Humpback Datasheet

Sonar Solids Profile Monitoring

Principle of Operation

The "HUMPBACK" Sonar Array System utilises the unique acoustic impedance, self-cleaning developments (rarefaction) that were designed for the Flotation Cell process. The "Humpback" Sonar Array System has been designed to monitor the settling conditions in Concentrate Thickeners and provide feedback to help automatically control infeed rate, (Tons per hour/Cubic metres per hour) based on the settling efficiency (solids in suspension/stratified layer) in the region above the hindered layer and dense bed of the thickener.

The transducers in the acoustic array pulse independently and the signal produced is proportionally affected by the suspended solids concentration directly in front of each individual transducer. This information is then processed by the controller, which produces a solids in suspension profile for thickener control purposes. Concentrate thickeners have a history of froth and scum buildup on the surface of the thickener, which makes the monitoring of changing settling conditions too difficult to measure automatically, or even problematic for manual testing by an operator.

With diminishing ore grades worldwide, the automation of Concentrate Thickeners is an absolute necessity, with the ever-increasing tonnages being processed through the flotation process.

FloLevel Technologies™

Features

- Self-cleaning transducers
- No periodic calibration requirements
- High sample rates
- Will operate in all Thickeners

Specifications

Maximum Array Size: 6000mm

Bracket/Flange Mount:
316 Stainless Steel 12-00" ANSI Flange

Array Housing Materials:
ABS, 316SS, Urethane

Cable Length: 15 metres (50 feet)

Process Temperature:
-20 Deg C to 60 Deg C

Controller

Controller Enclosure: 316 Stainless Steel

Supply Voltage: 80 – 265Vac 50/60Hz

Current Consumption: <5 amps

Outputs: (a) ModBus, ProfiBus PA, Foundation FieldBus
(b) 12 x 4-20Ma isolated analog, 500Ohm @ 24Vdc

Display: 3.5" Colour HDMI

Controller Temp Range:
-20 Deg C to 70 Deg C

Typical sample time Update: 40 seconds

Conduit Entries: 6 x 20mm (6 x 0.75")

Weights: Array 3000mm = 150Kgs
Controller = 30Kgs

Primary Application Uses:
CONCENTRATE THICKENERS

Mining concentrators that utilise the flotation process to recover valuable mineral commodities like, Copper, Molybdenum, Cobalt, Zinc, Gold, Silver, Iron Ore etc, are faced with decreasing ore grades worldwide, which requires the processing of greater tonnages of ore per year to compensate for the diminishing grades. The froth laden concentrate from the flotation circuits is then pumped to the Concentrate Thickeners, which separate out the concentrate (high density) from the froth and water (low density).
This concentrate sinks to the bottom of the thickener by gravity and creates a heavy bed. The froth/water component flows upwards to the launders and is returned to the concentrator as process water.
Each Concentrator Thickener is designed for a maximum inflow rate (tons per hour/cubic meter per hour) that will allow efficient settling under "ideal" process conditions.

Problems occur when process conditions change; caused by a number of factors (ore characteristics, clay in suspension) etc. Settling is affected, which creates stratified layers of suspended solids in the top zone of the thickener, above the hindered layer. The stratified layers move upwards, caused by the hydraulic flow pattern towards the launders. The tendency for this to happen is when the Concentrate Thickener is operating at high inflow flow rates and changes in ore characteristics, clay in suspension change the settling efficiencies.
The major control issue, is to know when these stratified layers are developing, so that a control strategy can be implemented to settle out the suspended solids layers and allow the thickener to again operate at its maximum inflow rate.

HUMPACK: SONAR SOLIDS PROFILE MONITORING SOLUTION

The HUMPBACK ARRAY is made up of individual self-cleaning acoustic transducers. The array size is made to suit the distance from the launder down to the start of the cone, although the array length can be made to order.

