

PREVENTIVE MAINTENANCE MOLD & MACHINE GENERAL OVERVIEW

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Overall operational availability is a critical parameter to track in any manufacturing environment. In simple terms, we can consider this factor to represent “actual machine operating hours/total machine available hours”. As an example, the actual machine operating hours are the value added hours in which the process is running; moreover, the lost production hours associated with down time, breaks, shift change, changeover, etc. cause the operational availability to decrease.

One of the most significant factors of reduced OA (Operational Availability) is unplanned down time. For simplicity, we can generalize down time into categories related to either mold or machinery issues. As many already know, it is the unplanned down time that kills productivity and reduces the bottom-line profitability of any corporation.

From a sampling of different molding operations we have determined that there are 2 different types of PM (Preventive Maintenance) programs: the ones you don’t do and the ones you say you do (but most likely, don’t).

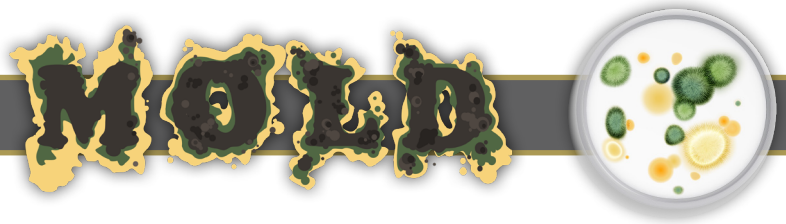
Establishing a culture targeting the prevention of down time vs run to failure (and fix ASAP) can make a considerable difference in the success of the business. In either case, many facilities lack discipline to take a machine down for **4-8 hours for planned maintenance** in order to perform vital checks on system functionality. This planned down time is generally **4-5x less** than the subsequent down time that could be avoided by having a simple system in place for machines and molds.



One of the most common examples is changing the oil in a machine every 1-2 years (depending on total machine hours run). It is highly likely that you know of someone that has allowed their personal vehicle to overheat due to not getting an oil change or checking coolant fluids for 100,000 miles…We would never think to treat our personal vehicles this way, and a molding machine should be no different!

In the following chart we show examples of (machine/mold) PM protocols that have been developed by various molders and machine OEMs over the years. It is highly recommended to follow your specific machine manufacturer’s PM routines, but at a minimum implementing some of the routines below will help maintain operational availability and reduce unplanned down time. As with any maintenance performed on industrial equipment, following OSHA standards for Lockout-Tagout should always be observed. Maintenance should only be performed on machinery by qualified personnel that are familiar with the process and have access to pneumatic, hydraulic, and electrical diagrams of the equipment.

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ITEM	TASKS	PROCEDURES
1	Part Overview	Inspect full shot for signs of flash, wear, pitting, drag marks, and other surface defects.
2		Inspect full shot for read-through, lifter seat off, and sharp edges on all flow channels.
3		Provide the tooling shop with the two most recent shots of all cavities.
4	Mold Safety Confirmation	Ensure the mold/part number is visible on the mold and safety strap.
5		Ensure all pneumatic, hydraulic, and water fittings are properly labeled.
6	Mold Condition Check	Visually inspect the locating ring
7		Visually inspect the mold sprue bushing radius/orifice and nozzle tip radius/orifice.
8		Report rolled edges, abraded plating, cracked welds/inserts – tool shop to determine if root cause of defects.
9		Inspect for gas burns, water stains and pitting on the cavity, core and recesses in the mold.
10		Inspect the gates for signs of wear / tool damage.
11	Grease Components Check	Apply a light coating ejector pin lubricant on all pins and sleeves.
12		Apply light coat of grease to bushings, wear plates, lifters, etc.
13	Mold Component Check	Confirm that ejection springs are the same length and type.
14		Check for loose shims.
15		Clean mold components. Use alcohol if the cleaner leaves reside. Ensure solvent does not damage mirror polish.
16		Ensure there are no high spots on the tool sealing surfaces – excess clamp force can cause mold deflection.
17		Polish (in draw direction) the cavities, cores, runner, sprue, sprue bushing, and vents (Diamond on vents).
18	Electrical Systems Check	Ohm out and amp draw on heaters to ensure functionality.
19	Mold Condition Check	Cleaning mold faces.
20	Final Assembly	Assemble Mold - Consult Engineering / Mold Drawings.

