MAINTENANCE TECHNOLOGY
THE MAGAZINE OF PLANT EQUIPMENT MAINTENANCE AND RELIABILITY MANAGEMENT

Developing PMs for Hydraulic Systems

Focus on failure prevention rather than troubleshooting. Here are some best practices you can use to upgrade your preventive maintenance procedures for hydraulic systems.

By Ricky Smith, Life Cycle Engineering, Inc.

Most companies spend a lot of money training their maintenance personnel to troubleshoot hydraulic systems. If the focus were on preventing system failure, less time and money would be needed for troubleshooting.

We often accept hydraulic system failure as normal and use resources preparing for failure rather than deciding not to accept hydraulic failure as the norm and strive to eliminate it. When I worked for Kendall Co. in the 1980s, we changed our focus from reactive to proactive maintenance and practically eliminated unscheduled hydraulic failure.

Lack of maintenance of hydraulic systems is the leading cause of component and system failure, yet most maintenance personnel don't understand proper maintenance techniques of a hydraulic system. The basic foundation to perform proper maintenance on a hydraulic system has two areas of concern. The first area is preventive maintenance which is key to the success of any maintenance program whether in hydraulics or any equipment for which we need reliability. The second area is corrective maintenance, which in many cases can cause additional hydraulic component failure when it is not performed to standard.

Preventive maintenance

Preventive maintenance (PM) of a hydraulic system is basic and simple and, if followed properly, can eliminate most hydraulic component failure. PM is a discipline and must be followed as such in order to obtain results. We must view a PM program as performance oriented rather than activity oriented. Many organizations have good PM procedures, but do not require maintenance personnel to follow them or hold the personnel accountable for the proper execution of these procedures. In order to develop an effective preventive maintenance program for your system, you must follow these steps:

• First, identify the system operating condition: Does the system operate 24 hours a day, 7 days a week? Does the system operate at maximum flow and pressure 70 percent or better during operation? Is the system located in a dirty or hot environment?

• Second, what requirements does the equipment manufacturer state for preventive maintenance on the hydraulic system?

• Third, what requirements and operating parameters does the component manufacturer state concerning the hydraulic fluid ISO particulate?

• Fourth, what requirements and operating parameters does the filter company state concerning its filters' ability to meet this requirement?

• Fifth, what equipment history is available to verify the above procedures for the hydraulic system?

As in all PM programs, we must write procedures required for each PM task. These steps or procedures must be accurate and understandable by all maintenance personnel from entry level to master.

PM procedures must be part of the PM job plan that includes tools or special equipment required to perform the task, parts or material required to perform the procedure with store room number, safety precautions for this procedure, and environmental concerns or potential hazards.
Preventive maintenance tasks for a hydraulic system could include the following:
– Change the return or pressure hydraulic filter
– Obtain a hydraulic fluid sample
– Filter hydraulic fluid
– Check hydraulic actuators
– Clean the inside of a hydraulic reservoir
– Clean the outside of a hydraulic reservoir
– Check and record hydraulic pressures
– Check and record pump flow
– Check hydraulic hoses, tubing, and fittings
– Check and record voltage reading to proportional or servo valves
– Check and record vacuum on the suction side of the pump
– Check and record amperage on the main pump motor
– Check machine cycle time and record.
Preventive maintenance is the core support that a hydraulic system must have in order to maximize component and life and reduce system failure. PM procedures that are written properly and followed properly will allow equipment to operate to its full potential and life cycle. The process allows a maintenance department to control a hydraulic system rather than the system controlling the maintenance department. We exercise control by deciding when we will perform maintenance and how much money we will spend. The alternative is breakdown maintenance at a much higher cost.

Hydraulic knowledge

People say knowledge is power. This is also true in hydraulic maintenance. Many maintenance organizations do not know what knowledge and skills their maintenance personnel should possess. I believe hydraulic skills fall into two groups.
One includes the skills of the hydraulic troubleshooter, who must be the organization’s expert in maintenance. In general, no more than 10 percent of your work force should be in the troubleshooter category. The remainder are general hydraulic maintenance personnel, who provide the preventive maintenance expertise. This ratio is based on a company developing a true preventive or proactive approach to maintaining its hydraulic systems. Typical skills for each group are outlined in the accompanying section "Hydraulic Technician Skill Sets."

Measuring success

In any program we must track success in order to have support from management and maintenance personnel. We also must understand that any action will have a reaction, negative or possible. We know successful maintenance programs will provide success but we must have a checks and balances system to ensure we are on track.
In order to measure success of a hydraulic maintenance program we must have a way of tracking success but first we need to establish a benchmark. A benchmark is a method by which we will establish certain key measurement tools that will tell you the current status of your hydraulic system and then tell you if you are succeeding in your maintenance program.
Before you begin the implementation of your new hydraulic maintenance program it would be helpful to identify and track the following information:
• Downtime (in minutes) on the hydraulic system. Record daily and answer the following questions.
– What component failed?

– Cause of failure?
– Was the problem resolved?
– Could this failure have been prevented?
• Cost associated with the downtime. Record the following daily.
– Parts and material cost
– Labor cost
– Production downtime cost
– Any other cost that can be associated with a hydraulic system failure.
• Hydraulic system fluid analysis results. Track the following from samples taken monthly.
– Copper content
– Silicon content
– Water content
– Iron content
– ISO particulate count
– Fluid condition (viscosity, additives, and oxidation).

When the tracking process begins, you need to trend the information that can be trended. This allows management the ability to identify trends that can lead to positive or negative consequences.

A computerized maintenance management system can track and trend most of this information accurately for you.

Root cause failure analysis

As in any proactive maintenance organization you must perform root cause failure analysis in order to eliminate future component failures. Most maintenance problems or failures will repeat themselves unless someone identifies what caused the failure and proactively eliminates it. A preferred method is to inspect and analyze all component failures. Identify the following: Component name and model number, location of component at the time of failure, sequence or activity the system was operating at when the failure occurred, what caused the failure, and how the failure will be prevented from happening again.

Failures are not caused by an unknown factor such as "bad luck" or "it just happened" or "the manufacturer made a bad part." We have found most failures can be analyzed and action taken to prevent their reoccurrence. Establishing teams to review each failure can produce major payback quickly.

Maintenance of a hydraulic system is the first line of defense to prevent component failure and thus improve equipment reliability. As spoken about earlier, discipline is the key to the success of any proactive maintenance program.