Run Times
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In our final installment of The Seven Deadly Sins of Pump Ownership[1], we discuss the topic of abuse and neglect. We all have experienced pumps that give long trouble free life. Why don't all pumps do that? Abuse and neglect covers everything bad that occurs- by either act or omission- in the selection, operation, and maintenance of pumps. Obviously, there is more to this subject than can be adequately covered in this short space, but we will touch upon some of the more significant offenses.

Dale B. Andrews

Dale B. Andrews – Editor

A recent trade journal editorial took the provocative position that pump and seal manufacturers should stop complaining about how the real world operates and maintains pumps and should just start making equipment that survives real world operation. Although there is some merit to the argument, the idea of a bullet proof pump for every application is presently neither technically nor commercially viable. Until there is a commercially practical perfect pump it might be better to keep in mind that big improvements to pump life may be had by paying attention to some small but significant details: lubrication, fit tolerance decay, cleanliness, hydraulic instability avoidance, and communication between sellers and buyers, to name a few. What follows on these topics is in no particular order. Almost all of these topics have been the subject of prior newsletters. Where appropriate, links are provided to articles that provide more detailed coverage of the various subjects.

Lubrication

Change the lubricant regularly with compatible lubricant that has been properly stored. Any increase in oxidation and moisture content exponentially reduces the life of lubricating oil. (See our Aug 2009 Newsletter on lubrication contamination)

Fit Tolerance Decay

Every time a pump is disassembled, cleaned, and reassembled the mating fits are slightly enlarged. Corrosion also enlarges fits, as does any effort to "clean the fits up" through machining. The sum of the clearances of all of the mating fits between the bearings and the seal, added to any angular offset, is equal to the possible static seal misalignment in the assembled pump. Tolerance decay should be a prime suspect for any pump that has decreasing reliability with increased age. (See our September 2009 newsletter on static misalignment)

When restoring fits, one should be conscious of the fact that not everyone who works in a machine shop knows how to correctly machine a support column or bearing housing. It is possible to make fits concentric without being square; another potential source of seal and bearing problems.

Cleanliness

Any dirt or grime that contacts the bearings or seal faces is going to embed in, or score, mating surfaces once in operation. Check out the work area where repairs are done. Chances are the bearings and seals in the pump are no cleaner than the toolbox of the person doing the work. This is one area where work habits really count. While you're there, grab a light and give the inside of the bearing frame a thorough inspection. If there is rust in the bearing frame there is going to be rust traveling through the bearings. Clean it up and give un-machined surfaces a quality coating of compatible epoxy paint.

Additionally, if the installation has a closed loop seal or bearing support system, any debris from past seal or bearing failures is likely circulating within the system unless it has been separately cleaned. (See our July 2005 newsletter "Do you know what is in your seal reservoir?")

Excessive Nozzle Loads

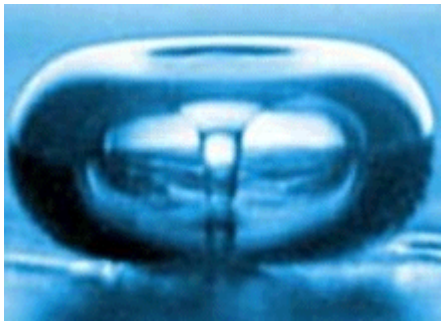
A pump is not a piping support. If mechanical leverage is required to align pump and piping, if the mating flanges are not parallel, or if the pump and piping are subject to thermal cycles, the nozzle loads may be excessive. It is good practice to calculate the actual loads, and make sure that they are within acceptable limits for the pump. (See our July 2009 newsletter on piping misalignment)

Hydraulic Instability Avoidance

Hydraulic instability creates variable thrust loads as a result of vortices, recirculation, cavitation, or gas entrainment. Instability avoidance starts at system design. If the process design calls for a pump that is going to operate off-design with a suction specific speed of more than 10,000, be prepared for higher maintenance expenses. (See our April 2009 newsletter on off-design operation)

Beware of well designed systems that change with time, moving what was a nicely matched pump into an incompatible one. Changes in process, feed rates, piping, and equipment all will move the operating point of the pump on its curve. Try to ascertain where the pump is operating with respect to its curve. Remember, the difference in power between 100% efficiency and the efficiency that the pump is operating at is power that is converted to heat, noise, and vibration. Check with the pump supplier, it may be possible to retrofit a pump to better match changed conditions.

Cavitation



Cavitation is a pump and seal killer. Take the time to find the NPSH available and where the pump is on its curve (remember, conditions change). The practical options are limited. One can change the suction pressure at the eye of the impeller, or change the pump through modification or direct replacement. Both choices are great advice on paper and hard to implement; which is why adequate NPSHA at design is so important. (See our June 2009 newsletter on cavitation)

Communication

In closing, consider that it has never been easier to communicate than it is today, yet it is arguable that never have buyers and sellers communicated less. Data sheets and quotations flying back and forth, without more dialog, is asking for trouble. Pump suppliers still need to learn about processes, and buyers still need to learn about the trade-offs involved in pump application. I think that it is fair to say that most pump suppliers, engineering firms, and users would agree that it is desirable to build a great pump installation. However, the price of not asking questions, or not giving consideration to alternative design options, may well create thirty or more years of problems for the user. Pick up the phone.

[1]The Seven Deadly Sins: (active links are to past issues)

1. **Off-design operation**
2. **Misapplied design (i.e. wrong type of pump)**
3. **Cavitation**
4. **Excess nozzle loads**
5. **Poor Lubrication**
6. **(A) Misalignment (part 1)**
   (B) Misalignment (part 2)
6. **Abuse & Neglect**