Application Note
Sector : Mineral Industry

POUDRES DURABLES

REDUCING THE COST OF REPROCESSING CRUSHED MINERALS

Context

For an application in the mineral sector, one of the many processing operations is to grind the raw material on a pendulum mill. Granulometry has a significant impact on the performance of the finished product. After manual sampling, particle size measurement is carried out 8 times a day per each production line. These measurements are used to control the line. This ensures that the finished product is variable but complies with specifications. Nevertheless, around 400 tonnes of material are rejected each year, generating significant reprocessing costs. How can this be avoided?

Customer installation: Pendulum Mill 75kW

Objective: Halve the scrap rate

Methodolgy

The 1.5-year project consists of three phases:

❶ Configuration and installation of an Insitec dry-process granulometer on the grinding line.
❷ Remote monitoring of the installation for 6 months, with processing and interpretation of the measurement data.
❸ Installation of a grinder control system.

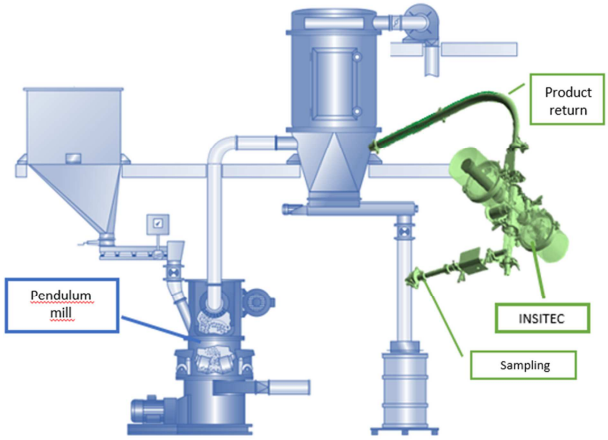

Fig. 1 : Layout of the Insitec implementation on the grinding line

Results

Phase ❶

Following a study of the existing production line, the location of the Insitec was determined. Several additional pressure sensors were installed to gain a better understanding of the process. The entire communication system between the online particle size analyser and the process was designed according to the client's specifications while considering network security requirements. Factory acceptance tests (FAT) were conducted before installation on the mill.

Fig. 2 : Insitec with gantry and enclosures installed on the production line

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The mill operation is controlled by a programmable logic controller (PLC - Siemens), which manages the entire installation. The PLC offers three interfaces:

- Touchscreen close to the mill, accessible from a control room.
- Remote control from a PC at the customers's site: display of production parameters and plant alarms.
- Remote assistance: the PLC and HMI are connected to a gateway module, allowing remote access to monitor operation, manage troubleshooting, and provide updates.

At the end of Phase 1, the grinding process is ready for continuous monitoring of the particle size measurement, which is archived alongside other key process parameters.

Phase ❷

Particle size measurements at the mill outlet were continuously monitored over six months. Systematic deviations and isolated incidents were analysed in correlation with recorded process data.
Following this analysis, parameter and equipment optimisations were proposed and tested in production. Real-time measurement results were used to validate these adjustments.

At the end of Phase 2, the optimal process parameters were identified, and the key variables required for autonomous process control were defined.

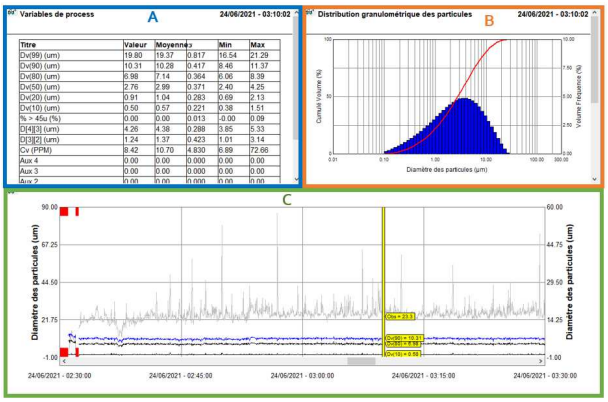

Fig. 3 : Visualisation of particle size measurements using RT Sizer software (window A : process variables, Window B : real-time particle size distribution, Window C : monitoring of particle size indicators over time)

Phase ❸

The final phase of the project was to implement the automated control of the milling line.
ased on the process knowledge acquired during phase 2, the setpoints, limit values and PID parameters were determined. A PID control loop was developed, followed by control and regulation tests to fine-tune the loop and validate long-term operation.

At the end of Phase 3□, the production line was fully optimised and regulated based on the target particle size, thanks to on-line measurement. The reject rate was drastically reduced.

Conclusion

The installation of an online granulometer and the automated control of the grinding line resulted in a 50% reduction in reprocessing costs related to rejects. The return on investment is 1.5 years.