What Causes Noise?

Most of us working around pumps and systems have experienced noise generated by pumps during operation. So what is it that causes noise? Generally, the first cause that comes to mind in the pumping world is cavitation. While this may be the leading cause of noise, it is certainly not the only reason for those sounds we hear during operation. Noise is usually generated by a mechanical or hydraulic issue with the pump and or system. One way to determine the difference is to operate the pump without water. Most pump designs will allow you to operate the pump for a short period of time without damage to the mechanical seal. This short period of time needs to be no more than 10 seconds. If the pump continues to generate the same noise without water, then a mechanical issue appears to be causing the noise. If the noise goes away when the water is removed, then the pump was generating a hydraulic noise. Let's take a look at each and some possible causes.

Hydraulic Noise

Cavitation – As previously mentioned, cavitation is the leading cause of hydraulic noise. Most of us have had the opportunity to witness cavitation noise. This is caused by operating the pump too far to the left or right of the best efficiency point on the pump performance curve. Cavitation is sometimes confused as air while it is just the opposite. During operation at these extreme right and left hand side of the curve, the condensed gases are extracted from the liquid. These gases are in the form or vapor bubbles which implode or return back to a liquid when the external pressure rises somewhere within the pump. This return back to a liquid or implosion is the occurrence that generates the noise. Use your gauges to determine where the pump is operating on its performance curve.

Air – Air moving through the pump causes noise as well. The noise generated by air is different than that generated by cavitation. Air handling is lower pitched with more of a "rumbling" noise where cavitation has a higher "metalized" rattle. Both produce vibration. Air typically produces more vibration with accelerated corrosion. This entrained air could come from dumping water over or near to the suction inlet. Most pump users don't realize the vacuum created about the inlet of the pump and the affect of this vacuum. Air bubbles can move horizontally in the water to be ingested by the pump prior to bubbles floating back to

Damage caused by both suction and discharge cavitation

Damage caused by discharge cavitation

the surface. Insufficient submergence of the suction line can lead to vortexing and air handling. This air moving through the pump causes an imbalance as the air and water mixture moved through the pump. Mixers can generate air. Compressed air used in level systems and aeration mounted too close to the suction can cause hydraulic imbalance.

Turbulence – Let's not confuse turbulence with air. While the pump may not be suffering from the affects of air, it could still be affected by turbulence in the well or source from which the pump is drawing. Suctions line too close to one another can interact when operated at the same time. Always ensure that multiple suction lines are properly spaced from one another and from the well's sides and bottom. Long horizontal suction lines will contribute to pump noise as well as increased vibration. Other features in the well can cause turbulence such as mixers.

Excessive Velocity – Water moving through a system, especially at higher than recommended velocity, may cause noise generated by a resonant frequency.

Mechanical Noise

Bearings – The pump may be experiencing a bearing failure. Don't forget, electric motors have bearings as well. Disconnect the drive and operate the motor separately. Monitor the temperature and amperage. Elevated temperature and amperage may be the first sign of bearing failure.

Debris – There are many stories floating the pumping world in regards to the subject of debris. Plain and simple, if you ingest something that fails to pass through the impeller eye, the clog may cause noise. The pump performance will be affected in flow and discharge pressure.

Impeller – An impeller that has worn to an "out of balance" condition or damaged through use can generate vibration and noise.

Wear Plate / Impeller/ Seal Plate – Contact between the impeller and wear plate and or seal plate will certainly generate noise. Don't allow it to "wear in". Always reset the clearance if it was set too close during preventive maintenance or repair.

Drive Maintenance Alignment / Tension – All types of power transmission components will make noise if

misapplied or installed improperly. Make sure these components are sized and aligned properly. The effects of a misaligned drive will damage other components as well.

Structural Vibration – Improperly designed and installed pump assemblies can generate structural vibration causing noise. This vibration may be the result of an imbalance in the motor or pump. Motors improperly shimmed will cause vibration leading to noise.

This may not be all of the causes that contribute to noise in pumps and system. Nonetheless, when you hear an unusual noise, investigate and find the source of the noise. The noise may be inherent to the pump's design. Some pumps are just noisier than others. Finding the source of the noise and eliminating it will increase performance and extend the life of your equipment.