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MOLD PREVENTIVE MAINTENANCE PROTOCOL | 150,000 SHOT PM



ITEM	TASKS	PROCEDURES
1	Visual Inspection	Inspect for damage and water leaks before cleaning components, leader pins, bushings, and locks. Any area inside the cavity detail area with damage or signs of wear should be considered critical and carefully analyzed before replacements or repairs are started.
2	Check Tooling Surface	Inspect tooling surface and last shot samples to determine if steel needs to be repolished or retextured.
3	Check Vents	Vents should be checked for depth, width and land and compared to the material manufacturer's specification.
4	HR Inspection	Inspect the HR-manifold for leakage. Test for open thermocouples/shorts, repair as needed.
5	Re-Torque HR Manifold	Re-torque all bridge manifold bolts per tool build specification.
6	Assemble HRM	Assemble Top Clamp plate with the manifold plate. Ensure proper seal off.
7	Split Cavity & Manifold Plates	Ensure sure plates are at room temperature and HRM is in standby.
8	Cleaning Probe Tips	Heat probe to ~250F-300F with portable controller, remove plastic tip from probe.
9	Ejection System Check	Remove the Ejector Box and separate the ejector pin plates.
10		Clean all ejector pins and inspect for damage, replace as needed.
11		Inspect all springs, replace springs in FULL sets if ANY are bent or broken.
12		Clean all ejector pin holes in the cavity blocks with 'pipe cleaners', use minimum solvent.
13		If ejector pin holes have become egg shaped, determine if they should be redrilled and bored to a larger size and the existing pins replaced with oversized pins.
14	Component Cleaning	Clean Cavity & Core parting line surfaces, and inspect for damage/rolled parting line.
15	Assemble Core Side	Use minimal Ejector pin lube while assembling.
16	Slide Assembly	Ensure spring/hydraulic functionality and water test when completed.
17	Mold Water Test	Check water circulation with closed system and pressure test to ensure there are no leaks.
18	Final Assembly	Reassemble mold halves and mark for return to operation.

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ITEM	TASKS	PROCEDURES
1	Visual Inspections	Inspect for damage and water leaks before cleaning components, leader pins, bushings, and locks. Any area inside the cavity detail area with damage or signs of wear should be considered critical and carefully analyzed before replacements or repairs are started.
2	Overview 150k PM	Check that previous 150k PM was followed and signed off; check all critical system components and follow 150k PM protocols at 300k mark.
3	Ejector Return Springs	Inspect all springs, replace springs in FULL sets if ANY are bent or broken.
4	Ejector Pin Hole Cleaning	Clean all ejector pin holes in the cavity blocks with 'pipe cleaners', use minimum solvent.
5	Ejector Pin Hole Inspection	If ejector pin holes have become egg shaped, determine if they should be redrilled and bored to a larger size and the existing pins replaced with oversized pins.
6	Component Cleaning	Clean Cavity & Core parting line surfaces, inspect for damage, replace components as needed.
7	Complete Disassembly	All plates, all surfaces removed.
8	Cleaning Plates	Clean all plates, inspect for damage, report abnormal wear and document to the Maintenance Document. Ensure plates are parallel and grind flat if required.
9	Inspect Leader Pins	Check Leader Pins & Bushings for wear using micrometers, replace worn items (in sets) as needed.
10	Components	Clean all components while inspecting for damage & wear, record and replace as needed.
11	Probe Inspection	Replace any damage tips, heat manifold to set point and verify probes are at proper height.
12	Replace all O-Rings / Seals	Apply proper lubricant when installing.
13	Slide Assembly	Water test when completed.
14	Water Fittings	Inspect for damage, replace as needed.
15	Quote	Submit Request to Quote Refurbishment or New Tool if required.

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1 INTERVAL

~ Monthly or Every Other Month | 1,000 - 1,500 Machine Hours, or 200,000 Cycles

TASKS
Clean all machine surfaces of excess resin, oil, etc.
Visual check for damaged panels or safety gates.
Check pneumatic, hydraulic, and water lines for signs of wear. Check cables and connectors on EOAT for signs of damage.
Check functionality and installation of all the safety devices.
Remove scrap molded parts below platen and machine spacing.
Perform maintenance on auxiliary devices including HR controller, water temperature controller, hopper, and supply lines.
Check central oil lubrication system is functional.
Empty primary oil overflow tank as needed.
Grease guide rails on mold door and safety gates.
Determine if any auditory or vibration signatures are different during daily production. The sounds a molding machine makes can offer insight as to potential problems arising.

2 INTERVAL

~ Quarterly | 1,500 - 2,500 Machine Hours

TASKS
Perform air filter maintenance on all control cabinets.
Check high-pressure, hydraulic hoses to ensure they are safe for operations.
Have the oil tested for water content and contamination. If needed, filter or change oil based on manufacturer's recommendation.
Clean oil cooler.

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3 INTERVAL

~ 2 Times a Year | 4,000 - 6,000 Machine Hours

TASKS 3
Check Nozzle centering and adjust to ensure proper seal off.
Confirm Injection speed linearity.
Confirm check ring function (cushion stability).
Perform audit on molded parts and compare critical process parameters.
If significant differences are detected in pressure response, injection speed, etc. determine if wear or breakdown of control is related to screw/ barrel, check ring, heater bands, etc.

4 INTERVAL

~ 1 Time a Year | 8,000 - 10,000 Machine Hours

TASKS 4
Replace hydraulic oil (have the oil tested by your hydraulic oil vendor and replace oil filter if needed).
Check sensors and machine accuracy.
Grease high speed clamping cylinder.
Replacement of the filter element in the oil tank ventilation filter.
Check machine leveling.

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