6 Steps to Effectively Control Contamination

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Contamination is a leading cause of machinery failure. Maintenance and reliability professionals need to comprehend the destructive nature of contamination and realize the benefits in removing contamination from their facilities. Several areas will be discussed which will help you reduce contamination at your site. Ways of monitoring and controlling contamination will also be presented. If foreign materials enter your system, critical responses are necessary to minimize the effects of destructive contaminants. A necessary tool for the reliability professional is having the knowledge to understand the signs and symptoms of contamination. In doing so, you will be able to maximize your maintenance dollars, thereby resulting in lower down time and increasing your bottom line. Hopefully, the tools discussed in this presentation will give you an outline to effectively control contamination.

In order to effectively control contamination, you need to follow the next 6 steps:

Understand
Identify
Monitor
Respond
Remove
Prevent

Contamination control begins with a thorough understanding of what contamination is and why it is important to keep it out of your equipment. Basically, contamination is any unwanted material in a lubricant. If present in your lubricants, foreign material can become an important cause of equipment failure. Typically, debris can lead to failure by interfering with the lubrication film, which results in improper lubrication. Contamination can also promote the oxidation process, thereby decreasing the lubricant's ability to function properly, which in turn will result in longer down time. Contamination can occur in many forms. Water and particle contamination are some of the more common types. Fuel, soot, heat, air, and radioactive material are other potential sources of contamination, although they are less common. Often we think of contamination as entering operating equipment. However, contamination can occur even when the equipment is not in use. New lubricants are often perceived to be free of contamination. Unfortunately, this may not always be the case. It is not surprising to find new lubricants which are already contaminated. A key principle in understanding contamination control is to realize that it is much easier to fix a contamination problem prior to it entering your system rather than trying to fix it after a system has been contaminated. Keeping contamination in check can help extend the life of your equipment. The process of lubricant development can result in foreign material entry. For example, the refining process of lubricants can be an area where contaminants can enter the lubricant. Once lubes are dispensed to facilities there are many places where the lubricant can be subjected to less than ideal conditions. Storage locations, which are susceptible to outside environments, virtually guarantee some external contamination of lubricants will eventually occur. Lubricant dispensing is another potential area for pitfall as debris may have easier access depending on the equipment being used and the procedures being followed. If left unchecked, facility cleanliness is another key area where contamination can become an issue. Obviously some facilities, due to the nature of their operations, are going to be easier to clean than others. Even so, it is important not to overlook the overall environment lubricant and equipment are subjected to as a potential area for contamination control. It is also important to comprehend the benefits of reducing contamination. Investment of capital and commitment from management are

necessary for the success of any maintenance program. Contamination control is no different. Contamination control can help increase your bottom line by reducing down time and increasing your return on your investment. Thoroughly understanding the many facets of contamination is essential for controlling contamination.

The next step in controlling contamination is identification of the foreign material. It is important to understand what type of contamination is present in your system. There are primarily two major types of contamination. They are particle and water contamination. Particle contamination can come in many forms. Some of the more common sources of particle contamination are air, dust/dirt, and machinery parts. Regardless of where the particle contamination is coming from, the end result is prevention or hindering of proper lubrication. Particle contamination can promote failure, oxidation, and deplete additives. Water contamination is another major source of contamination. If water is present in your system it can promote corrosion and lead to wax formation. Lube degradation, oxidation, and internal rust are other symptoms associated with water contamination. Water can enter the system from leaks, malfunctioning seals, and contaminated new lubes. Topping off equipment, if not done properly, can also introduce water contamination into a system. Water takes on several different forms when it is present in lubricants. Water can show up as free water, dissolved water, or emulsified water in a lubricant. Other types of contaminants that may need to be identified include fuel, soot, and glycol. These contaminants, although less common than water and particles, can be just as destructive and it is important to be able to properly identify them.

If successful contamination control is to be implemented, it is imperative that some type of monitoring system also be employed. A monitoring system is essential to detecting contamination. If contamination is already present in your system, efforts to reduce it can be effectively measured by a successful surveillance program. In order to successfully monitor contamination, a testing regimen of lubricants should be performed on a regular basis. The testing regimen employed should be capable of measuring the different contaminants present in lubricants. Monitoring water contamination can be accomplished by utilizing the following tests – crackle test, Karl Fischer, and water by distillation. Another critical contaminant, which needs to be monitored on a regular basis, is particle contamination. Particles can be measured via spectroscopy, particle counting, and ferrography analysis. Each testing option has its own strengths and weaknesses which should be evaluated carefully. It is important to choose a test that will give you the necessary information to accurately ascertain the amount of contamination. An accurate determination of the contaminant concentration will be crucial in determining the appropriate action plan to remove the contaminant.

Contamination control will fail unless there is a willingness to respond to the signals that the program is sending. It is critical that you take action when there are problems as well as taking action long before problems arise. Setting contamination limits for your systems and lubricants will help ensure you are meeting or missing your target limits. Acting when problems present themselves will help ensure the root cause is identified. Failure to respond will guarantee the necessary clues for root cause analysis are lost forever. Utilizing the contamination found during monitoring will help determine the best course of action. Responding is also critical for the continual improvement of your contamination control program. It is also important to realize when not to respond. Sometimes it may be possible to refine your contamination control program to the point where you do more harm than good. For example, new lubricant specifications can be written to the point where they are economically unfeasible, as well as impractical for the operating conditions the lubricant is subjected. It is important to have a balanced response that will ultimately benefit the goals of the contamination control program.

If contamination is present in systems and lubricants, an important component of an effective contamination control program is the removal of the foreign material. Different technologies are available for the removal of foreign debris. It is important to select a technology that will be able to remove the type of contaminant present. Particle contamination removal can be accomplished utilizing several different methods. Filtering is one of the more common methods for removal of particle debris. Filters come in a variety of shapes, sizes, and systems. Selection of a filter removal system will be dependent on your particular equipment, lubricant, and maintenance budget. The key is to select a system that will help meet the goal of particulate removal. Electrostatic separators are another technology, which can be employed to help remove particle debris from your system. This technology makes use of different electrical charges to separate particles from your lubricant and system. Water contamination can also be removed via several different methods. The effectiveness of these methods will be dependent on the type of water present. Settling tanks remove water from lubricants by allowing the water to settle out. Centrifugal separators and vacuum dehydrators employ mechanical stresses to the lubricant to help facilitate the water separation. Another method, which can help in the removal of water by preventing its entry, is to improve seals so water isn't allowed to enter the lubricant or the system.

This leads to the last step in controlling contamination, which is preventing contaminants from entering the system or lubricant. When feasible, implementing changes that reduce contamination from entering equipment and lubricants should be undertaken. Some of the easier equipment changes to implement are ensuring the work area is clean and that equipment has the appropriate breather and filter installed. Creating clean rooms for new lubricants and lubricant storage will help ensure contamination is not introduced when lubricants are being dispensed. Proper dispensing equipment can also help prevent foreign material entry. Sampling techniques can often introduce contaminants into systems. Methods for preventing foreign debris from entering while pulling lubricant samples should be continually evaluated. Sampling ports or sampling method revisions can help prevent contamination from entering unwanted areas. Proving the merit of a contamination control is an effective prevention strategy for budgetary cutbacks. Reviewing the program on a regular basis as well as cost justifying the program will help ensure the efficacy of the program is communicated to the appropriate personnel. Prevention is the first line of defense and it should be treated as such, as it is much harder to remove contamination after it has entered a system. Contamination control is much easier to achieve if foreign debris is prevented from entering a system. The 6 steps outlined should provide the tools necessary to effectively control contamination.