WHITE PAPER

Best Practices – General Maintenance on Factory Metal Forming Equipment

Overview:

The Metal Forming Equipment Council (MFEC)/Rollformer Council has partnered with a collaboration of machinery OEMs to provide a structured outline of the benefits of proper general maintenance schedules for machinery. Fabricating accurate and aesthetically acceptable metal trim and panels is essential to the success and efforts of many other supply chains of metal materials in construction including roofing, exterior wall panels and other unique panel applications. Sheet metal shops using metal-forming equipment with well-executed preventive maintenance programs experience less unexpected downtime and manufacturing disruptions.

With the supply of metal-forming equipment, the OEM will provide maintenance schedules that outline the different functions and the frequency of inspection for the machinery should to ensure proper operation. It is important to review these tasks and create a maintenance schedule to ensure the machine is both safe and efficient. Having a well-executed plan for preventative maintenance is critical and will lead to less downtime, longer equipment lifespan, and increase revenue and profit. In fact, according to a Wall Street Journal post, "Unplanned downtime costs industrial manufacturers an estimated $50 billion annually. Equipment failure is the cause of 42 percent of this unplanned downtime."

Discussion:

There are quite a number of issues that come to mind when discussing equipment maintenance. To address some of the more common and critical issues, a series of questions and answers follows:

What are common maintenance issues that the OEM runs into when servicing machines that machine owners can inspect and address to ensure an accurate long-lasting machine?

1) ***Machine has become out of level*.** There are different causes from the machine settling to the building foundation shifting. An improperly leveled machine can not only form metal inaccurately, but it can also cause abnormal wear on various critical machine parts. For proper leveling procedures, contact the OEM and always use a machinist level. Remember, once a machine is leveled and bolted down, there is no guarantee that machine will always stay that way.
2) ***Hydraulic and Motor Oil replacement or monitoring*.** A well-maintained machine can last decades and extending the machine life may be as simple as ensuring that the hydraulic oil and/or the motor gearbox oil is clean and within the specified lifespan for the oil. This is probably the most common maintenance issue, because "out of sight is far too often out of mind". The typical hydraulic oil temperature range is in the area of 120°F. Always check the OEM manual for a specific recommendation for the active

temperature range. When the oil temperature is out of range it is important to stop operation and determine the cause for this elevated temperature that could at the very least have an impact on the material being produced and at worst damage the metal-forming equipment.

3) ***Recognize gradual changes and abnormalities that might be affecting the equipment.*** No one spends more time in front of the machine than the operator who can see, or sometimes even sense, minor operational changes in the equipment. Many times, issues slowly arise, and an observant operator can help catch an issue when it still is an easy fix rather than a requiring a major overhaul. Operators should be trained to pay attention and document gradual changes such as hydraulic oil color over time. Documentation with pictures is a good practice. Regular check-ins and training will help operators keep the reporting changes as part of the regular operational procedure.

4) ***Daily housekeeping needs.*** While the main focus of this paper is lubrication, general daily maintenance must also be mentioned. Removal of waste items such as metal filings, masking, excess lubricants, and other foreign items must be considered. These "excess" materials can impact both the precision and the quality of the finished product.

5) ***Neoprene roller cleaning.*** It is important to regularly clean any neoprene rollers that help pull the material through the equipment. This is important to:

    - Eliminate debris that could leave imperfections in the panel.
    - Keep the whole machine work together, preventing additional stress while forming the panel.

    Common cleaners such as soap and water are among those recommended by the equipment manufacturers. Always use a cleaning agent prescribed in the operator manual or recommended by the OEM.

Why do many machines have a "Lubrication Schedule" and why is that schedule so important?

Lubricants are used to reduce the amount of friction between two parts. If lubrication is lost, parts will wear resulting in the failure and the premature need to replace these parts. Eventually, lack of lubrication will dramatically reduce the productivity and life expectancy of the machine. Following are ideal points to consider from the Machine Design website when talking about lubricants.

- Check the lubricant level frequently and look for excessive grease build-up and oil seal leaks regularly.
- Always use a lubricant prescribed in the operator manual or recommended by the OEM.
- Use the correct amount of lubricant. Too little use of lubricant, can lead to an increased risk of friction/wear and tear. Excessive lubricant can build up grease that will trap dirt and metal shavings that can damage machine components.
- Check lubricant levels with Automatic Lubrication Devices regularly. These require less attention, but still should be on the preventive maintenance program.
- Document all lubrication points and dates regularly. A lubrication schedule based on "memory" will eventually be forgotten leading to major equipment damage.

