CrusherMapper (developed by Scanalyse which is now part of Outotec) is a globally patented technology for the condition monitoring and modelling of gyratory crushers. This world’s first, in-situ analysis tool enables optimisation of crusher mantle and concave liner designs. It allows informed decisions to be made on reline scheduling and crusher operation. OSS/CSS measurements can be provided for every scan, giving unprecedented control over product quality.

Benefits

- Optimizes concave and mantle lifecycle and design
- Early detection of liner failure
- Remotely operated - no confined space entry required
- Minimize inspection shut-down times
- Tonnage-based wear tracking
- Improved forecasting from more accurate and reliable data
- Unprecedented product quality control with OSS/CSS measurements
World’s first gyratory crusher monitoring technology

Strong industry demand for a reliable, accurate and safe method to analyze gyratory crushers led to the development of CrusherMapper. Launched by Scanalyse (now part of Outotec) in 2009, following its highly successful predecessor, MillMapper, this unique, globally patented technology provides detailed condition monitoring and optimization for gyratory crushers in-situ.

CrusherMapper provides the means to identify asymmetrical wear patterns, measure closed and open side settings (CSS and OSS) and optimize mantle and liner designs. The technology gives essential information that enables maintenance personnel to make critical decisions on reline scheduling and crusher operation.

Operating principle

Scanning

Initially the crusher is scanned using a state-of-the-art laser scanner either from the cleared dump pocket or with a remote deployment frame. Scanning is performed within an hour and can be scheduled to coincide with your planned reline or inspection shutdown.

Using a specially calibrated terrestrial laser scanner, CrusherMapper captures all liner surfaces in-situ, as opposed to conventional methods where only a few arbitrarily selected points are measured. Both the entire mantle and concave liner areas are scanned.

Unlike Ultrasonic Thickness Gauge (UTG), CrusherMapper is not susceptible to inaccuracies caused by operator error, complex back-of-liner designs, poor calibration or casting additives such as manganese. UTG and other manual measurements provide data subsets and do not represent the entire crusher.

3D Modelling analysis

Following the scan, the raw data is uploaded and processed to deliver a high definition 3D model. This is colour-coded according to liner thickness and provides point thickness measurements on all wear surfaces to an accuracy of ±3mm. The software automatically detects high wear zones, asymmetric wear patterns and damage to the liners.

Reporting

Following automatic detection and flagging of the wear ‘hot spots’, the software produces precise wear curves and intelligent forecasting based on trend data gathered from over ten million thickness points on the liner. The reporting software also produces cross sectional and longitudinal profile curves and reline efficiencies for both the concave and mantle liners.

Operators can therefore establish critical thresholds that define reline criteria and also make informed decisions based on automated, consistent and repeatable measurements followed by rigorous statistical analysis.

Measure Model Manage

Optimizing crusher operation

Data obtained from CrusherMapper is used to identify critical concave or mantle liner parameters. These
parameters have a significant influence on crusher performance and frequently involve consideration of wear asymmetries around the concave liner. Preferential dumping geometries, unsuitable feeding arrangements and the effect of typical localized high wear zones (referred to as ‘ski ramps’ or ‘duck tails’) are highlighted in the analysis.

The indepth report from the crusher scan provides practical advice on removing bottlenecks from the crushing operation, such as tripping or bogging events. The report generally identifies these events as the result of liner wear shape.

**Reline forecasting**

Reline forecasts are determined with advanced tonnage-based modelling techniques specifically designed to capture high wear zones within the crusher.

Reline schedules can be optimized with confidence, the advanced forecasting algorithms capture dynamic wear rates over each liner lifecycle and historical data of several lifecycles can be compared to the current one. The resulting profiles show when ineffective shapes such as ‘duck tailing’, for example, are being formed.

**Quick and simple**

A gyratory crusher scan is usually completed within an hour and can be simply integrated into regular production stoppages, eliminating liner inspection shutdowns.

**CrusherMapper deliverables**

A detailed report from the CrusherMapper data is generated within a short time frame. Outotec’s highly experienced team reviews these reports and discusses recommendations in a one-to-one consultation. Sites are also encouraged to download the 3D models and reports from their scan and, using the integrated CrusherMapper software, can conduct a virtual inspection of the crusher and review, in complete detail, any particular point.

- Detailed initial wear report
- One-to-one consultation follow-up
- 3D model and software
- Database package of site’s wear history

**Proven at site**

CrusherMapper has proven its value at many sites. One site in Australia doubled its concave liner life from 12 to 24 months. Another site, located in South America, achieved 40% increased daily production and more than doubled the concave life from 9 million to 23 million tonnes. Such a reduction in reline downtime represents a significant increase in production and decrease in maintenance and reline costs, including labour hire.

Mantles damaged by tramp steel have been identified by CrusherMapper at some sites, well before it became visually obvious, allowing repairs to be made before failure. “Bogging” events have been avoided by early corrective action to prevent ineffective profiles forming.
Improved safety

Laser scanning can be performed remotely by mounting the scanner on a deployment frame. Remote scanning eliminates the need for a confined space entry, thus reducing safety risks, minimizing inspection downtime and negating the need for lengthy safety procedures.

Advantages

The tracked cross-sectional and longitudinal profiles produced by CrusherMapper enable personnel to optimize concave liner design and mantle shape/size. Optimized liner design and mantle shape allows increased throughput and extended liner lifecycles. CrusherMapper also has the following benefits over conventional thickness measurement techniques:

- Scanner mounted on a deployment frame for remote entry
- Improves safety by eliminating confined space entry
- Minimizes inspection shutdown times
- Captures wear data on the entire concave and mantle liner
- Measures OSS and CSS
- Monitoring of spider-arm condition
- Reliable reline forecasting
- Optimizes liner designs

<table>
<thead>
<tr>
<th>Process</th>
<th>Before CrusherMapper</th>
<th>With CrusherMapper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concave liner thickness measurement</td>
<td>• Personnel need to be lowered into confined crushing chamber for spot UTG measurements • Safety gear must be worn and safety procedures adhered to</td>
<td>• 10 million thickness points captured by remote scanning • No entry or dump pocket clearance required • Automated, consistent, repeatable measurement • Reduced inspection downtime</td>
</tr>
<tr>
<td>Mantle thickness measurement</td>
<td>• UTG accuracy susceptible to casting additives such as manganese • Only a few arbitrarily selected points measured</td>
<td>• Colour-coded 3D model and in depth report indicating accurate wear patterns, cracks and hotspots • Automated, consistent, repeatable measurement</td>
</tr>
<tr>
<td>Measure Open and Closed Side Settings</td>
<td>• Alfoil/lead ball • Manual tape measurement in confined crushing chamber</td>
<td>• Automatically calculated from scan data</td>
</tr>
<tr>
<td>Monitor condition of spider-arm</td>
<td>• Suspended over crusher opening to carry out spot UTG measurements</td>
<td>• Thickness calculated from scan data to ±3mm • No safety issues</td>
</tr>
<tr>
<td>Schedule reline</td>
<td>• Manual spot measurements</td>
<td>• Reliable forecasting • Optimization with tonnage-based wear tracking</td>
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Outotec provides leading technologies and services for the sustainable use of Earth’s natural resources.

As the global leader in minerals and metals processing technology, Outotec has developed over decades many breakthrough technologies. The company also provides innovative solutions for industrial water treatment, the utilization of alternative energy sources and the chemical industry. Outotec shares are listed on NASDAQ OMX Helsinki.

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