

Stress Wave Analysis: Ultrasonic-based Online-Condition-Monitoring

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- Critical asset monitoring provides important condition and operation information

Stress Wave Analysis (SWAN™) is an ultrasonic instrumentation and analysis technique for the quantitative measurement of dynamic contact stresses between moving parts in operating machinery. It was originally developed to identify abnormal sources and causes of friction and shock (such as damaged gears and bearings) in kinematically complex gearboxes, where vibration analysis proved to be impractical.

SWAN systems employ a unique sensor that utilizes the sensor's resonant frequency to selectively amplify low amplitude stress waves, and specialized signal conditioning to filter out structural vibration.

Evonik Energy Services GmbH recently has signed a contract with the company SWANtech, a business unit of Curtiss-Wright Flow Control, based in Fort Lauderdale, FL in the U.S.A, to act as distributor for the SWAN solution consisting of hardware, software and services.

To use a health care analogy, an EKG is used to understand how the human body responds to changes in the external environment. Under load, there is an expectation that stress levels will rise. An EKG reveals if the increase in stress is appropriate for the conditions. If so then the patient is healthy, if not then the abnormal stress is caused by a condition and the earlier the detection, the greater the probability of successfully managing that condition. This is analogous to machinery and it is the fundamental to understanding the methodology of SWAN.

This provides the ability to quantitatively measure, and trend, low energy sources of friction and shock, in the presence of high background levels of vibration and audible noise repeatedly and reliably. SWAN systems are currently deployed across a broad array of industries and applications, ranging from cruise ships to process industry applications, from high speed gas turbines to low speed wind turbines; and most recently in gas storage, detecting internal leakage in valves.

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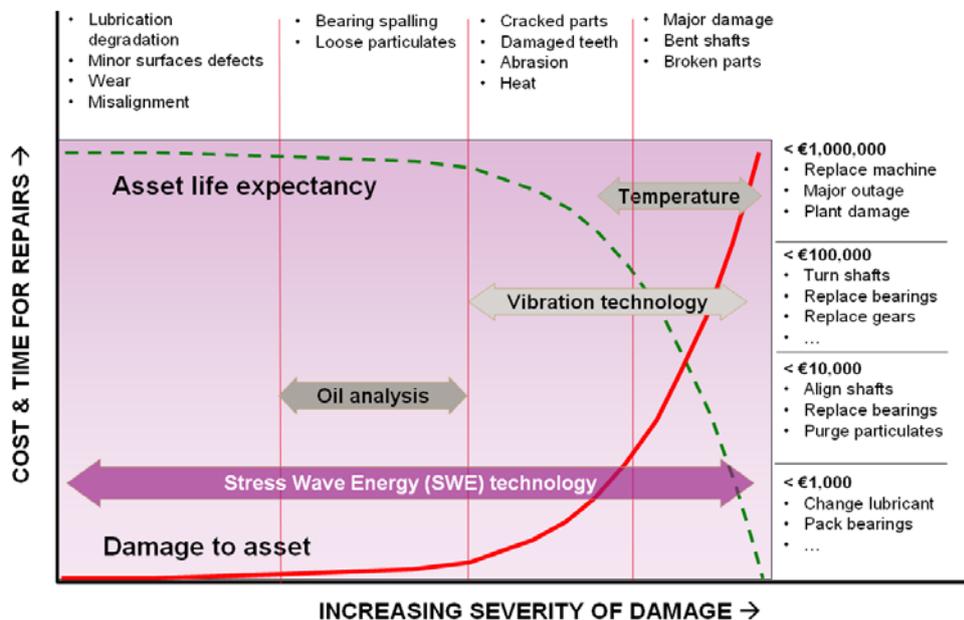
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One of the features computed in SWAN, is Stress Wave Energy (SWE). SWE is directly proportional to the friction between moving parts that are separated by a lubricant boundary layer. Since friction is a function of both speed and load, SWAN is an excellent method for understanding dynamic loading and lubrication condition in operating machinery, as well as detecting classic rolling element defects, imbalance, et al.

In this respect, friction is said to be a first order response to changes in load, speed and component health, whereas temperature and vibration tend to be second order responses. Friction is an immediate response, and will change by orders of magnitude in proportion to input forces and component health. This makes SWAN an effective early warning system, because it can distinguish between mechanical component health and operating condition.



The Stress Wave Analysis provides the earliest possible detection of damage processes

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About SWANtech

Based in Fort Lauderdale, Florida, SWANtech is part of Curtiss–Wright Flow Control’s Controls Systems Division. SWANtech develops and supplies advanced software, services, sensors and data collections equipment to monitor and automatically evaluate the operating condition of high performance critical equipment, primarily in the power generation, marine, and industrial process markets. Its patented technology listens for friction in the ultrasonic range, using Stress Wave Energy, detecting in real time the earliest signs of the development of cracks, pitting, spalling, surface wear and lubrication degradation. SWANtech holds six U.S. patents and one European patent and has additional patents pending.

About Curtiss–Wright Flow Control

Curtiss–Wright Flow Control Corporation (CWFC) specializes in the design and manufacture of highly engineered valves, pumps, motors, generators, electronics and related products for the commercial nuclear power industry, oil and gas processing facilities, and a range of critical military programs. CWFC’s innovative, high–performance products play an integral role in our nation’s defense, and in the safe, efficient operation of power plants and other industrial sites worldwide. Based in Falls Church, VA, the company has over to 3,000 employees worldwide and is the Flow Control operating segment of Curtiss–Wright Corporation, headquartered in Roseland, NJ. For more information, visit www.cwfc.com.

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Company information

Evonik Industries is the creative industrial group from Germany which operates in three business areas: Chemicals, Energy and Real Estate. Evonik is a global leader in specialty chemicals, an expert in power generation from hard coal and renewable energies, and one of the largest private residential real estate companies in Germany. Our strengths are creativity, specialization, continuous self-renewal, and reliability. Evonik is active in over 100 countries around the world. In its fiscal year 2007 about 43,000 employees generated sales of about €14.4 billion and an operating profit (EBITDA) of more than €2.2 billion.

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