Leading the way with Lidar: real-time material flow with OWL EYE®

In modern bulk material processes, precise monitoring of material flow is essential - from mining and processing to logistics. OWL EYE, initially developed within the Sachtleben Minerals Group for its mines in Germany, is a modular platform offering a comprehensive solution for noncontact volume and mass flow measurement across the entire process chain - from stockpiles to conveyor belts, from trucks and wheel loaders to silos. The system combines a durable design with intelligent data analysis and condition monitoring.

Recent advances in sensor technology, fibre optic and wireless networking, as well as data analytics are opening new possibilities how mines are operated. With increased automation initiatives, sensors have become more affordable and more accurate.

Historically, production data was based on truck or bucket counts with assumed fill factors, reported at the end of the shift, kept in Excel spreadsheets, and accessible to only a limited number of people. This created data silos and information gaps.

The transformation towards the intelligent mine of the future will allow easy information sharing between systems and teams (mine/mill/shipping). Continuously updated dashboards can provide real time status reports to everyone without needing specialized IT knowledge. This assists short interval control and allows quicker decisions to improve workflows in the mine and mill. Time consuming month-end surveys become a thing of the past.

Why material flow monitoring is crucial in mining

Mining revolves around the movement of mass - the economic value lies in the material that must be transported, stored, and processed. However, mining, processing, and logistics rarely operate in perfect harmony. Extraction volumes fluctuate, plant capacities are limited, unscheduled downtimes occur due to breakdowns, and transport from mine to port is subject to external factors. The results: temporary stockpile buildups, mill feed bottlenecks, production shortfalls, or unused storage capacity.

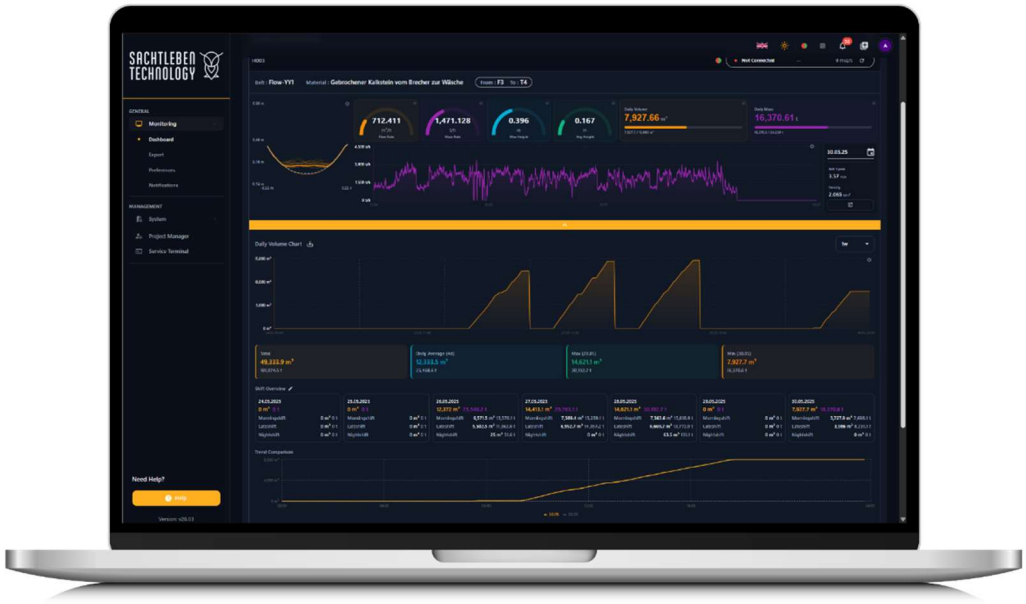

Fig.1: OWL EYE Dashboard volume flow measurement. © Sachtleben Technology GmbH.

Precise and continuous monitoring of material quantities provides the necessary transparency. It allows operators to identify potential bottlenecks early, better coordinate processes between mine and mill, and make data-based decisions - whether it's planning loader usage, optimizing transport routes, changing blend ratios, or evaluating plant efficiency. Ultimately, accurate knowledge of the available inventories and current material flow is essential to ensure efficient, reliable, economical, and well-controlled operations.

One software, many solutions

OWL EYE is not a single-purpose device, but a scalable and integrated system designed to monitor mass flows at various points within an operation. Including several specialized modules for different areas of application the Systems software then unifies the collected data from the different modules in one single dashboard:

1. Static stockpile volume measurement

Permanently installed 3D LiDAR sensors periodically record stockpile growth or reduction. Data is processed into 3D models to document material movement and provide reliable

inventory levels. This data can be utilized during the shift for mine dispatching or mill feed control, daily, weekly, or monthly production reporting, or regulatory compliance verification. Inventories of different ore types (high grade/low grade/contaminants) can be tracked and blend ratios adjusted to run processing at steady, optimum recovery rates.

Fig.2: OWL EYE LiDAR sensors mounted on light pole to monitor stockpiles. © Sachtleben Technology GmbH.

2. Mobile stockpile scanning

Specialized units mounted on discharge conveyors, rotary stackers, or bucket wheel excavators continuously measure material build-up at the discharge point. The system helps monitor remaining capacity on the stockpile and determine when a wheel loader is needed to redistribute the accumulated material - improving storage space utilization and internal logistics. Low inventory warnings can be implemented in the system.

3. Wheel loader mapping

3D LiDAR units mounted on wheel loaders scan the working areas during normal driving operations. A dynamic 3D representation of the stockpiles is created without interrupting regular workflows - ideal for progress tracking, stockpile management or documentation. Time consuming month-end surveys become a thing of the past.