Is there any other "Lubrication" required?

- It is important to note that on machines used to shear materials that the shear blades must be kept properly lubricated at all times to ensure clean cuts and to add to the life expectancy of the shear blades. A lack of proper lubrication will shorten the shear blade life and result in more jagged cuts in "post-cut" rollforming.

Do most companies that have manufacturing equipment have preventative maintenance schedules?

Larger manufacturers tend to maintain a regular preventative maintenance routine where smaller companies do not take the time to create and execute this program. The consensus within the MCA MFEC/Rollformer Council is that all companies with metal forming equipment should invest the time and resources into developing and implementing procedures for preventative maintenance. A study conducted by RWC Production Support Services Inc. came to the conclusion that, "Many studies suggest that consistent PM can result in a 5 to 10 percent productivity improvement, which can reduce costs by up to 20 percent."

What should a company do if there is no maintenance staff or technical machinery experienced people?

Most preventative maintenance tasks are basic and can be done by an operator. If the operator is new, it is important that they read the OEM manual to know how to safely work on the machine. This is primarily for the safety of both the operator and the machine. Knowing what not to adjust is just as important as knowing what to adjust. Another maintenance option is that many machine OEMs offer preventative maintenance programs that are customizable to specific operational needs. These packages ensure proper factory trained technicians adjust the machine and keep it within working specifications.

What time interval should be used to perform maintenance on machines?

When a machine is first installed, it is always recommended use the maintenance schedule recommended by the OEM (examples shown below). As the machine ages, it may also be a good idea to increase the frequency of the maintenance checks on the equipment. Add line items to the Preventative Maintenance (PM) checklist that require additional focus. Each machine is different and needs to have a separate PM schedule. Slight differences down to the specific type of grease/lubrication can make a significant difference in both operation and expected lifetime of the equipment. Also, consider production use of the equipment and the structure of the manual, it is important to align the operating hours to the intervals in which the manual is written.

What are trends in Preventative Maintenance programs?

Just like many business trends, automation and digitization is increasing in popularity. There has been a recent uptick in preventive maintenance software that assists in planning and tracking equipment and operational performance. Many of these programs come with reporting dashboards that provide a great deal of important and telling information. It takes time to implement these programs, however there can be real value in using this type of tool. At the very least, these programs help to keep preventative maintenance on the radar and measurable. It is also possible to combine Key Process Indicators (KPI) and other metrics to see a correlation between PM work and up time on a machine. When doing this type of analysis, make sure to measure Preventive Maintenance and Corrective Maintenance separately. With

the automation trend in full swing, the next trend that companies will push toward is Predictive Maintenance. Machines and production are measured and the access to this data allows for AI to allow us to predict when machines may start to experience failures. This is in the early adoption stage within the metal forming industry, but taking a more organized approach to preventative maintenance is the first step in this direction.

Below is an example of an OEM's Maintenance Schedule Document. Each machine model is going to have its maintenance schedule. A good practice is assigning responsibility to an employee to supervise that the actions.

Item	Daily	Monthly	Quarterly	Biannually	Annually	Comments	Initials
Safety Check							
Emergency stop button		●					
Clean around the machine	●						
Functional Check							
Inspect the pedal unit	●						
Fold a sheet a metal	●						
Frames and Motors							
Clean		●					
Check wires		●					
Lubricate						See lubrication chart for lubrication intervals	
Level					●		
Pneumatic intake valve			●				
Clamping beam chain tension				●			
Back Gauge							
Clean	●						
Inspect the pans			●				
Inspect the cables and hoses			●				
Check the pneumatic system			●				
Level the back gauge					●		
Lubricate the guides					●		
Lubricate the linear wagon					●		
Lubricate the ball screw					●		
Parallelism					●		
Electrical System							
Main switch					●		
Start and stop button					●		
Pedal unit cable					●		
Cooling fan					●		