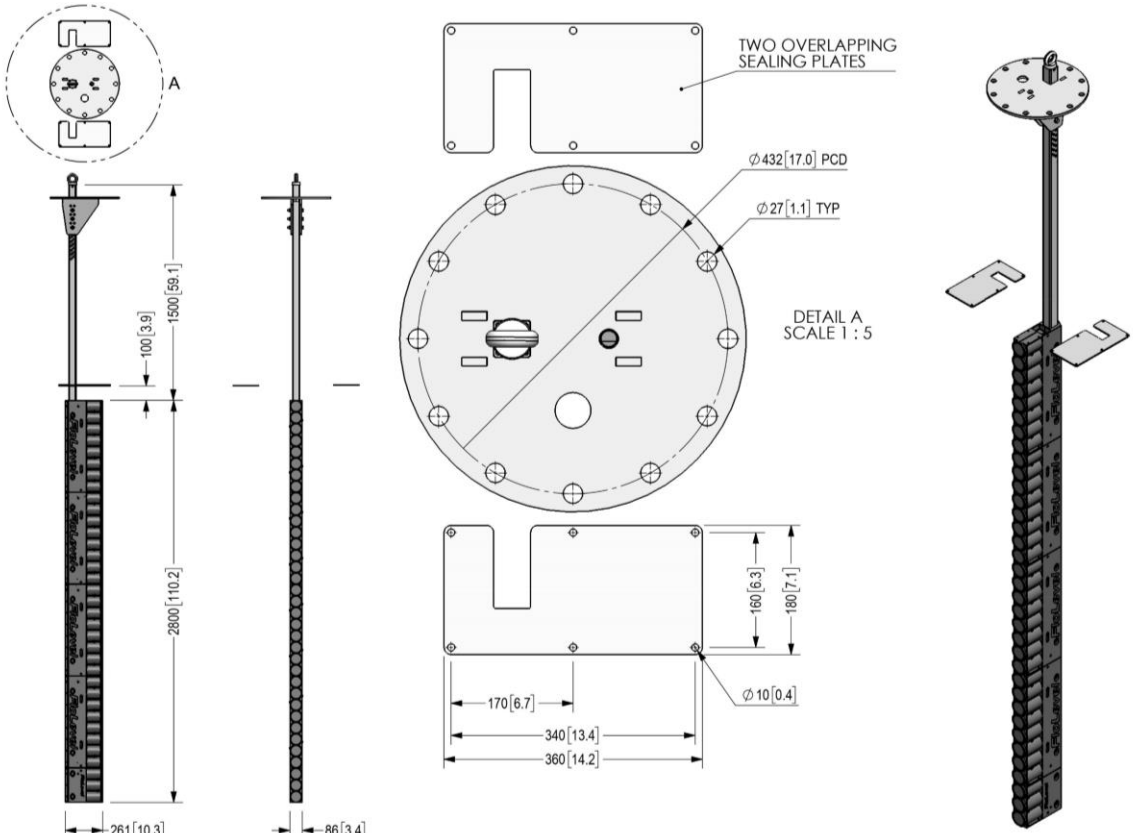
A typical 2000mm array has twenty-seven transducers. The controller pulses each of these transducers independently, starting from the bottom transducer in the array.

Each transducer is pulsed for a second in time, at a controlled amplitude that not only allows for the Acoustic Impedance measurement, but also creates a powerful cleaning "rarefaction" effect on the face of the diaphragm, removing all build-up. Water directly in front of the transducers, that contain suspended solids, create an acoustic impedance change, that is directly proportional to the suspended solids concentration percentage. This information is sent to the controller and after all transducers in the array have pulsed, the controller provides an update profile of the suspended solids, divided into zoned areas of 400mm. Typical sample time update for the solids profile = 30 seconds.

