USING AN OFFLINE DATA COLLECTOR TO CATCH PUMP CAVITATION

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Cavitation data collection is an integral part of any predictive maintenance program. Pumps that operate with low cavitation levels can maximize the productive capacity of the machine and the lifespan of machine components, saving both time and money. Scheduled programs for collecting cavitation data can reduce process downtime, and save money on expensive impeller repairs or pump replacements and inspections.

Companies without a predictive maintenance program that includes cavitation data collection can encounter various forms of pump damage that range from minor pitting to catastrophic failure. All failures can be linked to pumped fluid characteristics, energy levels or the duration of cavitations. The impeller is the most commonly damaged component of the pump. Specifically, the leading face of the non-pressure side of the impeller endures the bulk of the cavitation damage. During cavitation, tiny bubbles form and rapidly collapse in the pumped fluid. On the vanes or impeller blades is where the bubbles will normally begin to collapse and release energy onto the vane. The overall result will be a rough, pock-marked surface.

An offline data collector – in this case a Vibscanner from Pruftechnik - can detect cavitation through two different methods. The scanner can trend the decibel level on the volute of a pump over time, or it can take comparative decibel level readings on several similar pumps to determine an acceptable decibel level. This data can either be viewed in the tool itself or downloaded to a PC and viewed with dedicated software.

Trending the decibel level on the volute of the pump over time is the most accurate way to determine when a pump has reached an unacceptable cavitation level. Often, it is impossible to determine a pump's cavitation warning stage through comparative readings alone, either because there are no other similar pumps to compare it to, or the data is too similar to discern an appreciable difference between pumps. In this case, trending over time is the only option to monitor cavitation levels.

The decibel reading on any data collector is a relative value. There is no absolute correlation between decibel levels on the volute of a pump and the degree to which that pump is cavitating. This is because pumps come in many different sizes, have different flow rates, pump different liquids, and otherwise operate under different conditions. One pump could have a low decibel level in relation to another pump, yet the pump with the high decibel reading is not cavitating while the pump with the low decibel reading is. When the relative readings are taken, it is important to compare them to other pumps that are of the same size and have the same operating conditions.

The best way to determine pump cavitation from a decibel reading is to trend that pump over time. The generally accepted rule is when a decibel level has changed by more than 10%, the pump has a cavitation problem.

The pump in Figure 1 is trended over a six-month period. Once several months of data have been collected, warning and alarm levels can be established. At the end of October the cavitation level rose above the warning level. The next time data was collected, it was operating above the alarm level, and this pump should have been taken out of service immediately in order to

