

Reducing cost per ton with remote monitoring of mobile machinery

Solution helps drive operation costs down 3.3 cents per ton and avoids over \$1.2M in parts and labor costs.

The challenge

Given the extremely challenging market conditions faced by the coal industry today, the pressure to increase profitability is greater than ever. Companies must find innovative ways to be more efficient and reduce cost per ton if they want to survive.

One of the most critical areas to focus on in the effort to increase reliability, efficiency and profitability is maintenance of mobile machinery. Harsh conditions and entrenched reactive maintenance cultures can quickly drive up costs.

Cloud Peak Energy, one of the largest U.S. coal mining companies, turned to SKF, looking for solutions. Cloud Peak had a sizable fleet of mobile equipment including 6 draglines, 20 electric mining shovels, 68 haul trucks and 3 Letourneau loaders spread across three sites – and they wanted to monitor them all and do it more efficiently.

They had already been manually monitoring equipment with handheld devices, but this was time-consuming and labor intensive. It also wasn't supplying them with high-quality data as maintenance personnel only went out to take vibration measurements every 75 days. They needed to continuously monitor the equipment remotely. This would supply them with the high-quality reliability data they needed to do condition based



maintenance and avoid costly component replacements and overhauls based on fixed intervals. It would also improve safety, since the need for maintenance personnel to go out to – and onto – machinery to take measurements would be virtually eliminated.

The solution

Tim Hopkins, Cloud Peak Energy's Predictive Maintenance Manager, was familiar with SKF technology. Cloud Peak had been a long-time user of SKF Microlog portable data collectors and the SKF IMx-P portable 16-channel unit, along with SKF Observer software. Over the years, they had tried out another company's on-line reliability system for automated data collection, but found that the hardware wasn't fully



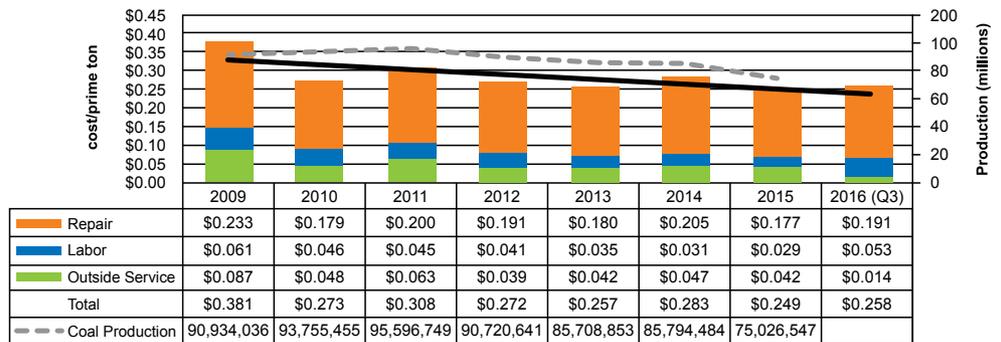
Innovative use of multiplexers resulted in reduced hardware costs by increasing the capability of each installed IMx.

meeting their needs. The SKF Multilog on-line IMx system with 16 channel parallel processing capability and wider dynamic range provided the platform to better handle their requirements.

With the SKF on-line solution, permanently mounted sensors strategically placed on every piece of equipment in their mobile fleet now send data from the equipment to engineers, instead of sending engineers

to the equipment. Additionally, an innovative use of multiplexers allowed them to reduce hardware costs by increasing the capability of each installed IMx. This new solution has allowed for daily data collection, instead of the previous quarterly readings. And since the data collection is now done remotely, the need for technicians to travel to mine sites and take machinery off-line has been eliminated.

Mobile Equipment & Plant Maintenance



The results

In addition to performing many other tasks, Cloud Peak Energy's five-man team performs vibration analysis of the entire mobile equipment from their desks, including:

- 20 electric mining shovels
- 6 draglines
- 3 processing plants
- 3 Letourneau loaders
- 35 haul trucks

The impact of the new system has been clear and significant. Draglines, shovels, haul trucks and plant machinery have all realized decreased expenditures and improved asset availability.

Across the sites, the number of Predictive Maintenance Generated Work Requests has been significantly reduced, in many cases by more than 50% since 2012. This has led to an

average of 32% maintenance cost reduction, which, in turn, has reduced costs per ton by as much as \$03.3 between 2008 – 2016.

Additionally, Cloud Peak Energy has done a cost avoidance analysis that, in a single case, showed a cost avoidance of over \$1.2M through savings in parts and labor alone.

Documented savings for SKF mobile equipment monitoring system

| SKF mobile equipment monitoring system | | No mobile equipment monitoring system | | Documented Savings |
|--|--|--|------------------|-----------------------|
| Description | Cost | Description | Cost | |
| Outside service | Planned procurement process to work scope \$83,489.84 | Reactive procurement process | \$ 153,600.00 | \$ (70,110.16) |
| Spare parts | Replacement of damaged components only \$28,197.11 | Major overhaul due to catastrophic failure | \$ 804,276.00 | \$ (776,078.89) |
| Downtime costs | 7.25 days, 20 hrs/day, \$2908/hour \$421,660.00 | 14 days, 20 hrs/day, \$2908/hour | \$ 814,240.00 | \$ (392,580.00) |
| | | | TOTAL: \$ | (1,238,769.05) |

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PUB 800-627 · February 2021

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