

Mining Reliability Solutions

TIMKEN
Where You Turn

Improve Operating Costs with Dragline Monitoring

The dragline is at the heart of your mining operation. Ensuring machine availability means a lower cost of operation through increased productivity and reduced repair expenses.

With an abundance of gears plus 200 bearings throughout your dragline and more than 100 of them in critical locations, being able to predict problems prior to catastrophic failures is a key. Turn to Timken for complete reliability programs or to add solutions that mesh with your existing plan. Our comprehensive condition monitoring and reliability services were developed based on over 100 years of bearing and power transmission experience.

Timken's Online Intelligence System provides a flexible monitoring solution capable of taking readings and analyzing data on 36 channels at the times and conditions when you need them most. Dragline components operate at varying speeds, loads and shaft angles, so you need a monitoring solution that can be tailored to fit the rugged environment you operate in.

This monitoring system can be used to measure and analyze data from various areas such as the drag and hoist system, fairlead, boom point, sheave positions and the swing system as well as the auxiliary gearbox, transmission and main drum bearing. Then, when a problem is detected, Timken has the trained and certified reliability engineers to analyze the data, conduct on-site testing and consult on solutions.

The conditions monitored by Timken reliability solutions for detection include:

- Misalignment
- Vibration Analysis
- Unbalances shafts
- Shaft deflections
- Bearing conditions
- Lubrication
- Electrical issues
- Gear damage
- Mechanical looseness

Through a combination of shock-pulse, vibration analysis and more, we can provide early detection of potential bearing and gear problems. The early detection of mechanical problems allows for better maintenance planning, reduced downtime and increased cost savings.

Sample Configuration of Shovel Timken Online Intelligence System



- | | |
|-------------------|-------------------------------------|
| 1 Swing Motors x2 | 1 Shock Pulse, 3 Vibration, 1 Speed |
| 2 Hoist Motors | 1 Shock Pulse, 3 Vibration, 1 Speed |
| 3 Crowd Motor | 4 Shock Pulse, 1 Speed |
| 4 Boom Point | 2 Shock Pulse |

Stop Digging for a Reliability Solution and Turn to Timken

Timken's range of services and online monitoring system can be combined in a variety of ways to meet your needs. Whether you've got a complete reliability staff capable of interpreting data collected from our monitoring system or you're looking to fully outsource your reliability program, we adjust to fit your needs.

Timken Dragline Monitoring System

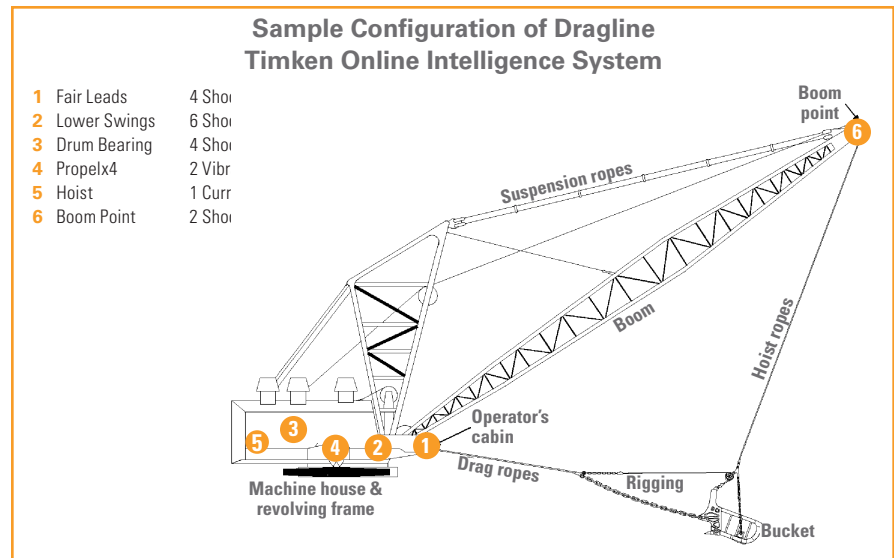
Timken's unique mining solution is designed to handle all the difficulties of one of the most extreme challenges in condition monitoring, including:

- *Variable speeds and loads -> Triggered data collection*
- *Short steady state window -> Flexible data storage*
- *Transient vibration -> Intelligent alarming*
- *Signal transmission -> Wireless ready*

The Timken Online Intelligence System uses a powerful signal processor to allow for high levels of accuracy and repeatability even while making extremely fast measurements. The system's communication software controls and filters data while handling messages between multiple Commander Units and the central database. In addition, the service software offers top-of-the-line alarming and analysis capabilities in an easy to use graphical interface.

The system utilizes OPC® Data Access, a worldwide standard for exchanging process control data. With the OPC standards, data can be transferred from any source to any other OPC compliant application. Using this client-server architecture, OPC creates a plug-and-play solution for system interconnectivity.

With its modular design, the system allows for a broad combination of



different measuring techniques as required to meet your needs, including:

- **The Bearing Monitoring Unit**
Measures shock pulses for early detection of bearing damage and marginal lube conditions.
- **The Vibration Monitoring Unit**
Supports broad band measurement according to ISO 2372 and ISO 10816. It also handles FFT with symptoms and optional EVAM.
- **The Analog Monitoring Unit**
Used for measurement filtering and triggers. Used for continuous monitoring of analog signals.
- **The Analog Output Unit**
Converts digital measurement values into 4-20 mA analog signals for use by DCS, SCADA or other process control systems.

Timken Reliability Services

With over 20 years of experience in providing reliability services to a range of industries, Timken is uniquely qualified to offer a complete predictive maintenance solution customized for your needs. The Timken Company's reliability services team can monitor your equipment, helping to increase uptime and improve profitability.

While our services apply across many industries, we have worked to tailor these solutions to the unique demands of the mining industry and also to

complement the technology of our monitoring system. These services include:

- *Vibration analysis*
- *Infrared thermography*
- *Oil analysis*
- *Video imaging*
- *Ultrasonic testing*
- *Balancing and alignment*
- *Root cause failure analysis*
- *RCM facilitation*
- *Asset prioritization*
- *Criticality analysis*
- *Remote monitoring services*
- *Mentoring programs & training*

This combination of monitoring technology and services is the key to Timken's proven award-winning method of managing a program's data and delivering tangible results.

TIMKEN

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Precision Components • Lubrication •
Seals • Remanufacture and Repair •
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