OiW-100 Oil in Water Analzyer

Applied Analytics DS-006A — Revised 18 June 2013

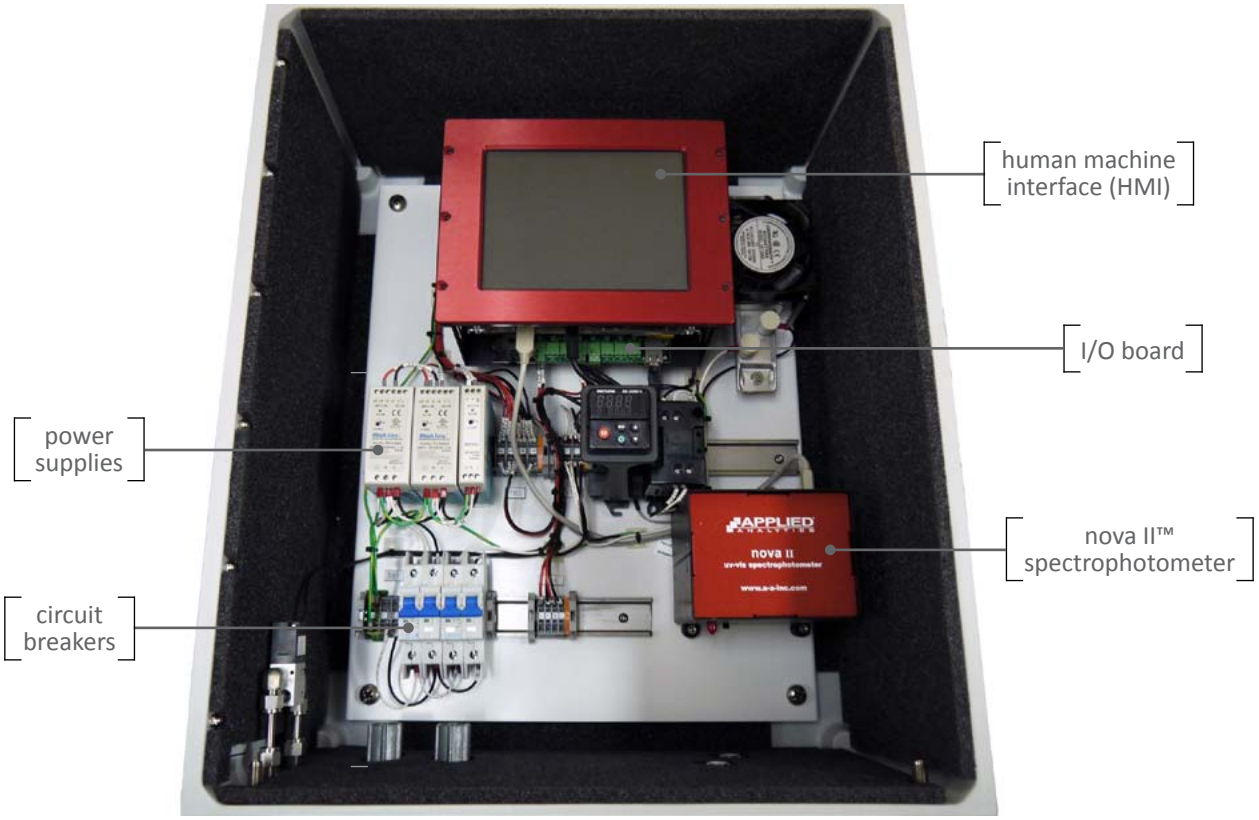
Continuous analysis of total petroleum concentration in water.

As global oil production grows each year, so does the amount of water being released into the environment from refining and other processes. Continuously monitoring dynamic oil concentrations in effluent water, the OIW-100 is a painless and economical option for complying with increasingly stringent wastewater regulations. Measuring aromatics' absorbance from 250 to 320 nm, the OIW-100 accurately correlates total oil concentrations from trace levels to high contamination.

