashing FAILURE alarm will be triggered if the Moving Mechanism Advanced switch does not open when the moving mechanism retracts. Check the switch to see if something is preventing the switch from opening when it should.

Acknowledge and reset the alarm in order to start production again.

4. The Cable-In-Place icon

OPEN: The Cable-In-Place icon should display the OPEN signal when the tooling is open or when a cable is not in the cable channel when the tooling is closed.

CLOSED: The Cable-In-Place icon will show a CLOSED signal when the tooling closes and a cable is in position. The switch must be closed for an injection to take place.

TROUBLE: The PLC has a built in counter which increments each time the Cable-In-Place switch does not close during cycling.

Note: This counter is only enabled when the injection is turned on. When this counter reaches four, a flashing TROUBLE alarm will be displayed and the system will stop cycling. If the TROUBLE alarm is triggered in a very short time, it would be wise to find out why immediately. Reset the Cable-In-Place switch.

If the TROUBLE alarm is triggered after operating the system for some time, simply turning the pressure regulator, (on the Cable-In-Place pressure switch pneumatic circuit) up slightly should solve the problem.

Acknowledge and reset the alarm in order to start production again.

FAILURE: A flashing FAILURE alarm will be displayed and the system will not cycle if the Cable-In-Place switch does not open when the tooling opens. Check the Cable-In-Place switch setting. Check to make sure the safety pin in the movable tool, (which activates the switch when a cable pushes it up), is moving freely. The spring behind the pin could be broken or the pin could be binding because it is dirty. Clean the pin or repair the spring as required.

Acknowledge and reset the alarm in order to start production again.

5. The Link-Pin-In-Place icon

OPEN: The Link-Pin-In-Place switch is open when the moving mechanism is retracted or if the link pin has been left out. If the link pin is left out, an alarm will be triggered.

CLOSED: The Link-Pin-In-Place switch will display a CLOSED signal when the mechanism advances and the link pin is installed.

TROUBLE: A flashing TROUBLE alarm will be triggered if the link pin is left out and the system is cycled. Disconnecting the electrical cable from the switch will also trigger this alarm. The system will stop cycling.

The alarm must be acknowledged, reset and the Cable Processor Module put in the home position. Replace the link pin, or connect the electrical lead if it was not connected. Check the switch setting. Screw the switch in further if the switch will not close when the link pin is installed.

FAILURE: A flashing FAILURE alarm indicates that the Link-Pin-In-Place switch did not open when it was supposed to. Check the switch itself for damage or failure.

Acknowledge and reset the alarm in order to start production again.

6. The Cable Loaded icon

OPEN: The OPEN signal indicates that a cable is not inserted into the cable upsetter. The switch should be OPEN when the cycle is complete.

CLOSED: The CLOSED signal indicates that a cable has activated the Cable Loaded switch. This switch starts the system cycle in the Run Semi-Automatic mode. In Setup mode, the switch should be CLOSED when the upsetter anvil is pushed back and it should be OPEN when the cable is removed.

FAILURE: A flashing FAILURE signal will be displayed if the Cable Loaded switch does not open when it should. The likely cause is a dirty or oily anvil. Remove the cable upsetter tooling and degrease it thoroughly. Also check the condition of the spring which pushes the anvil forward after the cable upsetter retracts.

Acknowledge and reset the alarm in order to start production again.

7. The Transfer Arm Locked icon

OPEN: The Transfer Arm Locked icon will display an OPEN signal if the transfer arm lever is not closed completely or if the proximity switch is set incorrectly or is damaged.

CLOSED: The Transfer Arm Locked icon will display a CLOSED signal when the transfer arm lever is correctly closed.

The Process Diagnostics screen

The Process Diagnostics screen has icons for the Melt Pot Heater Contactor, the Melt Pot Temp Status and the Torch Flame Status.

1. The Melt Pot Heater Contactor icon

OPEN: When the Melt Pot Heater Contactor icon displays an OPEN signal, the contactor is not activated - meaning that the melt pot temperature is at or above the set point.

CLOSED: When the Melt Pot Heater Contactor icon displays a CLOSED signal, the contactor is activated - meaning the melt pot temperature is below the set point.

TROUBLE: If the contactor fails to close when it is supposed to or it fails to open when it is supposed to, a flashing TROUBLE alarm is triggered. The system will stop cycling. Replace the melt pot heater contactor.

Acknowledge and reset the alarm in order to start production again.

2. The Melt Pot Temp Status icon

OK: The OK signal indicates that the melt pot temperature is within the low and high limits.

HIGH TEMP: If the melt pot temperature goes above the high limit, (10 degrees C or 20 degrees F above the set point), the HIGH TEMP alarm will be triggered. The HIGH TEMP alarm would likely be coupled with a TROUBLE alarm from the melt pot heater contactor - if the contactor failed to open.

Check the melt pot temperature with a separate temperature indicator. Check that the thermocouple is installed correctly in the protector tube.

If the HIGH TEMP alarm is flashing and it cannot be acknowledged and reset, just acknowledge the alarm and then display the MELT POT CONTROL screen. Check the actual temperature of the melt pot on the screen. If it is not at the high limit, the thermocouple has failed - replace the thermocouple.

LOW TEMP: When a flashing LOW TEMP alarm is displayed, the melt pot temperature has dropped 10 degrees C or 20 degrees F below the set point. The LOW TEMP alarm can be acknowledged and reset so that production can resume. The LOW TEMP alarm can be triggered by adding a large quantity of cold alloy to the melt pot. Likewise, if the melt pot heating element fails, the LOW TEMP alarm will activate.

3. The Torch Flame Status icon

OFF: The OFF signal indicates that the nozzle heater has not been turned on, or it has timed out with the nozzle heater timer.

ON: The ON signal indicates that the nozzle heater has been turned on and has reached operating temperature in the specified (preset) time period.

IGNITION: When the igniter is on, the IGNITION signal is on.

FAILURE: When the nozzle heater has been turned on, it must ignite and reach a preset temperature within 10 seconds. If the flame detector reaches the preset temperature, the igniter shuts off. If it does not, a flashing FAILURE alarm will be displayed. This can happen quite often when the nozzle heater has been turned on for the first time in a shift. Acknowledge and reset the alarm. Turn the nozzle heater on again. If the alarm is tripped again, check the position of the flame detector. It should be directly in the flame and resting against, or very close to, the nozzle.

The FAILURE alarm can also be triggered if, after the igniter shuts off, the flame detector does not reach a second preset temperature in another 10 seconds. If the flame detector does reach the second temperature, the alarm will not be triggered. This alarm is rare.

Finally, the FAILURE alarm can be triggered if, after reaching a third (operating) temperature, the nozzle heater is extinguished and the flame detector temperature drops below the operating temperature. In each case, the alarm must be acknowledged and reset.

ATTENTION!

If, after acknowledging and resetting an alarm, the PLC indicates that it has screen control, there may be two alarms - one on each of the diagnostics screens. Press F8 and acknowledge the first alarm again, but do not reset it. Go to the other diagnostics screen and acknowledge and reset the alarm. Go back to the first screen and reset the alarm which was just acknowledged before.