

Steel Roll Mill Temperature Monitoring

Online Monitoring Averts Major Gearbox Failure

Site: NUCOR Steel Arkansas
Area: F1 and F2
Asset: Mill Stand Gear Drive
Date: July 2009
Analyst: Don Rainey
drainey@azimadli.com



NUCOR Steel Arkansas undertook a major upgrade to its gearboxes driving the F1 and F2 mill stands. The upgrade represented a capital investment of nearly \$24 mm. Due to the low speeds of these very large machines, traditional vibration monitoring was of questionable value. However, monitoring of the bearing temperatures in these massive gearboxes was recommended by the gearbox OEM. The company used Azima DLI's 1600 network based temperature monitoring technology to all 16 bearings in the gearboxes. This advanced technology allowed for trending, alarming and immediate notification of both Azima DLI experts and relevant plant personnel. The system was commissioned in July of 2009, along with the startup of improved mill stand drives.

The Azima DLI remote monitoring system immediately identified bearing temperatures at two specific locations that were well above expected limits due to excessive mill loads and speeds. The data was exported to Azima DLI's hosted web portal where vibration analysts with special knowledge of mill stands were able review it and confirm that the mill speeds and loads were directly correlated with the temperature data.

The company also applied Azima DLI's thermal imaging technology to the gearboxes in order to confirm the data from the temperature monitoring systems. The thermal imaging results revealed that the lubrication feed oil piping temperatures was much higher than anticipated suggesting a malfunction in the lubricating system. Further thermal imaging tests discovered a fault in a large water cooled heat exchanger used to regulate lubricant temperatures. The findings revealed a leaking bypass valve that was allowing hot oil to cross over into the cooled lubricant stream to the gearboxes, with the effect of overheating the bearing. A simple correction to this valve promptly lowered lubricant temperatures. The application of multiple condition monitoring technologies provided a quick and simple solution that greatly improved the mill's equipment performance and reliability, and mitigated the risk of costly damage to a new \$24 million gearbox.

NUCOR Steel Arkansas is a world-scale flat rolled steel mill producing in excess of 2.4 million tons of steel annually, with a market value of over \$1.4 billion dollars. It is a state of the art facility and is recognized as

one of the most modern and efficient mills in the world. Azima DLI operates a turnkey comprehensive condition monitoring program for the mill that includes all aspects of condition monitoring technology, including advanced remote machinery monitoring. NUCOR Steel Arkansas is one of the largest remotely monitored machine sites in the world. Azima DLI has operated such programs for NUCOR for over 12 years.

Don Rainey is a Director with Azima DLI and a mechanical engineer with 30 years of experience in condition monitoring and maintenance engineering. He is assisted in the execution of the program at NUCOR by Jeff Langford, Dan Hogan, and Jacob Schlottman. Dan, Jeff and Jacob are well experienced in all condition monitoring technologies and have over thirty years of combined experience in petrochemical, pulp and paper, and primary metals industries.

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Media Contact:

Danielle Kotzias

Azima DLI

Phone: +1 781-938-0707 x772

Email: dkotzias@AzimaDLI.com