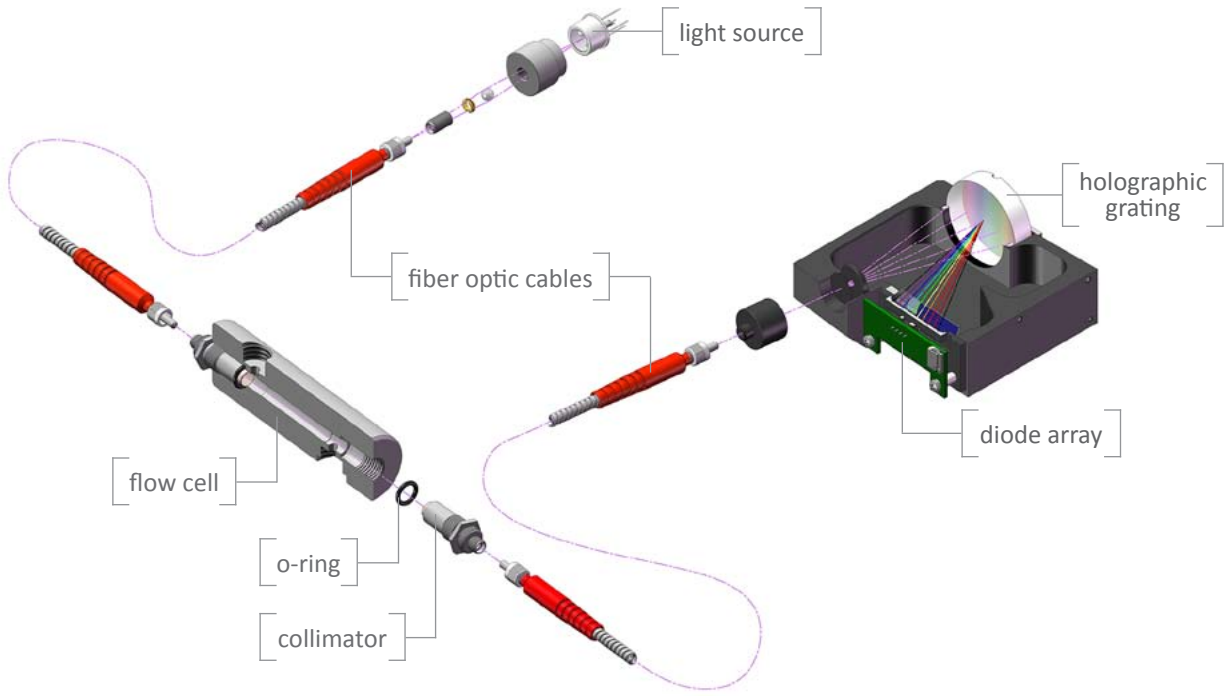
Features

- Continuously measures total petroleum concentration in a homogenous water stream sample
- Totally solid state build with no moving parts — modern design for low maintenance
- Correlates aromatic hydrocarbons' absorbance to total oil using customer sample for precise calibration
- Long-lifespan xenon light source (avg. 5 years)

OiW-100 Internal Components



Optical Assembly & Principle of Operation



The OiW-100 measurement cycle is instantaneous, but it can be helpful to visualize it in stages:

(1) The white light signal originates in the pulsed Xe lamp that functions as the light source.

(2) The signal travels via fiber optic cable to the flow cell. A collimator narrows the light beam.

(3) The signal travels directly across the flow cell, interacting with the continuously drawn process sample.

(4) The signal exits the flow cell through a collimator, now containing the distinct absorbance imprint of the current chemical composition of the sample.

(5) The signal travels via fiber optic cable to the nova II.

(6) The signal is dispersed by the holographic grating. Each differentiated wavelength is focused onto a designated photodiode within the diode array. The nova II provides this rich data to the HMI for real-time visualization of the absorbance spectrum.

The Oil Measurement

In various industries, complying with environmental regulations often boils down to verifying specified limits for oil content in effluent water. In order to validate their investments in wastewater processing, refineries and plants require highly accurate online monitoring of dissolved and un-dissolved hydrocarbon concentrations in runoff water. High oil content in effluent water also presents a maintenance concern, as it often indicates equipment failure (e.g. leaky heat exchangers) and that the wastewater is unfit for reuse in the facility.

