

Sensors for Digital Mine Age

“Real-time sensors provide a safer mining future”

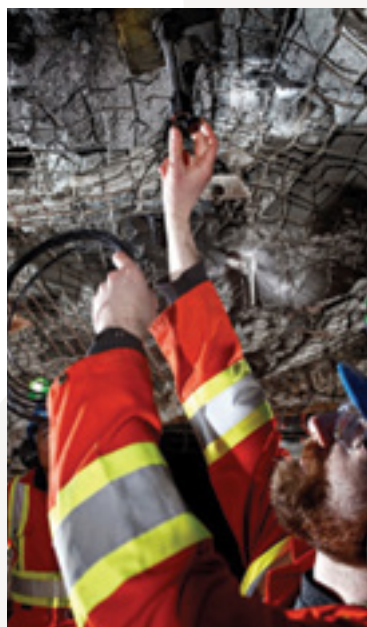
- ▶ **Industry Challenge:** *In-situ* and real-time monitoring of critical mine assets.
- ▶ **NRC Solution:** Real-time monitoring techniques that minimize unpredicted failures and unscheduled shutdowns.

Suite of Sensor Technologies

Rock Bolt Sensors (RBS™)

RBS™ is an ultrasonic based sensor technology with distinctive features that is developed to monitor ground activities within a mine. Positioned in strategically pre-defined locations, a network of rock bolts equipped with these sensors is connected to a real-time data collection system which monitors rock mass stress changes.

Mines are going deeper and deeper in pursue of valuable metals increasing the need for better monitoring of ground conditions and safety technologies. A wide-spread implementation of microseismic monitoring systems has significantly advanced the ability to improve mine safety by providing



real-time decision-making information regarding re-entry, seismic hazards, and planning. The NRC's RBS™ allows large scale cost effective deployment of this technology as sensors have low fabrication and maintenance costs, robustness of assembly, and are easy to install. Benefits of the technology are further enhanced by providing wireless options and real-time access to data.

Liner Thickness Measurement Sensor (TSEnse™)

Sacrificial liners are frequently used in slurry pump and tumbling mill applications to protect internal components from wear. Current industry practice is to replace liners on a fixed time interval rather than taking into account changes in wear rates

due to physical and chemical changes of transported materials properties, such as changes in a solids' abrasiveness or particle size distribution. Consequently, liners are either replaced prematurely, resulting in high maintenance costs, or too late, accruing repair costs.

TSEnse™ is an integrated ultrasonic based technology that provides an accurate measure of liner thickness change and wear/ corrosion loss, allowing decision makers to factually predict when liner replacement is required. TSEnse™ provides the benefit of real-time liner thickness monitoring which in turn increases productivity and reduces spare parts inventory by providing an optimum replacement schedule. Results show that thickness changes of a few micrometres can be detected. This technology has a small footprint, performs comparably to other commercial ultrasonic transducers, and can withstand high temperatures.

Hydro-transport Pipe Liner Thickness Measurement Sensor (PSEnse™)

PSEnse™ is a vibration/acoustics base technology that allows the *in-situ* monitoring of hydro-transport pipeline elastomer based liners. Slurry hydro-transport pipeline safety, mainly the internal liner wear conditions, has been a concern for mining companies for years. There is no practical technology available so far to monitor many polymer based liner health condition *in-situ* without shutting down the pipeline operation and disassembling the pipeline. Therefore, significant maintenance costs are involved in frequent downtimes for pipeline inspection.

PSEnse™ is a practical *in-situ* slurry pipeline liner health monitoring technology that does not disturb operation schedules. Such a technology is in high demand by the oil sands and mining companies not only because of its cost saving potential, but also because of its prevention of environmental spillages due to premature pipeline failures.



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