Getting Down on The Floor

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Failure – Not a Question of If, But Rather, When

Anyone who has ever played organized sports or served in the Armed Forces has had the following statement drilled into their heads: "Failure is not an option." This statement is true – failure does not have an option…of occurring. Failure will occur at some point, it is merely a question of when. There are some people who believe everything happens for a reason and then there are those that believe there is a reason why everything happens. Whether you believe in divine design or random occurrence, things fail. Success and reliability occur when failure can be kept in check.

In general terms, the cause of failures can be grouped into four categories – man, machine, method, and materials (see Table 1). Once these categories are identified, then a root cause can be identified and corrective measures put into place. If done so successfully, the opportunity for that failure to occur again will be reduced dramatically.

If maintenance management can get a clear understanding as to why various pieces of equipment fail, then implementing corrective actions for improved reliability will follow. In order to do this, it is essential that management spend time on the floor understanding why machines break down. Once this occurs, management must also spend time understanding the legitimate corrective actions and how to get them successfully implemented. In many instances, what looks good on paper may not always make the most sense on the floor. A simple checklist can help in understanding how failures occur. Table 2 will help to understand and document the failure event(s).

Table 1. Causes of Failure

Failure Cause	Reason (simplified)
Man	Lack of training/experience Human error Poor supervision
Machine	Poor maintenance Used beyond its design criteria Old, worn
Method	Lack of supervision No standard operating procedures Lack of management
Material	Wrong materials External influences/ contamination Improperly manufactured

Understanding Failures as They Relate to Lubricating Grease

Many applications in various types of equipment create a host of lubrication problems; extreme heat, excessive pressure, water washout, and contamination all can degrade grease and leave the components unprotected. Attempting to understand which grease is best for a given application can be a difficult task. One way to make this process easy is to identify why grease is failing and then choose a product that can stand up to these problems. Various controlled test methods have been established that relate to these problems, also known as failure sources. Understanding the standards and test results make the selection process less painful. The performance requirements are determined by actively examining the various bearing failures.

Typically, grease was considered a commodity product. Purchasing would buy the cheapest grease and the maintenance technicians made sure that the bearings always had grease in them. Only until the maintenance and engineering staff actually examined and understood the failure modes of the bearings did they realize that performance and bearing life was actually driven by the grease they used.

To understand the performance requirements, one must first identify the cause of downtime, parts replacement, and labor costs. Once this is established, then standards are identified as basic performance levels. Grease is used to solve problems. These problems, if not addressed, can manifest into

Table 2. Understanding and Documenting the Failure

Actual Event	Details
What happened	Define incident/equipment specifics. Interview all personnel directly and indirectly. Gather any physical evidence (worn gear, seized bearing, etc.).
Where did it happen	Identify specific area affected. Has this occurred before? On different equipment?
When did it happen	Define the timeframe of occurrence. What were the sequence of events that lead up to the failure?
List changes, if any	List out changes in product, practices, procedures, environment, etc.
Who was involved	List all personnel directly and indirectly involved including supervision and procurement/purchasing.
What is the impact	Was anybody injured? Financial impact in terms of downtime, parts replacement, labor costs, direct and indirect cost pools.
Likelihood of reoccurrence	Determine the probability of reoccurrence.
Can this be prevented	List what needs to be done to avoid a similar failure.

equipment failure resulting in downtime, parts replacement, and labor costs. Grease problems can be characterized in three main groups:

1. *Excessive load*: Force applied to a bearing or journal that exceeds the load carrying capability of the grease. The result is grease squeeze-out where metal contact, premature wear, and increased heat occurs. Example: a bucket pin on a hydraulic excavator.

2. *Excessive and/or localized heat*: Operational heat that is generated during extended operation or localized heat that is generated as metal asperities collide, producing temperatures in excess of 2,000 degrees Fahrenheit. The result: breakdown of grease, cold welding, or galling. Example: 350-times magnification of bearing surface.

3. *Contamination*: Mud, water, and steam can wash away grease, leaving metal unprotected. Dust, fibers, and abrasive particles can combine with grease and grind away metal. Acids, caustics, and cleaning solutions can break down grease and corrode metal. The result is premature wear. Example: bearing failure due to contamination.

Getting the Answers

Anytime management is going to interview all involved, it can be uncomfortable, if not hostile. Care should be taken to convey the message that the questions asked are required not to assign blame but rather to fix the system. The relationship between subordinate and management is a tenuous one at best. It is compounded with a costly situation such as equipment failure. Production and maintenance technicians may not be straightforward with the actual reasons why an incident occurred. Many times the line workers or mechanics feel as though the reasons are management or company related and bringing them to light may cost them their jobs. In some cases, an outside "interviewer" has to be called in that can develop the background data impartially and in confidence. This provides a useful proposal that will elevate if not eliminate the failure that has occurred. ❖