

Hydrosteel 6500



World's first multipoint hydrogen flux corrosion monitor

For easy reliable measurement of flux in extreme environments



Unique capability

Flux measurement provides direct evidence of corrosion in near real time. Unlike wall loss measurements it is not limited in sensitivity by tiny decreases in thickness. Unlike corrosion coupons, it indicates corrosion of the actual service steel, not a steel specimen.

At low temperatures, the flux is generated by corrosion involving hydrogen promoters such as sour gas and HF. Flux provides a real time indication of active sour corrosion and the risk of hydrogen induced cracking (HIC) caused by such corrosion.

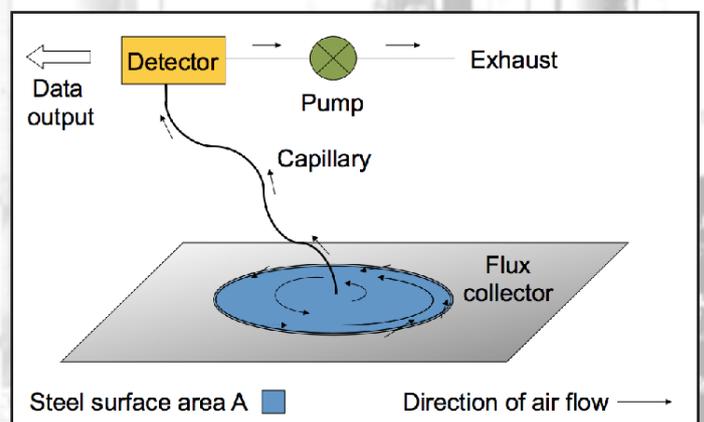
At elevated temperatures, flux is associated with naphthenic acid corrosion. Flux monitoring is also used to confirm the completion of hydrogen bakeouts.

Flux monitoring...

Since the year 2000, Hydrosteel® has been recognised as the simplest and most effective way to monitor hydrogen flux through steel in petrochemical service. Hydrosteel works by the magnetic attachment of a flexible metal plate onto a pipe or vessel. Air is drawn between the plate underside and adjoining steel surface, capturing hydrogen flux exiting the steel. The sample stream is passed over a hydrogen sensor. From the sample gas flow, capture surface area, and increased hydrogen gas concentration in the air, the hydrogen flux is calculated and displayed.

...just got better

Hydrosteel 6500 delivers the simplicity of measurement of the original handheld tool, with months of battery operated monitoring capability. Four separate sample lines ensure complete confidence in measurement integrity, so that the flux signature of a corrosion scenario is fully evident, and the success or otherwise of measures taken to mitigate corrosion and completely realised. The new Hydrosteel comes a new probe featuring more reliable attachment and wider temperature tolerance.



Applications

Hydrosteel 6500 has been designed to serve the diverse applications of flux monitoring

Lab testing

Corrosion experiments are widely undertaken, in the pursuit of chemicals, steels and processes which minimize influence the causes and effects of hydrogen permeation through steel. Hydrosteel is used to measure that hydrogen permeation.

HIC risk monitoring

Hydrosteel 6500 measures hydrogen flux through steel whose temperature and thickness can be readily verified. With this information it is possible to provide a quantitative measure of hydrogen induced crack (HIC) risk. By means of flux monitoring it is therefore possible to quantify the conditions that lead to HIC, and to establish a strategy for HIC avoidance. Carry out unscheduled tests with new LR probe. Use AT-S probes for routine inspection monitoring.

HF corrosion monitoring

HF corrosion is attended by a robust hydrogen flux indication. The method is used to monitor HF alkylation unit corrosion and provide an early warning of emergent corrosion issues, for example, from acid runaway. Use at least one AT-S probe plus background probe, monitor 3 data per day.

Naphthenic acid corrosion monitoring

At increasing temperatures, hydrogen more freely permeates steel, and all types of acid corrosion are prone to generate hydrogen flux. Flux from naphthenic acid corrosion in atmospheric and vacuum distillation units, can be used to estimate corrosion rate, offering the prospectus for a measured . Oil feedstock blends typically vary every few days. Flux monitoring provides a good indication of the blend's corrosivity, and therefore offers a near real time prospectus for assessing oil feedstock corrosivity, complimenting the information provided by corrosion prediction algorithms. Also used in coker plants. Use at least two AT-S or HT-S probes plus background, monitor 3 data per day. Trouble shoot with SR-probe.

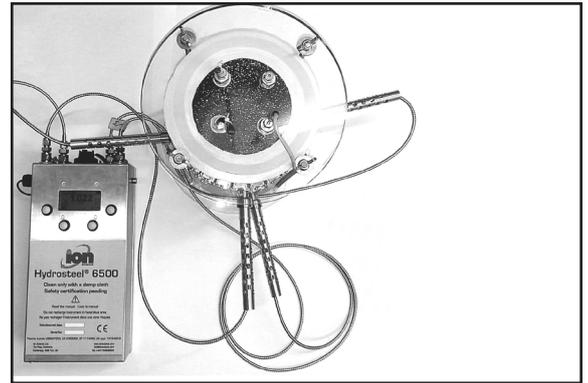
Hydrogen bakeouts

Hydrosteel flux measurement provides direct confirmation of sufficient hydrogen out gas of equipment that has been in hydrogen promoting or high temperature high pressure hydrogen service evidence an indication of corrosion in near real time. This is carried out in a pre-weld hydrogen bakeout. Typically three or four HT-S probes are deployed during the lay out of heat treatment circuitry. Hydrosteel 6500 enables continuous sampling of such probes during the course of bakeout, enabling an up to date assessment of bakeout progress and completion.

