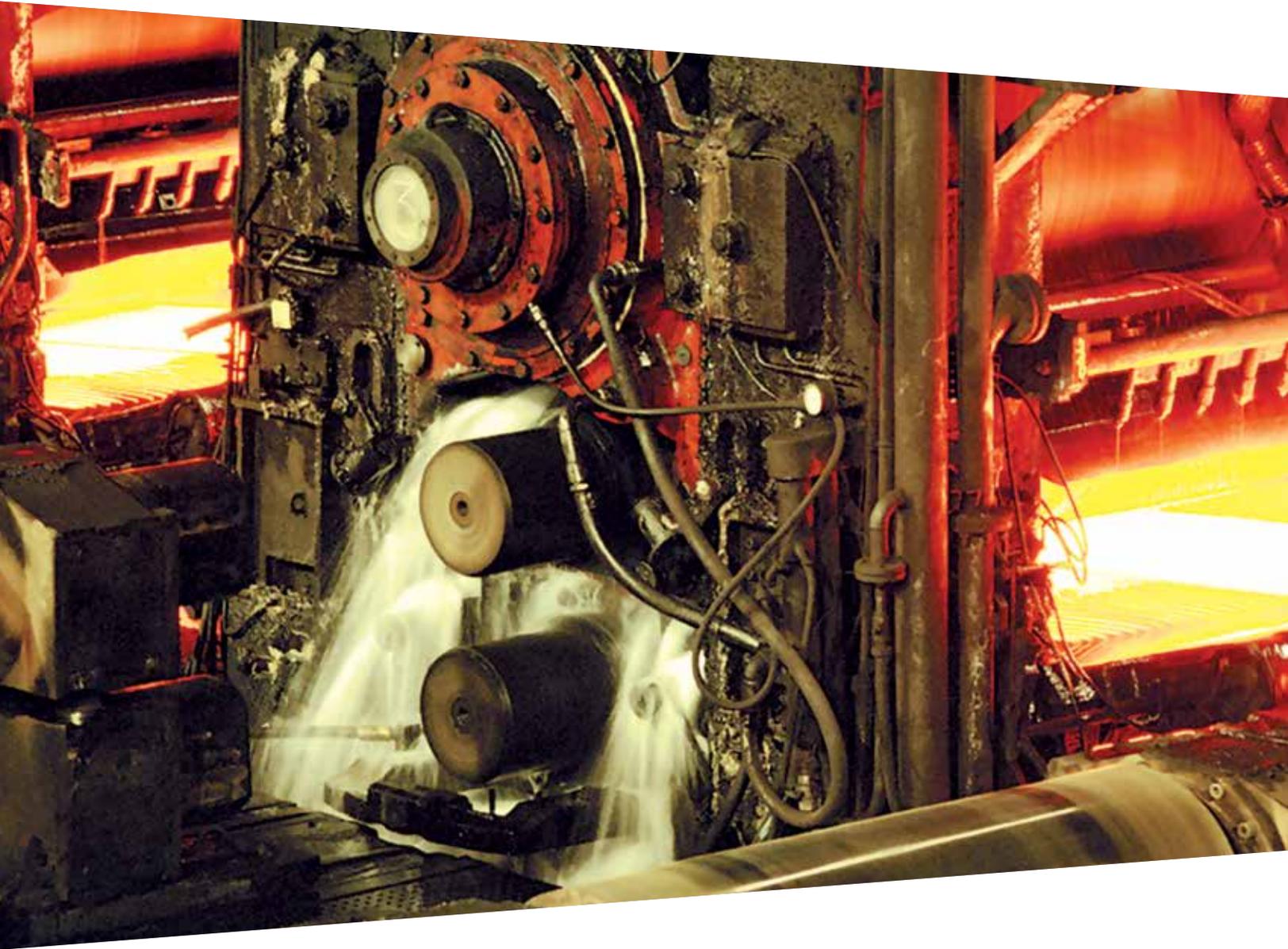


Kop-Flex® Monitoring
and Diagnostic Services
For The Metals Industry

KOP-FLEX®
JAURE®



A Regal Brand

REGAL



AVOIDING DOWNTIME IS CRITICAL

Kop-Flex® and Jaure® can help you recognize significant savings in these applications:

- Hot mills
- Cold mills
- Edger drives
- Bridle rolls
- Levellers

LET THE EXPERTS PROVIDE YOU WITH BOTH AN ANALYSIS AND A RECOMMENDATION

Unfortunately, no mechanical product can last forever and couplings are no exception. While Kop-Flex and Jaure products are designed and built to last, many applications are so severe that rapid wear and/or coupling damage may occur.

