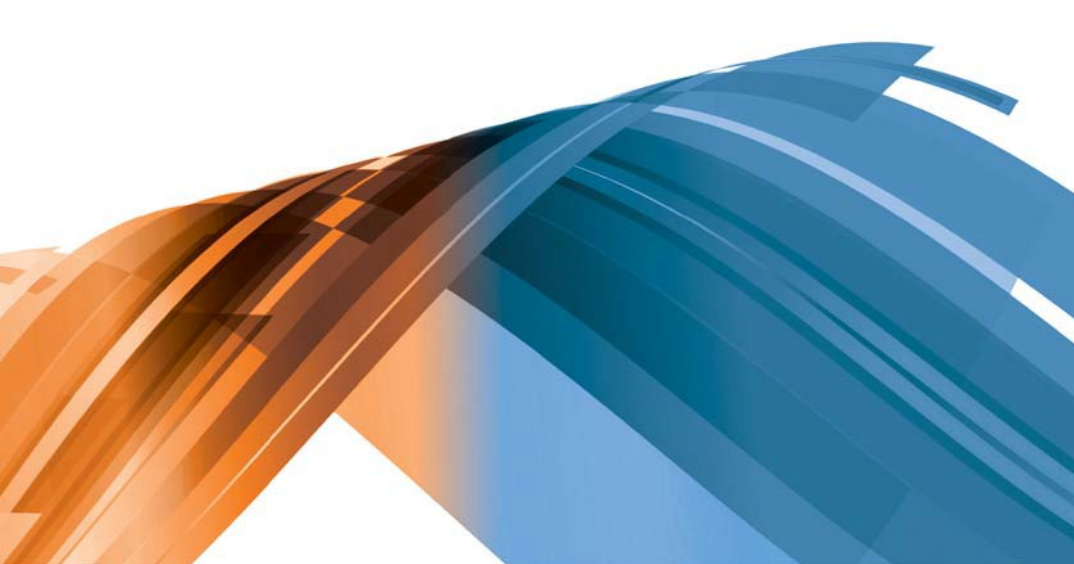




OLR
MINING



OnLine Rheometer for Automated Measurement of Viscosity and Yield Stress of a Concentrated Mineral Slurry

the **OLR** *keeps your process in line*

OLR MINING

The first on-line slurry rheometer



The OnLine Rheometer (OLR) has been developed and manufactured by Rheology Solutions and is designed to continuously measure, plot and report the flow properties of process liquids in the pipe.

The OLR will provide instant and accurate rheological data in real time so that liquids during mineral processing are produced and maintained within specification - first time and on time.

The OLR is designed for use in a pipe, and it continuously measures and relays the data to the process operator – either through SOLR the software for the OLR or through the factory PLC (Process Logic Controller).

The operator or mining engineer input specific flow property data for the process being run to establish the optimum production specification parameters. The OLR monitors the process and displays the product conformance throughout the mining and production process.

The schematic to the right shows alternative arrangements for the OLR installation. It can be directly connected in the main process pipe-line or in a side loop, as necessary.

Principle of Operation

The OLR uses squeeze-flow technique - it measures storage and loss moduli by imposing a small cyclic deformation on a liquid sample at a variety of frequencies, from 1-100 Hz. Quality control parameters and user interface at plant operator level are based on η^* (complex viscosity [Pa.s]), as measured by the OLR.

The response of the liquid is measured and displayed in terms of G' (storage modulus [Pa]), G'' (loss modulus [Pa]), δ (phase angle [Degrees]), σ (yield stress [Pa]) and η^* the same as with a conventional laboratory rheometer.

THE OLR ADVANTAGES:

- Fast and Reliable Real Time Results
- Low Maintenance
- Out of Specification Diagnosis
- Plug-and-Play Installation
- Precise and Robust Sensor System
- Process Control
- Process Monitoring
- Quality Control
- State of the Art Technology
- Time and Cost Savings

