

Synopsis of Savings



System 1* Identifies Generator Field Problem, Keeps Unit Online Until Scheduled Outage

A large refinery has an onsite power generation facility consisting of five gas turbines and four steam turbine generators to provide steam and electricity for the rest of its operations. The machines are monitored with GE's Bently Nevada* 3500 series machinery protection systems and System 1 software. The System 1 software allowed the plant to identify a thermal sensitivity issue in one of the generators by correlating vibration levels with load and VAR (field current) changes. Without this data, the plant would have attempted to correct the problem by balancing the generator and would have missed the problems with the generator field. By understanding the nature of the problem, the plant was able to avert a major failure that would have occurred had the generator field shorted out during peak load. The plant estimates that it **saved an 8-week outage and nearly \$1 million** by instead planning repairs for the upcoming scheduled outage and running the unit at reduced load until that time.

Remote MDS Assistance and System 1 Software Saves 1 Million Euros

A methanol plant in Europe was experiencing high vibration on one of its critical compressor trains. The units are monitored with GE's Bently Nevada machinery protection systems and System 1 software. Because the vibration rose to alert levels within one minute, these vibration changes never would have been spotted without a continuous monitoring system. Although the plant did not have personnel on staff able to examine the data from their System 1 software, they were able to enlist the assistance of their local GE office and the Bently Nevada machinery diagnostic services (BNMDS) engineers located there. Examination of the vibration and process data allowed the BNMDS engineers to conclude that a portion of the demister had entered the suction side of the compressor, but was not endanger-

ing the machine. The plant elected to keep the units running. Without this information, the plant would have had to stop to conduct a machinery inspection, causing at least **10 days of lost production and a loss approaching 1 million Euros.**

Cement Plant Saves Millions with System 1 Software

A large cement plant uses a combination of online and offline vibration monitoring hardware in conjunction with GE's System 1 software to provide an integrated environment for all equipment condition. The system was recently used to identify a problem on a gear mill reducer. The mill was changed out before it could progress to a catastrophic failure. Had the problem not been identified in time, the gear could have failed completely, reducing plant throughput, and forcing the plant to wait six months for a replacement unit. The cost to replace the gear unit in a planned fashion was \$2.5 million. In contrast, the six-month wait for a new gear coupled with reduced plant output by the loss of one mill **could have totaled nearly \$80 million.**

The plant used the system to identify another problem, this time on a dust collector fan. By identifying the problem early and conducting condition-based maintenance, they spent only \$2,000 with minimal downtime in contrast with the **\$135,000 that would have been spent** had the machine progressed to total failure and incurred **nearly 12 hours of downtime.**

System 1 Software Improves Availability of Coal Pulverizers, Averts Forced Outage

A coal-fired power plant in Asia uses GE's Bently Nevada Trendmaster* platform and System 1 software to monitor its coal pulverizers. The units historically suffered from low availability (below 90%). Within just a few months of system installation, availability increased by five percentage points to 93% and was steadily improving. The system also helped engineers quickly identify a

problem on a pulverizer, and an inspection showed five damaged gear teeth. The plant was able to machine the teeth as a temporary fix, allowing the pulverizer to continue operating until a planned plant outage five months later. Had the problem not been detected by the system, the gear would have run to total failure, taking the unit out of operation and **incurring costs exceeding 90,000 USD, not including lost production.**

Condition Monitoring Systems Accrues Huge Savings For Power Generator

A thermal power plant uses GE's Bently Nevada machinery protection systems and System 1 software to monitor the plant's five main turbine-generator sets, totaling more than 2 GW of electricity production.

The plant's PA fans are also included in the System 1 software and are monitored using a Bently Nevada Trendmaster system.

The plant has experienced several "machine saves" using these systems. One recent example involved

shorted rotor bars on a


generator. The plant was able to diagnose this condition using their System 1 software, balancing vibration levels and VARS to keep thermal bow of the generator rotor to a minimum. The unit was kept on line and VARS were shared across the other four units until this particular generator could be rewound during a planned outage. Because this is a base-load plant, **the economic benefits accrued were substantial—so substantial that the plant was unwilling to divulge the details, even among other plants in their company.**



"Smart" Condition Monitoring System Saves Mine More than \$700,000 In First Year

A large mining operation in South America installed a Bently Nevada Trendmaster system in 2002. The system provides online vibration and temperature measurements to assess the health of more than 160 pieces of rotating machinery including ball mills, screening machines, pumps, crushers, and others. By connecting the system to GE's System 1 software, the mine was able to develop an "intelligent" system that used rules written by the customer to automatically analyze the collected data and identify problems. **During the first year of operation alone, the system was responsible for more than 700K USD in maintenance savings.** In addition, savings were realized through reduction of spare parts inventories and plant downtime. Savings have continued to accrue in subsequent years and the plant has been so impressed with the results that they have published brochures and posters for use in other locations across their business, explaining the benefits of condition monitoring in improving overall reliability and availability.

Quick Detection of Seal Problem Cuts Oil Usage, Avoids Downtime

A large petrochemical company monitors their critical equipment using GE's Bently Nevada* 3500 series machinery protection systems and System 1 software. During a drum switch and cooling cycle in one of their processes, a compressor train suffered an unusual vibration excursion. Using the diagnostic capabilities of their condition monitoring software, the customer rapidly isolated a seal problem and was able to correct it before seal damage occurred. **In addition to the downtime and repair costs that a seal failure would have entailed, the customer reduced the oil usage on this seal from 500 gallons a week to 100 gallons a week.** 

*Denotes a trademark of the General Electric Company.