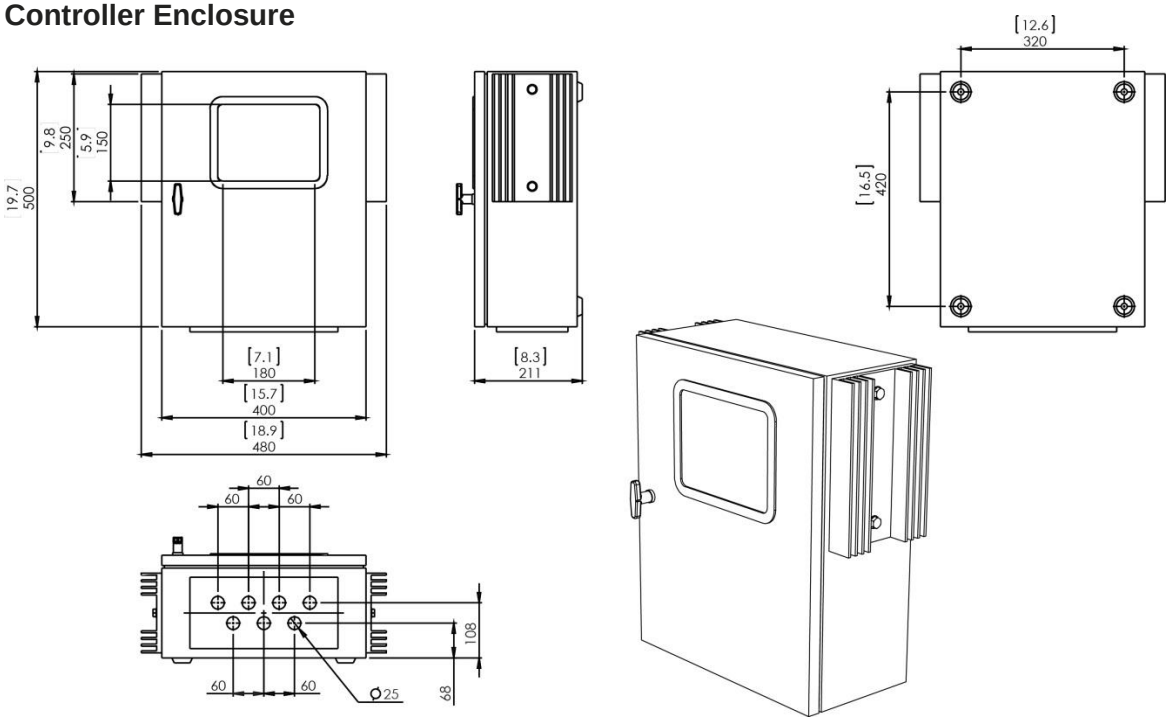
Because stratified layers move slowly towards the surface (launders), there is ample time to provide corrective measures of reducing the inflow solids rate, directing inflow to another concentrate thickener, chemical addition, etc. Typically, the time taken for a stratified layer to form and float to the surface is between 1 to 2 hours. This is ample time to correct for poor settling problems if they can be detected automatically in time.

By using technology that is designed for the service, automatic control of Concentrate Thickeners under all process conditions is possible, which will increase the overall performance optimisation of the flotation circuits, by allowing more tons per hour, cubic metres per hour through the Concentrate Thickener.
High froth heights and scum build-up on the surface of the thickener will not impede automatic control.