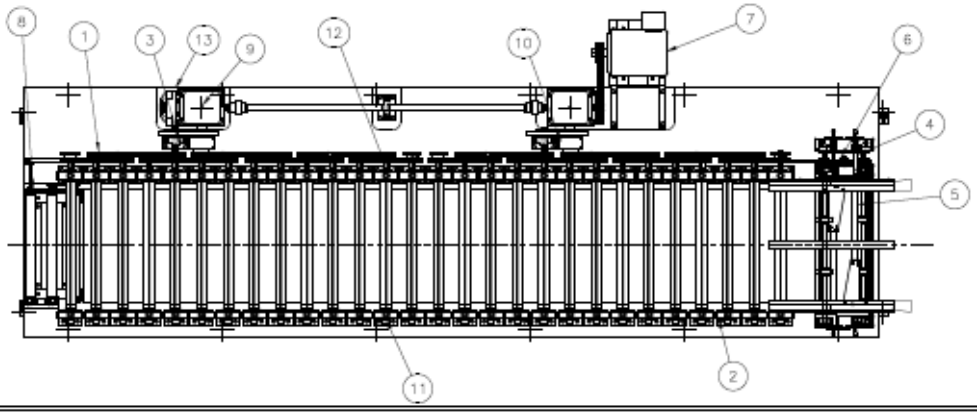
METAL CONSTRUCTION ASSOCIATION
8735 W. Higgins Road, Suite 300, Chicago, IL 60631
847.375.4718 | mca@metalconstruction.org | www.metalconstruction.org

Following is an example of lubrication points on typical machinery. The schedule provides specifics on the quantity, frequency, and type of lubrication for each point. Many OEMs recommend keeping a master or electronic copy of this type of schedule to ensure that over the lifetime of the machine records can be printed or reproduced if damaged or lost.

The lubrication schedule can be different than the general maintenance schedule, however it is important that each schedule is filled out separately and completely.

LUBRICANTS	FREQUENCY
1. MOBILUX EP 1 (NLGI NO.1)(BRG) 2. MOBIL DTE LIGHT (AIR LUBE, GUIDE, & ADJ SHAFT) 3. MOBIL DTE MEDIUM 4. MOBIL DTE HEAVY (ISO 100) 5. MOBIL DTE 25 (ISO 46)(HYD FLUID) 6. MOBIL EXTRA HECLA SUPER CYL.OIL (AGMA 8) 7. MOBIL GEAR 629 (AGMA 4 EP) 8. MOBIL GEAR 630 (AGMA 5 EP) 9. MOBIL GEAR 632 (AGMA 6 EP) 10. MOBIL GEAR 634 (AGMA 7 EP) 11. MOBIL GEAR 636 (AGMA 8 EP) 12. MOBILTAC 375 NC SPRAY (OPEN CHAIN LUBE) 13. PER MFR'S SPECS. 14. MOBILTAC 375 NC SPRAY (OPEN GEAR LUBE) 15. LOCTITE ANTI-SIEZE 16. MOBILGREASE XHP 222 SPECIAL (NLGI NO. 2 W/MOLY) (PRESS BRG.) 17. MOBIL SYNTHETIC SHC-634 (CONE DRIVE GEARBOXES) 18. MOBIL POLYREX EM GREASE (ELEC MOTOR) 19. MOBIL AUTOMATIC TRANSMISSION FLUID (DEXRON III) 20. MOBIL AUTOMATIC TRANSMISSION FLUID (TYPE "F") 21. ROYAL PURPLE THERMYL TUFF 300 (OPEN GEAR LUBE)	A. DAILY B. WEEKLY C. MONTHLY D. 2 MONTH INTERVALS E. 6 MONTH INTERVALS F. 1 YEAR INTERVALS G. FILL TO LEVEL H. PER MFR'S SPECS. I. CHANGE AFTER INST'L & @ 6 MONTH INTERVALS AFTERWARDS J. KEEP COVERED WITH LUBE

BUBBLE	POINT OF LUBRICATION	QTY	FREQ	TYP	REMARKS
1	DRIVE CHAIN	22	B	12	
2	ARBOR BEARINGS	112	B	16	4 PER PASS
3	PILLOW BLOCK BEARINGS	7	B	16	
4	LEAD-IN ADJUSTING SCREW	4	C	12	
5	LEAD-IN SHAFT	4	C	12	
6	IDLER SPROCKETS	2	B	16	
7	MOTOR BEARINGS	2	E	16	PER MFG SPECTS
8	CONVEYOR BEARINGS	6	B	16	
9	REDUCER	2	G	6	FILL AS REQUIRED
10	CHAIN COUPLER	2	C	16	
11	ARBOR ADJ SCREW	56	E	12	
12	SPUR GEAR	56	J	14	
13	AIR LUBRICATOR	1	G	2	



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847.375.4718 | mca@metalconstruction.org | www.metalconstruction.org

Works Cited:

Vannice, Petter. “Committing to consistent preventative maintenance” The Fabricator. June 27, 2002

Glick, Vernon. “6 Heavy Machine Maintenance Tips to Extend Longevity” Machine Design. May 19, 2019

The Wall Street Journal, Emerson, partners.wsj.com/emerson/unlocking-performance/how-manufacturers-can-achieve-top-quartile-performance/.

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