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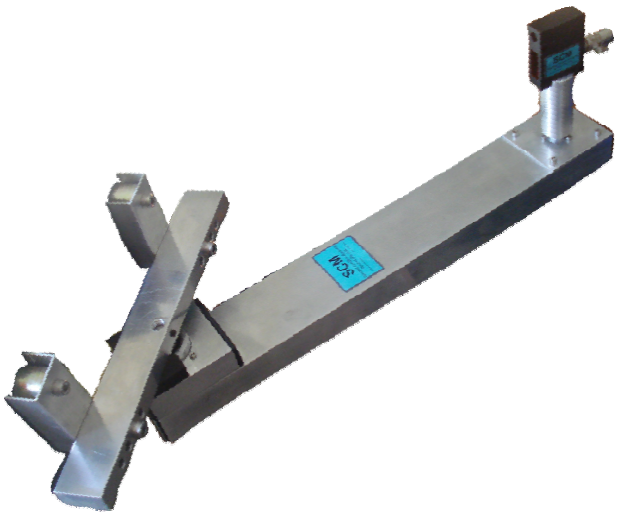
2D LASER SCANNER

Sheave Wheel Profiler



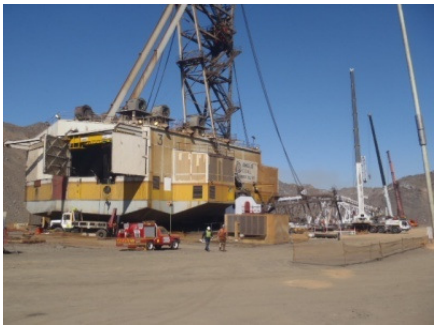
- The scanner offers a fast set-up with multiple configurations catering for use on most hoist pulley sizes and interfaces.
- Rechargeable batteries with a total on-time of at least. 3 hours.
- Accuracy of up to 1.0mm
- Analysis Mode for easy data capture on site while the data can be analyzed at a later stage.
- 2D Profile View with measurement capabilities.
- Acceptance Criteria functionality
- Automatic report writing capability

In essentially all industrial processes that rely on hoisting machinery for operation, sheave wheels are an integral and critical part of the process. Due to the extensive use of the sheave wheels, their eventual wear is inevitable. The sheave wheel is designed in a way that minimises the wear while keeping it as strong as possible. This means that it would have a hardened (yet brittle) outer layer (the first few millimetres) combined with a ductile but softer inner layer. This configuration is optimal for the conditions a sheave wheel is expected to encounter. The only drawback to this configuration is that once a wheel has worn through the hardened layer (which could typically take years on an underground mine), the softer layer wears extremely quickly. This can be prevented at a fraction of the cost of replacing it by reconditioning the sheave wheel as soon as it is through the hardened layer.

If the wear is not detected early enough and the wheel has been allowed to enter the ductile layer, the wear pattern is not controllable and the shape of the wear could often compromise the integrity of the wheel or even break of the rope.

Due to the high cost of purchasing and installing of the sheave wheels, their life cycle must be factored into the operating cost of the machine.

If the utilisation of the sheave were to be optimised, it would need to be used for as long as it is safe to do so and the replacement interval would need to be synchronised with the maintenance schedule of the entire operation to avoid unnecessary losses in production. It should be noted that the replacement intervals on different sheave wheels vary significantly due to different operating conditions (e.g. duty cycle, loading type, alignment and several other uncertain factors). It can thus not be estimated solely based on the intended conditions of operation. The approach to solving this problem relies on periodical inspection of the condition of the sheave wheel. Typical legislation requires bi-annual inspections. The decision to replace or refurbish is determined by acceptance criteria from the manufacturers and is based on certain geometrical factors.



During the bi-annual inspections, the wear rates are estimated using one of two methods: The first involves tracing with complicated mechanical copying devices. This method takes fairly long and is inherently subject to grave inaccuracies based on the fundamental operation principal of the device. The second method involves taking a plaster cast of a section of the sheave wheel and attempting to compare it visually with successive casts. This process is laborious at best and due to its nature does not readily lend itself to quantification let alone trending and prediction. The speed and accuracy of the SCM 2D Laser Scanner may be attributed to the non-contact measurements which lie at the heart of the technique. The added bonus of a digital interface allows for easy scan comparison and trending of wear rates as well as easily accessible data storage.

The left hand image above is of a dragline on a coal mine. The sheave wheels in this situation see very high dynamic loads and typically have significantly shorter lives than comparably sized wheels on a headgear. The mounting of the scanner can be seen from the second image. This is of a scan done on the dragline sheave wheel and while the scanner was developed for in situ scanning, this wheel was out for maintenance. The laser draws a point on the wheel and is capable of measuring distance data as the user sweeps the arm to trace the profile after the scanner has been mounted steadily. The profile can be taken with or without the rope. Contrast spray significantly enhances results. The top, right is of the headgear that houses the sheave wheels for the hoisting equipment of underground mines.

Results

The top image on the right shows a screen dump of the 2D data acquisition feature in the software. In this screen, the user would be able to track which data points have been collected and which are still to be scanned. This is especially relevant when certain sections are more important than other since the user can now spend more time scanning the important areas. The bottom screen is of the analysis part and as in this case, the scans can be overlaid for comparison. In the interest of clarity, a fully overlaid image is not shown. This scan would still need slight alignment for the black and coloured lines to match. Looking at the bottom image, a defect was purposely placed on the second (colour) scan to illustrate the differences. There are cursors on this screen which allow the user to find distances between two relevant points. The output image and relevant distances from the manufacturer specifications are laid out in an automatically generated report.