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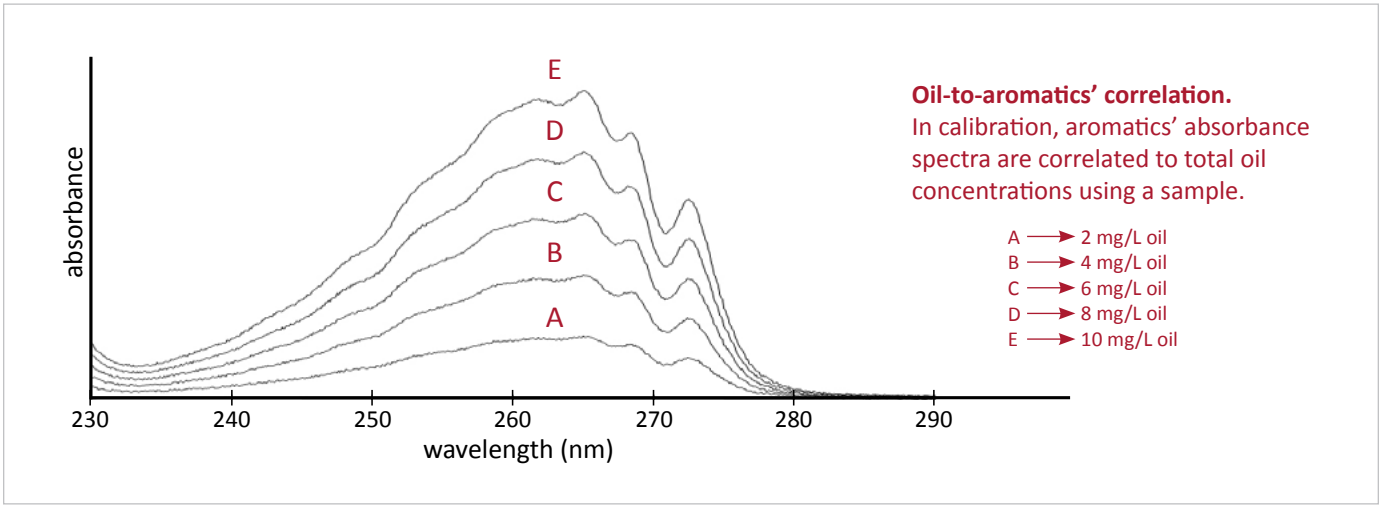
By nature, petroleum is a mixture of many compounds; this complex constitution (including hundreds of unique organic compounds) makes it impossible to directly measure the concentration of oil in solution. How can we verify that this vague mixture is below limits in our wastewater?

The answer lies in aromatic hydrocarbons, which, on average, comprise 15% (by weight) of crude oil. These molecules have strong absorbance features in the 250-320nm wavelength range and can thus be easily detected through UV-VIS (ultraviolet-visible) spetrophotometry.

The OIW-100 continuously monitors the total aromatics' concentration in wastewater streams. While conventional analyzers will only measure absorbance at the 254nm benzene peak--a single value susceptible to cross-interference and lacking any internal reference for validation--the OIW-100 uses diode array technology to measure the absorbance spectrum across the full 250-320nm aromatic absorbance range.

The system correlates aromatics' concentration to total oil in the water. To perfect the correlation, the instrument is calibrated for the typical composition of oil in the customer's wastewater (using a process sample).



