

CONSIDERATION REGARDING SOME PREVENTIVE MAINTENANCE PROCEDURES FOR HYDRAULIC SYSTEMS

Ilie Octavian, POPP

Lucian Blaga University of Sibiu, ilie.popp@ulbsibiu.ro

ABSTRACT: 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. 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.

1. INTRODUCTION

Preventive maintenance (PM) has the following meanings:

The care and servicing by personnel for the purpose of maintaining equipment and facilities in satisfactory operating condition by providing for systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects.

Maintenance including tests, measurements, adjustments, and parts replacement, performed specifically to prevent faults from occurring.

While preventive maintenance is generally considered to be worthwhile, there are risks such as equipment failure or human error involved when performing PM, just as in any maintenance operation. PM as scheduled overhaul or scheduled replacement provides two of the three proactive failure management policies available to the maintenance engineer. Common methods of determining what PM (or other) failure management policies should be applied are; OEM recommendations, requirements of codes and legislation within a jurisdiction, what an „expert” thinks ought to be done, or the maintenance that's already done to similar equipment. However Reliability Centered Maintenance, provides the most rigorous and method to determine applicable and effective failure management policies - which may include PM tasks - for an item.

To make it simple:

- Preventive maintenance is conducted to keep equipment working and/or extend the life of the equipment.

- Corrective maintenance, sometimes called „repair”, is conducted to get equipment working again.

The primary goal of maintenance is to avoid or mitigate the consequences of failure of equipment. This may be by preventing the failure before it actually occurs which PM and condition based maintenance help to achieve. It is designed to preserve and restore equipment reliability by replacing worn components before they actually fail. Preventive maintenance activities include partial or complete overhauls at specified periods, oil changes, lubrication and so on. In addition, workers can record equipment deterioration so they know to replace or repair worn parts before they cause system failure. The ideal preventive maintenance program would prevent all equipment failure before it occurs [1].

2. PREVENTIVE MAINTENANCE FOR HYDRAULIC SYSTEMS

Preventive maintenance 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 hydraulic system, must follow these steps [2]:

- 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 [3]:

- Changing the return or pressure hydraulic filter
- Obtaining a hydraulic fluid sample
- Filter hydraulic fluid
- Checking hydraulic actuators
- Cleaning the inside of a hydraulic reservoir
- Cleaning the outside of a hydraulic reservoir
- Checking and recording hydraulic pressures
- Checking and recording pump flow
- Checking hydraulic hoses, tubing, and fittings
- Checking and recording voltage reading to proportional or servo valves
- Checking and recording vacuum on the suction side of the pump
- Checking and recording amperage on the main pump motor
- Checking 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. The exercised control will decide when maintenance is performed and how much money will be spent. The alternative is breakdown maintenance at a much higher cost.

3. HYDRAULIC KNOWLEDGE

“Knowledge is power” and this is also true in hydraulic maintenance. Many maintenance organizations do not know what knowledge and skills their maintenance personnel should possess. The 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 remainders are general hydraulic maintenance personnel, who provide the preventive maintenance expertise.

4. MEASURING SUCCESS

Every program must be successful in order to have support from management and maintenance personnel. It is known that any action will have a reaction, negative or possible. Successful maintenance programs will provide success but the checks and balances system must ensure that the hydraulic maintenance program is on track.

In order to measure success of a hydraulic maintenance program is necessary to trace out a way of tracking success but a benchmark must be established. A benchmark is a method by which it is established certain key measurement tools that will tell the current status of the hydraulic system and then tell if the maintenance program will succeed.

Before begin the implementation of new hydraulic maintenance program its necessary 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 [4].

- 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.

5. 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.” 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.

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