Improved thickener operation at Minera Valle Central

Online interface and turbidity measurement with Turbimax CUS71D and CUS52D

Minera Valle Central offers integral solutions to the problem of tailings, including the design of storage, processing, transportation and redeposition facilities, as well as engineering and water reclamation projects. It also collaborates in mine closure plans, generation of emergency capacity in tailings dams and environmental sanitation solutions, in line with new legislations. The company has been operating in the secondary mining industry since 1992.

"The interface measurement helps us to prevent the generation of thickener embankment, while the measurement of turbidity in the overflow helps us to know the quality of clarified water that will be reused in the process. In both cases these measurement points lead us to improve the efficiency of the thickening process."

Marcos Orellana
Head of Electrical Maintenance
MVC Integral Solutions in Tailings,
Requínoa, Chile

Marcos Orellana,
Minera Valle Central

Advanced instrumentation in thickeners improves clear water recovery and maximizes solids content in the underflow

In many cases the medition of interface in thickeners is done manually, while the turbidity measurement is done by obtaining samples sent to the laboratory. In both cases the solution offered by Endress+Hauser proposes to have the values online.

The results

- Level measurement between water mirror and the defined interface inside the thickener.
- Overflow clarified water turbidity measurement.
- Heartbeat Technology to obtain diagnostics, verification, and monitoring of the instrument health status.
- Improvements in thickener operation performance.

Customer challenge On the mineral processing process the thickening stage is very relevant, both concentrate and tailings are needed with the lowest possible water content, as well as water clarified with the least amount of solids possible. The critical measurement points that any thickener must have is flow and density measurement both in the feed and discharge of the thickener. Torque and level of the rake mainly. Additionally, there are measurement points to optimize the operation of the thickener, such as pressure of the solid bed, liquid-solid interface level, turbidity in the overflow water, flow and viscosity of preparation of added flocculant.
In the case of Minera Valle Central, the challenges are related to get an interface level measurement in the tailing thickeners, to have this parameter in real time, to be able to carry out corrective actions in a timelier manner. And avoid this measurement must be done manually, so that the operator does not have to attend the thickener bridge several times during the shift, maximizing their work in the area and minimizing risks of accidents.

The other challenge of our client is to know the solid content in the clarified water on the overflow of the thickener. In this case the water overflows the walls of this process unit, and through an open channel is directed towards the water recovery pools, from where they are driven to the high-pressure water injection systems that are used to treat the old tailings deposited in the Cauquenes dam of Codelco Division El Teniente, which is part of the raw material of this process.

Our solution

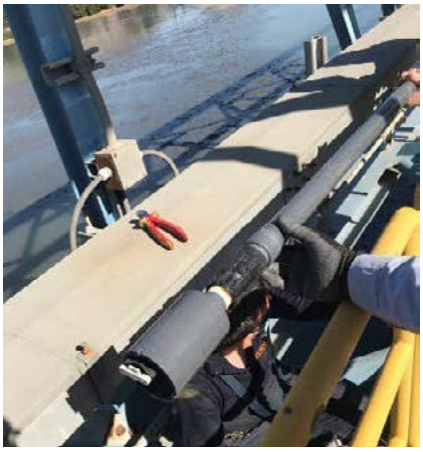
Endress+Hauser provided a solution that includes:

- Ultrasonic technology interface level measurement sensor, including wiper for self-cleaning.
- Turbidity measurement sensor with light scattering working principle.
- Multiparameter transmitter for analytical variables, with digital communication, Webserver and Heartbeat Technology.
- Assembly for immersion and fastening system for correct fixation on the mechanical structure.
- Commissioning service to ensure a correct start to the life cycle of the instruments.
- Follow-up visits, field and remote support, to evaluate measurement behavior and get the maximum performance out of installed equipment.

Application details

The instrumentation was installed in the tailing thickener Number 2. The objective of the thickener is to send the tailings with an optimal solids percentage to be reincorporated into the tailings open channel of Codelco division El Teniente, while the water recovered from the thickener is stored in the RAI pool, to thereafter be recirculated in the process. The process characteristics and details of the installation point are detailed below:

- Thickener diameter: 100 [m]
- Feeding slurry density: 1.32 – 1.38 [g/cm3]
- Underflow slurry density: 1.54 – 1.64 [g/cm3]
- Flocculant dosage: 6.0 – 6.7 [g/T]
- Solids content in overflow: 30 – 50 [NTU]
- CUS52D Installation: Assembly submerged in an overflow water open channel. Device is configured in Formazin application to measure in nephelometric turbidity units (Manual measurement in laboratory is carried out in the same units).
- CUS71D Installation: Assembly installed on the thickener bridge, at 17 [m] from the shore. Sensor is submerged 20 [cm] from the surface. Equipment configured to measure clarified water level.
- Distance between water mirror and thickener wall at the point: 4.23 [m]



Turbimax CUS71D ultrasonic interface sensor immersed in clarified water mirror; assembly installation is carried out on the bridge of the thickener N°2

Solution components:

- Ultrasonic interface sensor Turbimax CUS71D with Memosens protocol
- Turbidity sensor Turbimax CUS52D with Memosens protocol
- 4-channel multi-parameter transmitter Liquiline CM444 with digital communication
- Modular immersion assembly Flexdip CYA112
- Modular holder system Flexdip CYH112
- Commissioning service carried out by field service engineers

Turbimax CUS52D turbidity sensor installed in recovered water open channel, assembly installation is carried out in mechanical structure of the bridge of the thickener N°2

Results and customer feedback

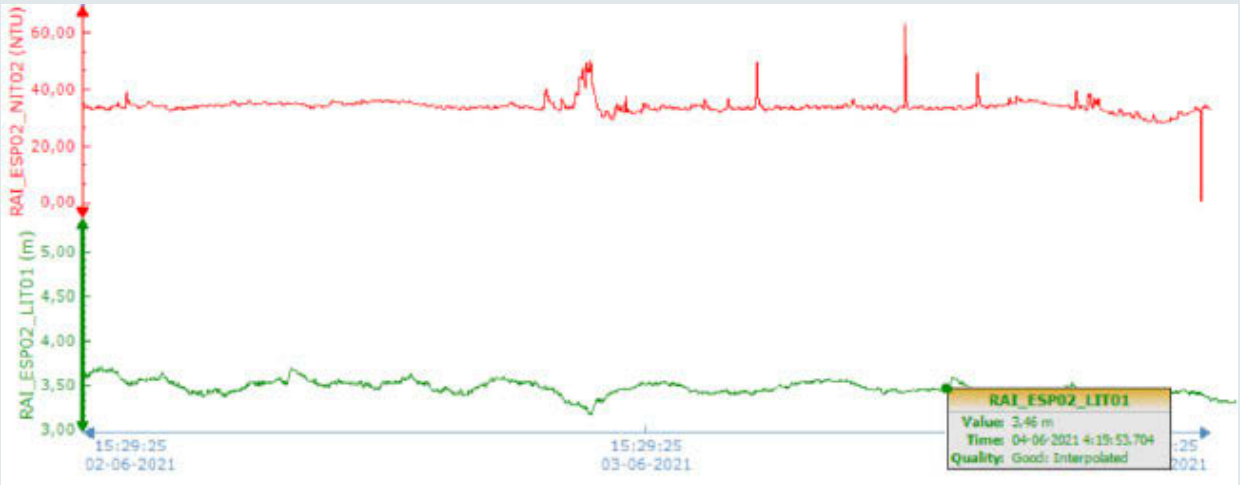
Interface sensor measurement has measurement accuracy and repeatability acceptable to electrical maintenance personnel. This measurement is contrasted with a manual measurement system that has an approximate graduation of 5 [cm], the contrast between the manual method and the values delivered by the Turbimax CUS71D have similar values. It is for this reason that the interface sensor implemented by Endress+Hauser has also been a measurement validated by the plant's operations staff.

On the other hand, the turbidity measurement in the water of the overflow open channel of the thickener, has presented a measurement within the expected range, between 30 and 50 NTU. Prior to the installation of the equipment, manual measurements were carried out in the clear water reception pool of the three thickeners, today comparisons are made between the measurement delivered by the Turbimax CUS52D and a laboratory equipment implemented in thickeners.

Given the improvements in terms of measurement in the thickener, Marcos Orellana indicates: "The installed equipment gives us a reliable measurement and allows us to better monitor these process variables and contributes to a more efficient operation of tailings thickeners".

Liquiline CM442 showing measured values: Channel 1: Turbimax CUS50D (Tested device) measured values are below the measuring range of the device. Channel 2: Turbimax CUS52D. Channel 3: Turbimax CUS71D

Trend graph of equipment implemented in thickener N°2



Measurement of turbidity in water recovered from the thickener (Red color). Level measurement from the clear water mirror to the liquid-solid interface (Green color).

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