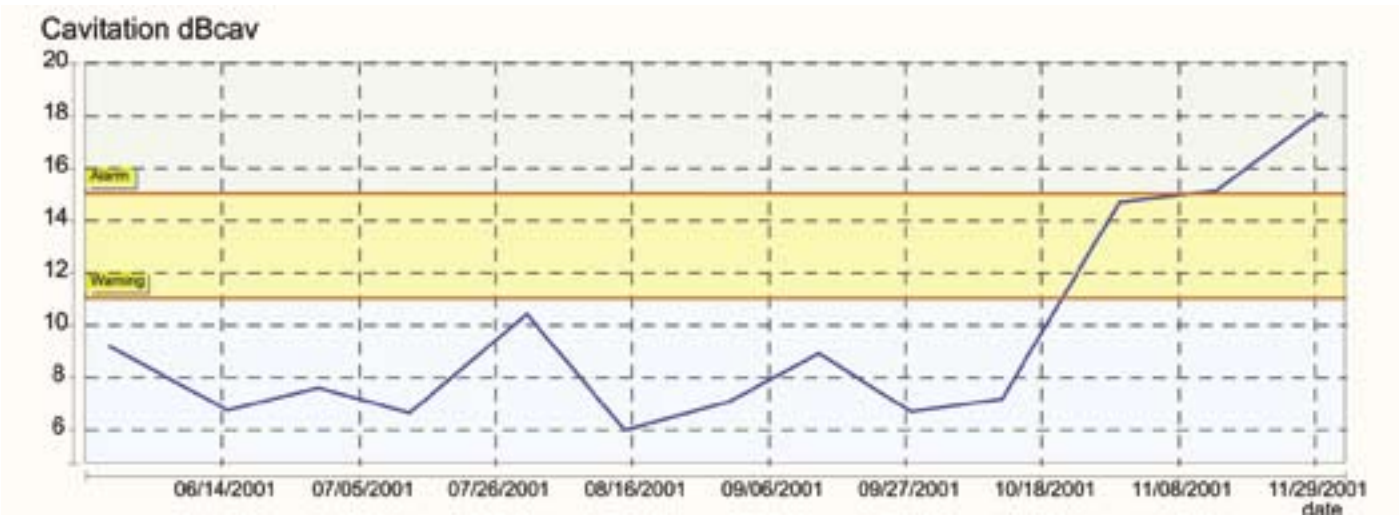

Fig. 1: this pump was trended over a six month period.

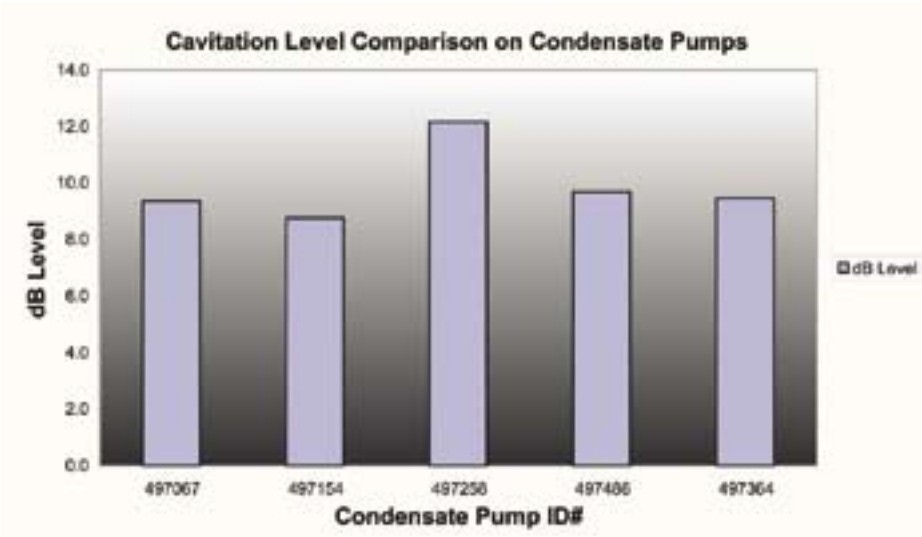

Fig. 2: cavitation level comparison on condensate pumps

prevent irreparable damage.
The data collector is programmed to accept predetermined alarm levels and immediately warn the operator when the pump has reached a warning stage during operation. When the tool is used in conjunction with the Vibcode technology (developed by Pruftechnik), it is virtually impossible to take an erroneous reading on the pump. The unit will identify the volute of the pump as a unique point in the path and automatically take the preprogrammed data to be collected. The Tandem-Piezo accelerometer will always contact the pump at the same location, orientation and at the same pressure. This ensures clean, repeatable data, which is totally independent of the person collecting the data. These conditions are required to do proper trending and analysis on a piece of equipment, from which scheduled maintenance can be planned.
Comparative readings taken on five identical pumps are shown in Figure 2. It is easy to see that pump #497258 has a cavitation level appreciably higher than its peers. In this case the comparative readings can be used to determine a cavitation level because five identical pumps, operating under the same load and pumping the same fluid are being compared.
In both of the above examples, the cavitating pump was further investigated to determine the root cause of the problem. The pumps were taken out of service and repaired in a scheduled manner to save time and money on unscheduled downtime and labor. The data collector provides an easy and effective way to trend, determine and correct pump cavitation. <<


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