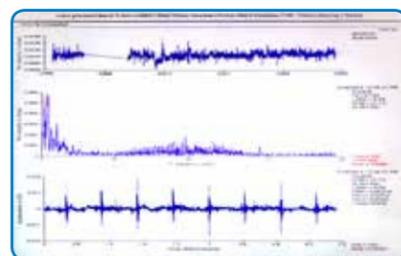
Kop-Flex and Jaure have the largest and most experienced engineering staff in the industry, with an arsenal of modern analysis tools at our disposal including FEA, and a staff dedicated to coupling service. Let our technical experts provide recommendations on how to help prevent coupling problems and premature drive train failures.

KOP-FLEX AND JAURE SERVICE CENTERS OFFER:

- REAL TIME DRIVE TRAIN MONITORING
- REPAIR AND REFURBISHMENT
- EXPERT FAILURE ANALYSIS
- COST SAVINGS THROUGH CONSULTATION
- FIELD TECHNICAL SUPPORT

DRIVE TRAIN MONITORING

The emergence of high strength steels has reduced rolling mill drive train reliability due to the increased rolling forces required to process these new products. Reducing the peak torques and vibratory torques is one approach to prolong the life of drive train components and can be accomplished by altering the system torsional dynamics. Kop-Flex and Jaure torque monitoring services can demonstrate how to model the dynamic torsional response, normalize the model with empirical data, and evaluate the effectiveness of increased damping and stiffness changes. These analyses have led to the successful implementation of design changes at several mills, increasing drive train reliability and providing means to establish more precise maintenance intervals.



Monitoring Software



CASE STUDY: COLD MILL SHAFT & COUPLING KEY FAILURES

Several mechanical failures including a yielded pinion shaft and fractured coupling keys prompted the mill personnel to evaluate the actual torque being transmitted throughout the drive train. Torque measurements showed a large variation in TAF (Torque Amplification Factor) even across sequential strips rolled.

A torsional vibration analysis of the drive train was completed to better understand the system dynamics assuming that a sudden instantaneous torque would produce the highest TAFs. To better simulate the torque being applied at the rolls in the model, a sinusoidal curve was fit to the actual torque measurements.

Analysis showed that the high torques resulted in stresses that exceeded the endurance limit of the key material – these stresses induced cracks in the coupling keys after repeated cycles. The yielded shaft was most likely the result of an instantaneous torque overload, due to the fact that yielding occurred rather than crack propagation. In an effort to minimize the peak torques transmitted throughout the drive train, damping style couplings were evaluated. Replacement of existing gear couplings with damping style couplings reduced the TAF up to 43%. A reduction of this magnitude will lessen the likelihood of fatigue failures.

The adage of keeping the TAF to a maximum of 2.5 is no longer suitable with increased rolling torques. Performing a torsional analysis can provide users with a valuable and proactive maintenance tool for identifying the cause of equipment failures and the solutions to eliminate the sources. Actual torque measurements should be conducted with transient torque meters to

ensure that analyses are completed correctly and the return on investment for any drive train modification is fully realized.

SYSTEM TUNING

In many cases, rolling stands are subject to frequent mechanical failures and motor problems causing unplanned downtime and expensive repairs. By installing strain gage telemetry systems on gear spindles, actual torque measurements can be collected. TAF values can then be measured and evaluated for peak torques and their effect on the power transmission components. The largest reduction in TAF's can usually be achieved by installing damping style couplings or modifying spacer type couplings from a tubular to a solid design. Damping style couplings and spacer stiffness changes can result in a reduction of peak torques and increase reliability of the drive train.



Scan code to learn more about monitoring services



GEAR SPINDLE

- Alloy steel nitrided and carburized gearing
- CCG™ - carburized and ground gearing
- Custom-designed for your application

UNIVERSAL JOINT

- Industry standard DIN and SAE flanges
- Lubrication and ease of maintenance features unparalleled in the industry
- Major components interchangeable with competitive designs



GEAR COUPLING

- Larger bore capacity
- Interchangeable with competitive designs

MAX-C

- Transmits very high torque and absorbs system shock
- Never needs lubrication
- Elastomeric element available in various compounds and hardnesses



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