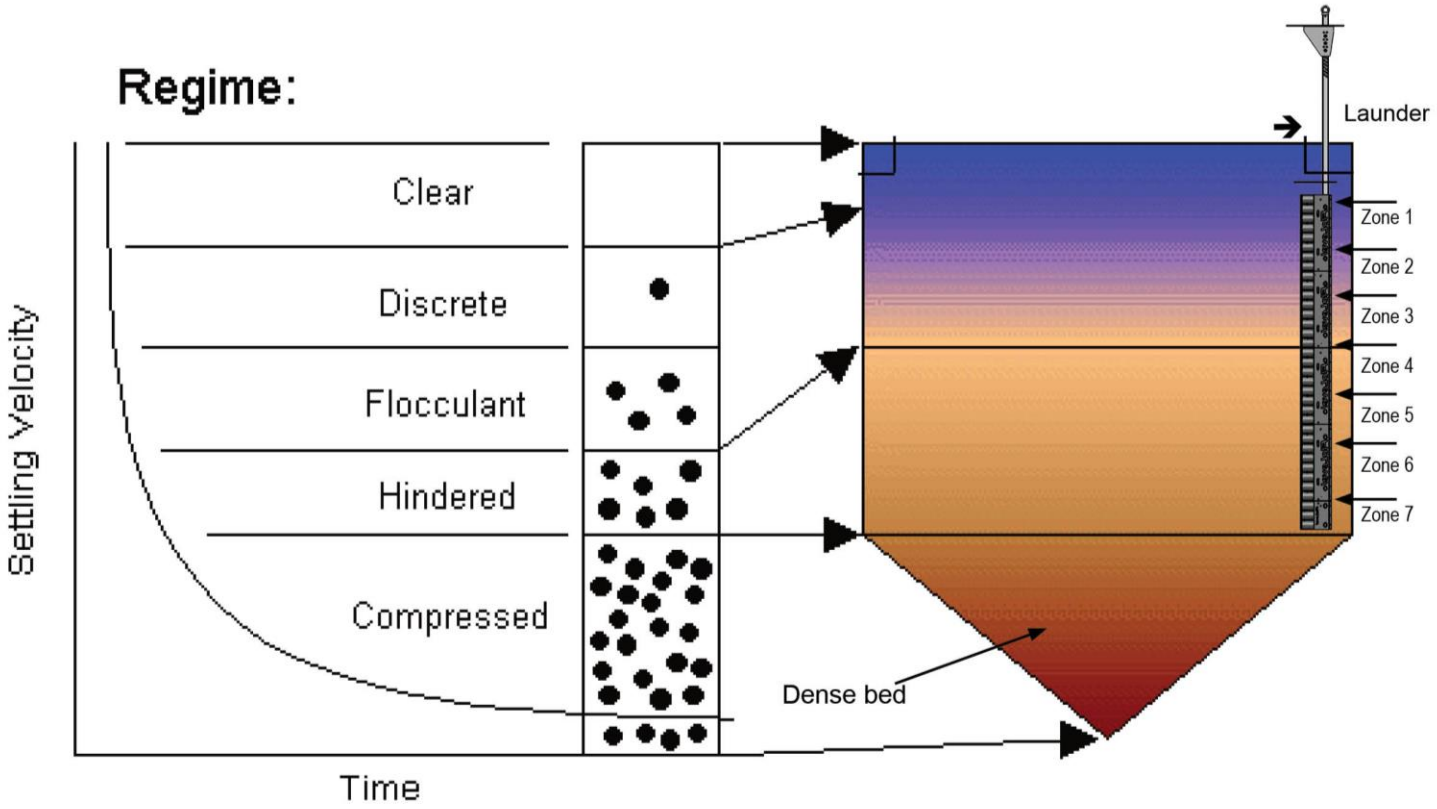
Drawings



Controller Enclosure



Settling Zones



This shows the Concentrate Thickener with perfect settling.

These solids % measurement will increase with poor settling

Zone 1: Will measure clear clarified water

Zone 2: Will start see minimal solids %

Zone 3: Will measure higher solids %

Zone 4: Will measure higher solids %

Zone 5: Will measure hindered zone solids %

Zone 6: Will measure hindered zone solids %

Zone 7: Will measure hindered zone solids % highest density

Ore characteristic changes and clay (arcilla) will see the hindered layer rise towards the launders. If the inflow feed rate is too high, the hindered layer rises.

Part Numbers: Humpback Solids Profile System

Product	Control Profile Range	Sonar Array Housing	Power Supply	Outputs	Cable Length	Flange
FLH	1000 mm = 1 2000 mm = 2 3000 mm = 3 4000 mm = 4 5000 mm = 5 6000 mm = 6	ABS = 1 Urethane = 2 Special = 3	80-265Vac 50/60Hz @<5Amp	Modbus = 1 Profibus PA = 2 Foundation Fieldbus = 3 Analog outputs 4-20mA = 4 (12x4-20 mA)	15 m = 1 Special = 2 (Consult Factory)	12.00” = 1 ANSI Special = 2

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