Example OiW-100 Sample Conditioning System

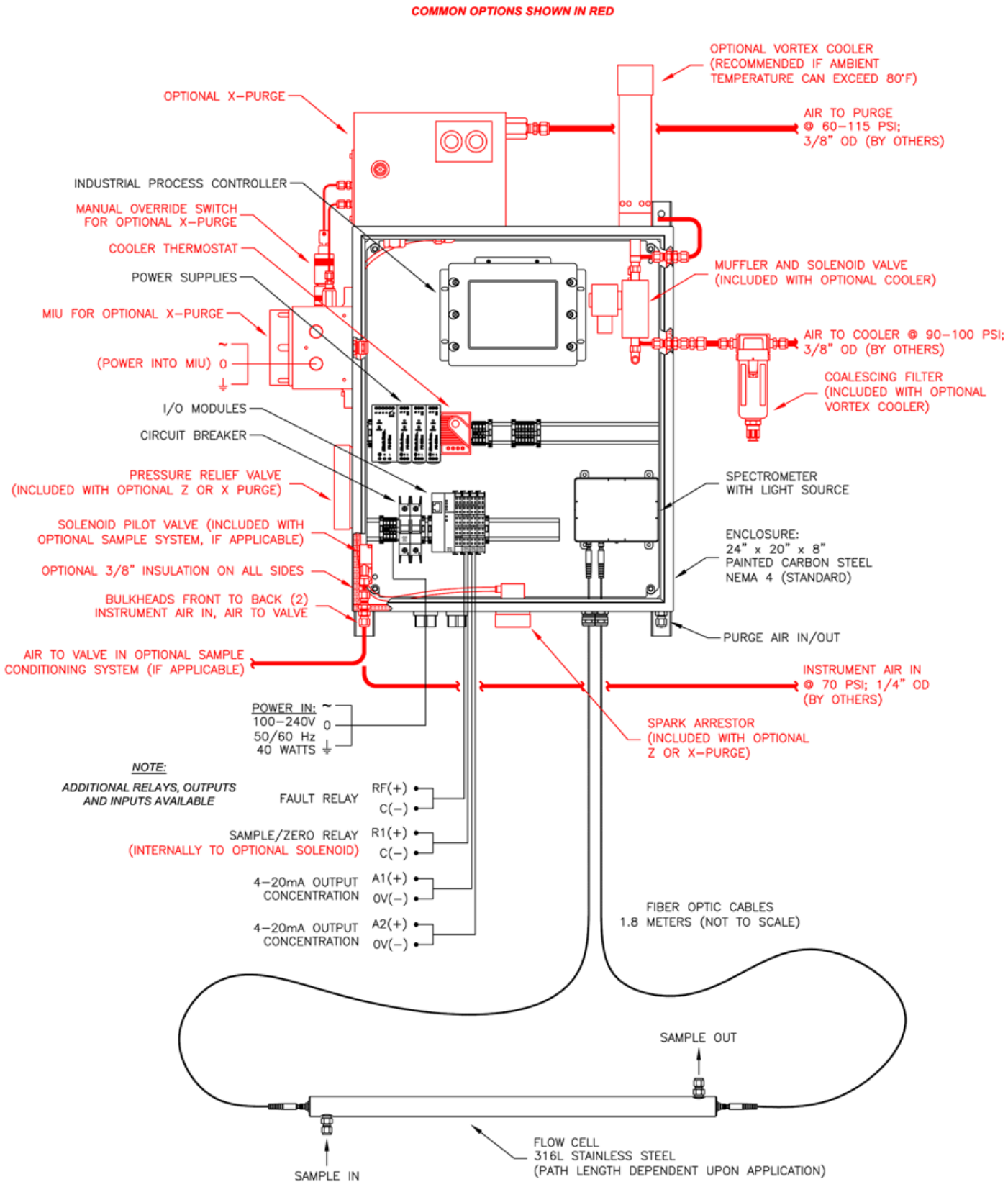
The SCS for the OiW-100 is designed on a per-application basis.

The main purpose of the OIW-100 sample conditioning system is to create an oil-free background sample for zeroing. For example, the system pictured below is designed for measuring oil in pond water; since pond water can vary significantly and somewhat mysteriously in composition, a continuous sample with all oil removed is required for blanking the instrument. Only certain deviations from this volatile background spectrum are registered as the presence of oil.

The sample is routed through a device which effectively removes all oil using a special filtration clay. This oilfree sample is transported to the background vessel which acts as a reservoir of oilfree pond water. The auto zero procedure automatically uses liquid from this vessel for background adjustment (60 second task).

At the same time, an untreated pond water sample is constantly being fed into the flow cell or direct measurement of oil concentration.

