

## APPLICATION NOTE Minerals & Mining

### Non-radiometric density measurement of tailings thickener underflow

- Measuring abrasive concentrated solids at coal handling and preparation plant in Australia
- Underflow density loop to improve water recovery and underflow withdrawal
- Reliable alternative to density measurement with nuclear density gauges

#### 1. Background

A coal handling and preparation plant in Queensland, Australia, has a production capacity of more than 10 million tonnes of coking coal per year. Adjacent to one of the country's largest and most established open cut coal mines, the plant sizes, crushes and removes impurities from the raw coal. As the coal preparation involves water based processes, a great deal of highly abrasive flotation tailings have to be disposed of on a regular basis. For water recovery purposes and to save costs with impoundment construction, a density thickener is used as part of a tailings disposal system. During the thickening process suspended solid particles separate from the liquid stream by gravity settling. While the clarified liquor overflows to the top and gets recovered, the solids settled to the pulp bed are removed from the thickener through the tailings underflow, which is the final disposal stage before the tailings are pumped to the tailings dam.

#### 2. Measurement requirements

An efficient tailings disposal facility is highly dependent on a reliable thickener underflow density measurement. Only if the required underflow density is obtained can the rate of underflow withdrawal be efficiently regulated and the amount of water in the underflow is kept as low as is practical. Traditionally, radiometric density measurement has been employed on thickener underflow lines as they provide a non-contact solution to measure abrasive concentrated solids streams. Since the high total cost and regulatory requirements of owning radiometric devices is becoming prohibitive in a competitive, cost and labour intensive production environment, the plant operator decided to optimise their tailings disposal schemes by applying a non-radiometric density solution that is compliant with environmental regulations.

## 3. KROHNE solution

The customer decided in favour of the OPTIMASS 7300 C for non-radiometric density monitoring. KROHNE was selected because of their knowledge and expertise in abrasive slurry applications enabling them to highlight potential problems so they are mitigated during the design, planning and installation of the mass flowmeter. The Coriolis mass flowmeter with a Titanium flow tube was mounted on the tailings thickener underflow line. In order to keep the heavy abrasive particles evenly dispersed in the carrier fluid, the OPTIMASS was installed into a vertical pipeline (DN 50 / 2"). The density measurement is sent to a DCS via a current output of 4...20 mA so as to control the underflow pump and to regulate the underflow solids concentration.

## 4. Customer benefits

Using the OPTIMASS for density control on the underflow, the plant operator is always able to assess their tailings thickener efficiency, allowing them to take immediate steps if the thickener underflow runs below or above the required setpoint. Applying non-radiometric density monitoring gives the plant engineers the information needed to optimise the thickener for the intended duty. In essence, the plant benefits from reduced capital and operating costs, as well as reduced environmental impact.

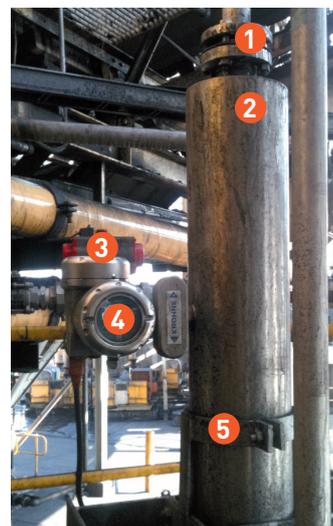
The single straight mass flow measuring tube of the OPTIMASS provides a robust and reliable alternative to nuclear density gauges, allowing the plant operator to optimise its tailings disposal scheme without using nuclear source material. There are no disposal costs for nuclear waste, documentation and administrative controls. Wipe tests and ongoing training of on-site radiation safety officers to perform calibration are no longer required.

Making the OPTIMASS a permanent part of the thickener process also enables the customer to effectively reduce water consumption, e.g. by avoiding filling the tailings dam with solids that contain too much water. Water can be efficiently recirculated, which is an additional advantage to the customer as the plant is located in an area of water scarcity.

## 5. Product used

### OPTIMASS 7300 C

- The only single straight tube meter available in 4 materials – titanium, tantalum, Hastelloy C22, Duplex
- Reliable measurement of mass and volume flow, density, temperature and solid content
- Low pressure drop
- Largest nominal diameter of any single straight tube meter in the world (DN 80 / 3")
- Highest safety factor with PED approved secondary containment (up to 100 barg / 1450 PSI)
- Any installation position, self-draining and easy to clean



1. Transition pieces to protect against abrasion,
2. Single vertically installed measuring tube with no flow splitters or bends to suffer premature failure,
3. Stainless steel housing for harsh environment,
4. Easy to change display orientation,
5. Insensitivity to installation including clamping



### Contact

Would you like further information about these or other applications?  
Do you require technical advice for your application?  
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