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SCM

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3D LASER SCANNER

Gear Tooth Profiler

- The scanner offers a fast set-up with multiple mounting configurations provided for and uses rechargeable batteries with a total on-time of approx. 3 hours.
- Accuracy of up to 0.5mm depending on the speed of the scan.
- Analysis Mode for easy data capture on site while the data can be analyzed at a later stage.
- 3D visualization and 2D slice views.

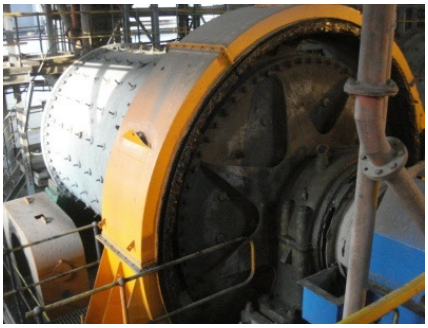
For all industrial systems that include the use of heavy duty gears as part of the process, the eventual wear of the gears is an inevitable outcome. Due to the high cost of purchasing and installing of such gears, the life cycle of the gears must be factored into the operating cost of the machine.

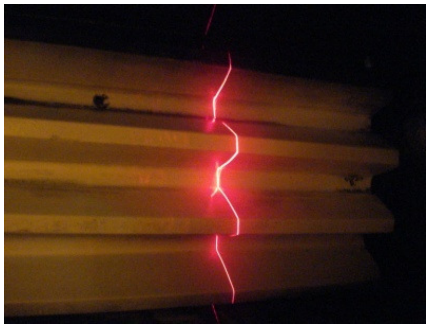
If the utilisation of the gear was to be optimised, the gear would need to be used for as long as it is safe to do so and the replacement interval would need to be synchronised with the maintenance schedule of the entire machine to avoid unnecessary losses in production.

It should be noted that the replacement intervals on different gears vary significantly (even on similar machines) due to different operating conditions (e.g. lubrication used, loading, 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 gears.

Traditionally the internal condition of a gear would be inspected with Non-Destructive Testing techniques (Eddy Current and Magnetic Particle Inspection) while the wear rates are estimated with one of two methods: The first involves tracing with complicated mechanical copying devices. This method takes fairly long and is inherently subject to severe inaccuracy based on the fundamentals of the technique. The second method involves taking a plaster cast of a single tooth and attempting to compare it visually with successive casts. This process is laborious at best and due to its analogue nature does not readily lend itself to quantification let alone trending and prediction.

The speed and accuracy of the SCM 3D 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 situation may become clearer upon explanation of the images above. The first image on the left is of a Ball Mill on a Concentrator Plant for a Platinum Mine. This mill contains steel balls and is used to crush the ore into smaller pieces before it can be sent to the Smelter for extraction of the platinum. The ore is crushed in stages and thus a concentrator plant typically has several of these mills. The orange part in the first image is the girth gear. The second image is a close-up of this gear with the inspection cover open.

Results

The top image on the right shows a screen dump of the 2D slicing function of the software. The screen is divided into four quadrants. The bottom, right quadrant is a 2D view of the gear tooth as would be seen from the laser perspective. The colour coding represents the depth in this image. There are cursors on this screen which represent the way in which a point of interest can be investigated. The screens on the bottom left and top right represent the slices through x- and y-axes of the gear respectively. By moving the cursor in the bottom right window, the slices in the other two windows change with the profile of the gear. The software also allows the user to import a previous scan into this window so that it can be compared to the current scan.

The bottom image represents the 3D model of the scan which can be manipulated as required.

The mounting of the scanner can be seen from this image. The laser draws a line on the gear and is capable of measuring distance data from every single point on the line. It is thus only necessary for the user to sweep the scanning head between its left and right hand extremes after the scanner has been mounted steadily. The line in the third image is the profile that the laser measures and should be kept in mind when the results are shown below.