Sour corrosion control

Corrosion of equipment in sour oil and gas service costs billions, in lost production and degraded infrastructure. Hydrogen flux indications of sour corrosion may be complicated by the presence of non-passivating scales: if corrosion is dependent on scale removal, then hydrogen flux indications provide a unique opportunity to verify the effectiveness of corrosion control and optimize chemical treatments.

Routine flux measurements are carried out on sour pipelines, refinery distillation and cracker unit overheads (eg condensers), typically by routine inspector visits to AT-S probes. More episodic corrosion arises from amine units (undersalt deposits), and batch processes such as water washes and pH adjustment. Trouble shoot with the LR probe.



Sour corrosion lab testing



HIC risk monitoring

Features

- Full back-compatibility with previous Hydrosteel probes via conduit terminal
- Ruggedised field analyser with program operation and data monitoring capability [1]
- New 150 mm high sensitivity LR (large roaming) probe, accommodating curvature down to 5 in and steel temperatures to at least 350 °C (2)
- New 60 mm low sensitivity probe [3] for inspection ports engagement
- Steel clad flexible sample conduit [4] - up to 10 m length
- Battery charge connector. Battery charging takes 24 hr, sufficient for a few days spot monitoring, up to 3 months long term monitoring [5]
- USB connector [6] for data download and program upload. Monitored data downloaded as .CSV file
- Robust push button finger operation [7]
- Large display with backlight [8]
- Provision for wireless communication and networking [9]
- Four ports [10] for sequential flux monitoring - appropriate for hydrogen bakeouts and multipoint measurements including background hydrogen
- Staubli® connectors [11] afford easy pneumatic fitting to ports. Connectable to all original Hydrosteel probes
- ATEX certification to intrinsic safe design to be confirmed



Hydrosteel 6500 instrument harness



Specification

PERFORMANCE	
Resolution	2 pL/cm ² /s
Accuracy	Resolution or +10%, whichever is greater.
Response	90% in 90 s
Flux range	1 to 2,000 pL/cm ² /s
TECHNICAL	
Size and weight	320x185x90 mm, 4.1 kg without leather case. 4.45 kg with case.
Safety	Initial Intrinsic safety narrative for IEC-ex.
Ingress	Designed to IP 66
Portability	Leather harness for analyser, spot probes and conduit.
Battery	Two 4.8 A.hr Li-ion batteries of rectangular construction at 3.8 V nominal to intrinsic safe design
Calibration	Concentration: 100 ppm hydrogen. Flow: self calibrating.
Gas fittings	Staubli® RBE3
Conduit	3 or 6 m, quick fit connections to case.
Probes	LR probe, 150 mm diameter. SRprobe 60 mm diameter
Keypad	Panel mount IP rated buttons around LCD
Lights	Backlit display only
Software	One single standard software version is required for each kit. All upgrades and data transfer achieved via USB connection. Customer configuration via key pad or USB.
Comms	USB 2.0, enabling data transfer, programming and software updates. Design for 2.4 GHz wireless with proprietary protocol for communication to DCS, and an external vandal proof mushroom type or other aerial.
Options	Data log and monitoring frequency from 1 Hz to 1 reading / day, monitoring station sequence etc.

Hydrosteel 6500 V1.0. This publication is not intended to form the basis of a contract and specifications can change without notice.

For more information please contact:
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Portable application

Hydrosteel 6500 is provided with a leather jacket carrying the analyser, both the LR and SR probes and conduit. The jacket is designed to be easy to carry, whilst protecting the apparatus from damage.

Application scenarios

Scenario 1: unscheduled spot measurements and short term monitoring

Hydrosteel is very well adapted for troubleshooting and monitoring of unexpected process upsets or corrosion episodes. After using the device to corrosion hotspots, the operator selects from the instrument a default monitoring cycle at 10 min intervals.

Scenario 2: scheduled spot measurements

AT-S probes are pre-fixed on the steel at, typically, typically 10 to 15 locations in a refinery unit. The instrument is used for repeat spot measurements, say 3 per week, at each site. After each spot measured flux and zone is stored in the instrument log by the user.

Scenario 3 scheduled monitoring

AT-S probes are pre-fixed at up to three sites within a few metres of each other. Stanchions may be required for the instrument, placed in a metal box for protection. The instrument is connected to the probes with conduit. It is programmed to monitor the background flux from the ambient air and each probe in turn, at specified intervals.

Scenario 4 hydrogen bakeout

Multiple sites are monitored continuously during a pre-weld hydrogen bake out at 3 to 4 locations to confirm that the bakeout is complete.

HT-R Battery recharging and USB

Battery charging and data retrieval is carried out in a hazard free area.

Calibration

The instrument will be calibrated at factory. Equipment as previously supplied with Hydrosteel 6000 will be optionally provided for bump testing of flow and sensor response in an office environment.

Maintenance

The instrument should require minimal maintenance, using just a damp cloth and mild detergent to clean up instrument surfaces.