ABSTRACT

Grinding mills are used extensively in the mining, cement and minerals processing industries. Numerous failures of drivetrain components of grinding mills have occurred in recent years. The components are not meeting their required design lives leaving mill owners concerned about the expensive repair costs and lost profits associated with the mill downtime during repairs.

There is a need to research the design methodology of the drivetrain components of grinding mills and the analysis of fatigue failures in mills and similar equipment e.g. kilns in order to develop a comprehensive and improved picture of how to design and operate these mills. As with numerous other engineered items, the critical issue is that a thorough understanding of the type, magnitude, direction, and duration of all loads that the components will experience while in operation is required in order to design them correctly.

A literature survey was performed to research advanced design methods and identify sources of loading data for grinding mills. Many interesting references were identified but no specific examples were found where strain gauge measurements were used to quantify the loads experienced by the drivetrain components of grinding mills.

Strain gauge measurements were conducted on the drivetrains of 30 grinding mills. The measured data was processed and analysed to determine the key operating loads experienced by the grinding mill drivetrain components. These loads were used in a review of the engineering design calculations for these components and the important findings are highlighted. Finally, comprehensive fatigue analysis was conducted using the measured data to understand the major contributors to poor service life of the drivetrain components.

Based on the findings of the investigation, several conclusions and recommendations are made that can serve as useful guidelines for improving the service life of grinding mills for both designers and operators of these machines.