Siemens Industry Inc.

Drive train with AI, machine learning delivered to refinery

A drive train with artificial intelligence and machine learning helps Deer Park Refinery located in Houston, one of the nation's largest refineries.

A drive train with artificial intelligence and machine learning is helping at the Deer Park Refinery located in Houston, Texas, which is co-owned by Shell Oil and PEMEX, Mexico's state-owned oil company. The drive train, consisting of a 15,250 hp motor and a water-cooled, medium-voltage drive, incorporates analytical hardware and software.

Deer Park Refinery is one of the nation's largest refineries with a 2,300-acre facility and the ability to process 340,000 barrels of oil per day. Shell Oil estimates 20% of its total production costs are from maintenance of motor driven rotating equipment. The refinery needed a solution that would ensure maximum reliability and availability and limit costly disruptions in production. "The solution was not the lowest cost one, but disruptions caused by failure can cost far more, as in millions," said Brad Shepherd, Siemens account manager for Shell in a press release.

Additional analytics integration in medium-voltage drives provide new performance and health monitoring of motors and the assets without installing sensors on rotating assets. The add-on technology gathers electrical waveform readings from the equipment and then builds a dataset that represents how the motor and its load (compressor, pump, fan, etc.) should perform. Machine-learning processing of the data happens in the cloud and any anomalies or changes in the equipment's behavior issues an early warning of any developing problems. These notifications allow operators to plan and schedule maintenance on failing equipment before the failure occurs.

"The future of variable speed drives are to not only power the world's motors but to continuously monitor industrial equipment performance and health, collect data and provide useful information to manufacturers to reduce costs," said Scott Conner, general manager, Siemens Medium Voltage Drives.

A bench trial of the technology was carried out at Texas A&M University. The trial involved running a pump on a test bed and then introducing sand into the fluid flow – actually quite large amounts of sand, enough to induce erosion issues and affect the integrity of the pump very rapidly.

A remote monitoring system fitted to the pump's electrical supply soon detected sand without precalibration and issued a warning alarm of a mechanical problem, as opposed to an electrical one, with a confidence level of 80%. Over a few days, the system updated the warning and indicated the problem was becoming more critical; and the level of confidence in the warning also rose to 90%. In stark contrast, a competitive system from a leading electrical-engineering company also based on electrical signal analysis failed to detect any changes in the condition of the pump or its operation as the sand was introduced. **ce**

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Shell Oil and PEMEX

PROJECT SUMMARY:

- Siemens Large Drive Applications delivered a drive train with a 15,250 hp Simotics motor and a Sinamics Perfect Harmony GH180 water cooled, medium-voltage drive, the first to incorporate Veros Foresight hardware and software from Veros Systems (Austin, Texas) with Sidrive IQ drive-train analytics.
- Veros technology gathers electrical waveform readings from the equipment and builds a dataset that represents how the motor and load should perform.
- Bench trial of the Veros remote monitoring system fitted to the pump's electrical supply soon alarmed excess sand without precalibration.
- Siemens and Veros engineered a drive-train to maximize reliability and availability and limit costly disruptions in refinery production.

More ANSWERS

KEYWORDS: motors and drives, AI and ML

A drive train, which includes artificial intelligence and machine learning, was delivered to a Houston-based refinery.

A remote monitoring system fitted to the pump's electrical supply correctly identified a mechanical problem.

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What benefits could other industrial applications get from medium-voltage drive train analytical technology?