Service Solutions

Troubleshooting the System

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Your recently rebuilt pump is leaking through the mechanical seal. This is the third time it has been rebuilt. The back-up unit to this pump runs fine. What is the problem?

This is a common scenario posed to the Goulds Pumps Field Service group. At times, this is the most information that is provided. This article will cover what basic information is required to begin a reliability issue analysis. Future articles will dig deeper into each category to help in your understanding of pump operation and the diagnosis of pump problems.

There are a number of direct and indirect pieces of data that should be understood when evaluating the performance and reliability of a pump. Analogous to human vital signs, the direct pieces of data establish the current condition of the unit. The indirect data provides a history leading up to the current event. Except for some very basic problems, it is difficult, if not impossible, to determine the true source of a problem without knowing both types of information.

There are five parameters that define the current condition of an operating pump: Flow, Head, Power, Temperature and Vibration. Knowing this information at different operating points is invaluable in determining reliability issues. Accuracy of this data is paramount and having incorrect data is more detrimental than having no data at all.

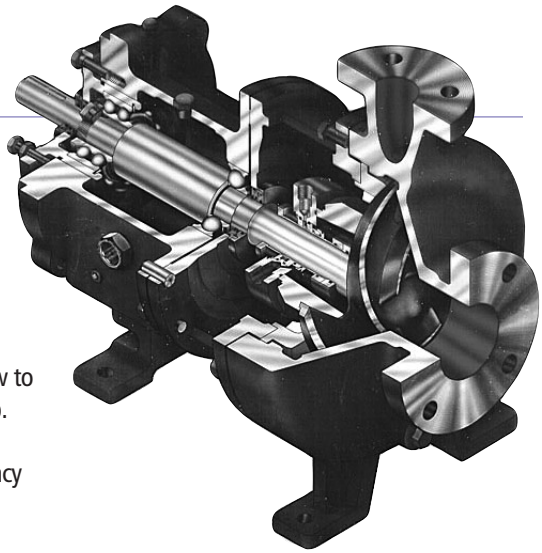
1. Flow – Often the most difficult to obtain because most systems do not have a flow measurement device that can accurately isolate the suspect pump. It is most important to understand how the flow is measured and where in general the pump is operating.
2. Head – The differential head, in combination with either flow or power consumption, will aid in triangulating the operating point of the pump. This can be determined by taking the difference between the suction and discharge pressure gauge readings, and then accounting for the fluid velocity, the specific gravity of the fluid, and the gauge height differential.
3. Power – Power can be used in lieu of flow to establish the operating point of the pump. To determine power, readings of motor current, voltage, power factor and efficiency are required.
4. Temperature - Skin temperatures will normally suffice. Casing skin temperature will provide, indirectly, the process temperature. Bearing housing skin temperature will provide, indirectly, bearing temperatures.
5. Vibration – Initial readings in overall measurements are acceptable. Discrete frequency data [i.e. spectrums] are ideal. In either case, the operating point must be documented with the previous operating parameters.

At least three of these parameters should be known in detail to ensure a productive discussion of potential failure cause. At least four are required to make definitive conclusions.

Indirect data is often the most revealing in troubleshooting. As mentioned earlier, it provides the history of the unit up to the current condition. Consideration should be given to the following questions:

1. Prior History – How frequently has this problem, or similar problems occurred? What is the usual failure mode?
2. Operational History – Is there any operational trend data? Has the operation of this unit changed recently, or during the course of previous failures?
3. Installation – Are the problems related to a specific installation or widespread? Are there standard installation practices performed here?

These are not a complete set of questions, they do however encompass the general intent of this data gathering phase; learning in detail the history of the unit up to this point. As with the direct data, accuracy here is paramount.



Determining and resolving pump reliability issues is often difficult and trying. It always starts however with understanding the basic condition and history of the unit. Try to avoid generalities whenever possible. The indicators of an issue are almost never obvious and what may appear to be irrelevant, may in fact be the key.

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variations in flow rate, result in very high-pressure losses across control valves. In many of these systems a more expensive variable frequency drive may alternatively be used to control flow. It is not unusual to achieve a 50% reduction in energy consumption, and an increase in pump reliability when using a variable frequency drive.

Many software packages exist which facilitate the calculation of system head requirements. Some of these packages also link to pump selection programs that make it possible to select a pump for the system. There are a few programs that allow the comparison of a system using a control valve with a system using a variable frequency drive.

The PumpSmart Selection software is one of the few programs that encompass such functionality. It can provide an excellent tool for making LCC comparisons for systems requiring flow control.

Send your comments or suggestions to:
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