IN-LINE OPERATION

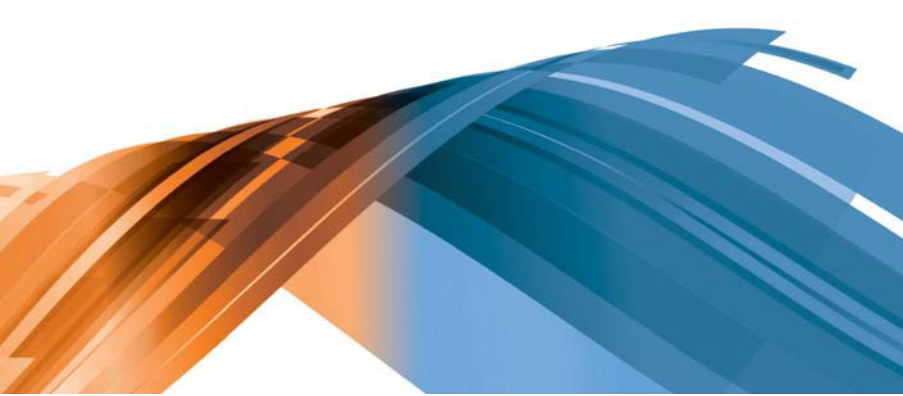


OLR in the process line

ON-LINE OPERATION



OLR in a side-stream



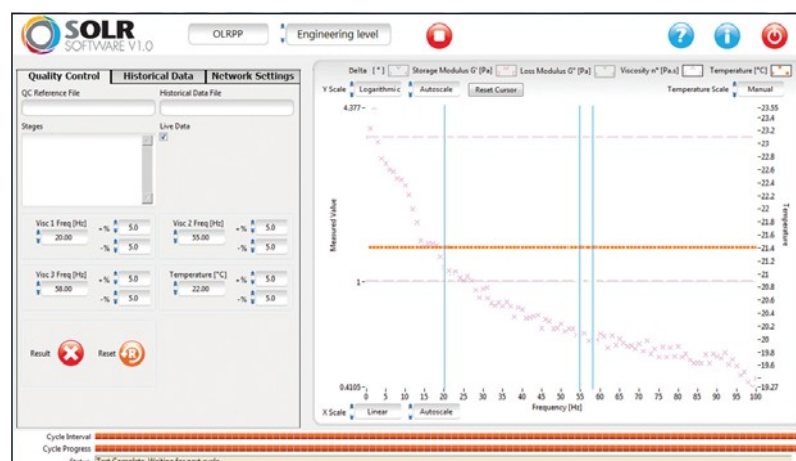
SOLR - Software for the OLR

SOLR provides flexibility – you determine from the drop down menu what you continuously measure, plot and report.

The OLR is used in conjunction with custom developed software specific for the sensor system. The SOLR has three key functions:

1. SET-UP OF PROCESS MONITORING AND QUALITY CONTROL PARAMETERS

The OLR provides a viscosity curve that characterises the material in the pipe. The option to view three frequency points from the viscosity curve allows the mining engineer or QC technician to see the quality and reproducibility of the process throughout the production process/shift. Each point chosen has upper and lower limits set as a QC band PASS/FAIL determination.



Characteristic curves for material in the pipe, with individual QC points selected

PROCESS MONITORING the engineer or QC technician has the option to establish a step-wise QC file that will track and plot successive process steps or stages.

CONTINUOUS MONITORING for an unchanged product in the pipe line a single stage QC file is applied.

PLANT PLC uses the settings from the QC stages and compares them with the data streaming from the OLR to the PLC.

ALARMS from SOLR or the factory PLC can be activated if the product viscosity or temperature drifts out of specification.

INFORMED DECISIONS about the process and product trends through the SOLR operator interface are able to be made by the engineer or QC technician.

AUTOMATIC DATA STORAGE of all data and curves are automatically saved and can be recalled at any time for diagnosis of product trends and production issues.

2. MONITORING AND CONTROL OF PROCESS EITHER THROUGH SOLR OR THROUGH THE PLANT PLC

SOLR provides control and monitoring of your production process and can be used in standalone mode. The operator is provided with a visual cue regarding the trends and quality of the material in the pipe. A visual PASS/FAIL display is shown on screen, plus the actuation of an audio (horn) or visual (strobe) alarm can be provided.



Operator interface allows monitoring of process according to single or multiple QC setpoints.

The operator controls the selection of the process stage from the QC file and initiates successive QC process stages. Each stage has the preset QC parameters installed from the set up. When the process stage is completed, the engineer or QC technician manually selects the next stage and the screen provides the pre set parameters for monitoring.

For continuous monitoring of an unchanging product in a pipeline, a single stage QC file is used. The operator screen will display the long-term viscosity and temperature trends of the material.

3. OUT-OF-SPECIFICATION PRODUCT DIAGNOSIS

If the process is out of specification, the plant engineer can recall the complete curve from the time where the drift out of specification occurred, and open it using SOLR or using readily available software (text files or MS excel).



Diagnosis of process issues can be performed

Historical data curves can be uploaded into SOLR, so that out-of-specification material can be compared with in-specification data.

Based on these comparisons a diagnosis as to why there is a change in the product quality from what is normally expected is addressed. Considerations include: missing or insufficient ingredient, incorrect amount of heating or shear.

TECHNICAL SPECIFICATIONS

Frequency range	1 – 100 Hz
Viscosity measuring range (geometry dependent)	0.25 – 200,000 Pa.s
Force range	0 – 44.48 N
Operating range	
- Temperature	-10 – 110 °C
- Pressure	0.05 – 30 Bar a
Temperature measurement	RTD PT100 Ohm, Class A

COMMUNICATIONS

- WiFi 6
- Bluetooth 5.1
- 2400 Mbps on 5GHz
- 574 Mbps on 2.4GHz

DIMENSIONS (STANDARD):

Height	600 mm
Width	250 mm
Depth	400 mm
Weight	35 kg
Measurement cavity diameter (standard)	50.8 mm
Inlet/Outlet connection diameter (standard)	50.8 mm

ENVIRONMENTAL

Ambient temperature in enclosure	-15 – 50 °C
(IEC 60068-2-1, IEC 60068-2-2) Operating humidity (IEC 60068-2-56)	10 – 90 %RH
Maximum altitude	2000 m
Electric supply	Input 24 VDC
Power input maximum	10W
Fuses	24V, 5A
Inlet/Outlet connection type:	2" Tri-clover as standard
Suitable for 1" to 8" pipe (DN25 – DN200) as standard.	
Non standard sizes available.	
Standard connection fittings include ASA/ANSI, PN/DIN, BS10, and JIS/KS.	
Non standard sizes available	

COMPLIANCE AND CERTIFICATION

The OLR is designed to meet the EHEDG (European Hygienic Engineering & Design Group) guidelines using FDA (Food & Drug Administration, USA) compliant materials.

Electricals are compliant with CE, C-Tick, FCC standards. IP-65 rated.

All the product contact parts are made of stainless steel (grade 304 or 316).