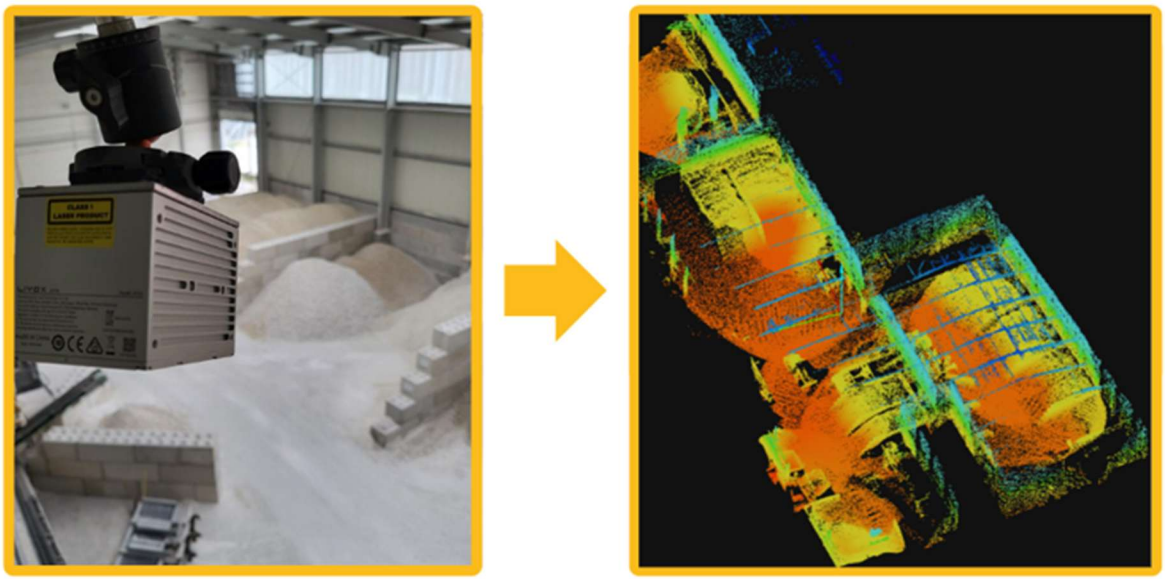

Fig.3: OWL EYE LiDAR sensor installed in concentrate storage building for monitoring of bin inventories. © Sachtleben Technology GmbH.

4. Bin and hopper monitoring

OWL EYE can also be used for volume measurement in closed or semi-open containers such as feed hoppers, crushers, silos, or chutes. The system continuously detects fill levels and volume changes, even in dusty or low-light conditions. Material hangups or buildup of dead inventory can be detected.

5. Conveyor belt volume flow measurement

A core component of the platform is the non-contact volume flow module for conveyor belts. A 2D LiDAR sensor, mounted above the belt, continuously scans the cross-sectional profile of the material. In combination with belt speed, the throughput is calculated in m^3/h or t/h, with a typical deviation of +/- 1 %. This system can be utilized as an alternative to weight scales when available space in a building is limited.

Fig. 4: OWL EYE LiDAR sensor above a conveyor belt continuously scans the cross-sectional profile of the material and provides detailed condition monitoring of the conveyor belt. © Sachtleben Technology GmbH.

6. Advanced conveyor diagnostics: integrated condition monitoring

Beyond conventional throughput measurement, OWL EYE provides real-time conveyor diagnostics. By analyzing the material profile, the system can detect deviations and potential damage early on. These include:

- Belt misalignment due to uneven loading or roller defects
- Asymmetrical or unstable loading, indicated by shifting mass centers
- Large foreign objects (big rock or trash metal detection) that may damage mechanical parts, belts or downstream processes
- Profile anomalies that indicate material buildup, belt damage or upstream feed issues

These events are recorded continuously and evaluated against predefined thresholds. This allows for preventative maintenance before failures occur, increasing operational reliability and minimizing downtime.

System integration and data access

Designed for industrial continuous operation, OWL EYE integrates seamlessly into existing automation and control systems using standard protocols:

- REST API for cloud or software connectivity
- OPC UA for SCADA and MES system integration
- Analog outputs for conventional PLC's
- SAP and Power BI compatible

A browser-based dashboard displays all operational data - accessible from any location or device (PC, tablet, smartphone). Key features include:

- Real-time throughput in m^3/h or t/h
- Historical data with 2D cross-sectional visualization
- Real-time alerts when minimum or maximum limits are exceeded
- Customizable data export for reports and further analysis

Due its durable design and robust IP65+ certified sensor technology, OWL EYE is perfectly suited for harsh and dusty environments worldwide. An optional automatic air-cleaning unit or an ATEX certified housing ensures sensor reliability even in highly dusty environments or in explosion-risk zones.

Adaptable to all types of bulk materials

OWL EYE is material-agnostic and suitable for a wide range of bulk materials - regardless of density, particle size, or moisture content. Practical applications include:

- Ores: iron, copper, base metals, gold, uranium, bauxite, potash, salt, coal
- Industrial minerals: silica sand, limestone, gypsum, kaolin
- Aggregates: gravel, crushed stone, sand, clay
- Chemical materials: fertilizers, plastic granulates, powders
- Wood products: wood chips, pellets, sawdust
- Organic materials: beet pulp, wheat, corn

Conclusion

OWL EYE delivers a robust and flexible solution for volume flow measurement and condition monitoring - from mine to mill to shipment of concentrates or final products. The combination of precise sensor technology, modular system architecture, and full IT integration provides operations with real-time transparency, early fault detection, and reliable data for strategic and operational decision-making. The modular philosophy of the system allows initial deployment on a limited basis for system testing and user acceptance, followed by future upgrades, adding new capabilities and features to further optimize the mine’s operation.