OiW-100 Technical Drawing



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All performance specifications are subject to the assumption that the sample conditioning system and unit installation are approved by Applied Analytics. For any other arrangement, please inquire directly with Sales.

Subject to modifications. Specified product characteristics and technical data do not serve as guarantee declarations.

Technical Data	
General	
Measurement Principle	Dispersive UV-Vis absorbance spectrophotometry
Detector	nova II™ Spectrophotometer Data sheet: http://www.a-a-inc.com/documents/AA_DS201A_novaII.pdf
Spectral Range	200-800 nm
Light Source	Standard: pulsed xenon lamp with average 5 year lifespan
Fiber Optic Cables	Standard: 600 µm core 1.8 meter fiber optic cables (qty = 2) Data sheet: http://www.a-a-inc.com/documents/AA_DS206A_FiberOptics.pdf
Sample Medium	Homogenous phase liquid
Sample Introduction	Standard: stainless steel 316L flow cell with application-dependent path length Options in data sheet: http://www.a-a-inc.com/documents/AA_DS207X_FlowCell_All.pdf
Sample Conditioning	Custom design if necessary
Analyzer Calibration	If possible, analyzer is calibrated with customer sample; no re-calibration required after initial calibration; measurement normalized by Auto Zero.
Reading Verification	Simple verification with samples or neutral density filters
Human Machine Interface	Applied Analytics standard HMI: industrial controller with touch-screen LCD display Data sheet: http://www.a-a-inc.com/documents/AA_DS202A_HMI.pdf
User Interface	ECLIPSE™ Runtime Software Data sheet: http://www.a-a-inc.com/documents/AA_DS203A_Eclipse.pdf
Data Storage	32GB Solid State Drive Data sheet: http://www.a-a-inc.com/documents/AA_DS204A_SSD.pdf
Enclosure	Standard: wall-mounted, carbon steel NEMA 4 enclosure Options in data sheet: http://www.a-a-inc.com/documents/AA_DS401X_Enclosures.pdf
Available Certifications	CSA Class I, Division 1 CSA Class I, Division 2 ATEX Exp II 2(2) GD *Please inquire for other certifications.*
Measuring Parameters	
Accuracy	@ range 0-20 mg/L: ±2% full scale
Response Time	10s
Zero Drift	±0.1% after 1hr warm-up (measured over 24hrs at constant ambient temp.)
Sensitivity	±0.1% full scale
Noise	0.004 AU at 220 nm
Sample Conditions	
Sample Temperature	Using immersion probe: -20 to 200 °C (-4 to 392 °F) Using flow cell: -20 to 150 °C (-4 to 302 °F)
Sample Pressure (max)	Using immersion probe: 100 bar (1470 psig) Using flow cell: 206 bar (3000 psi)
Ambient Conditions	
Analyzer Environment	Indoor/Outdoor (no shelter required)

Ambient Temperature	Standard: 0 to 55 °C (32 to 131 °F) With optional temperature control: -20 to 55 °C (-4 to 131 °F) *To avoid radiational heating, use of a sunshade is recommended for systems installed in direct sunlight.*
Physical Specifications	
Dimensions	Analyzer: 24” H x 20” W x 8” D (610mm H x 508mm W x 203mm D) SCS (if included): custom size
Weight	Analyzer: 32 lbs. (15 kg) SCS (if included): variable depending on custom build
Wetted Materials	Standard: K7 glass, Viton, stainless steel 316L *Various custom materials available — please inquire.*
Utility Requirements	
Electrical Requirements	85 to 264 VAC 47 to 63 Hz
Power Consumption	45 watts
Outputs/Communication	
Outputs	1x galvanically isolated 4-20mA analog output per measured analyte 2x digital outputs for fault and SCS control Optional: Modbus TCP/IP; RS-232; RS-485; Fieldbus; Profibus; HART; more
I/O Electronics	Voltage/Current Interface Module (i.e. I/O Board) Data sheet: http://www.a-a-inc.com/documents/AA_DS205A_VCIM.pdf

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