

Sulfur Monitors & Analyzers for Fuels and Oils



**On-line, At-line and
in the Laboratory**



Accurate measurement of sulfur is critical during the refining and processing of fuels and oils. For environmental reasons, and for its effect on quality, sulfur content in hydrocarbons is rigorously controlled by both national and international regulations. In addition, maximum levels for sulfur content in fuels continue to be made even stricter, thus analytical instrumentation today plays an even more pivotal role than ever before.

SPECTRO offers a complete range of instruments for monitoring and analyzing sulfur as well as many other elements at every stage of the production process. Typical applications range from online or batch analysis of crude oil through to high-performance analysis for the certification of finished products and online analysis at distribution sites. All SPECTRO sulfur analyzers are reliable, fast, accurate and easy-to-use. The analyzer most suited for any particular application is normally chosen on the basis of the refinery product and the sulfur content limits that apply, the nature of the measurement to be taken, and the speed with which measurements must be made.

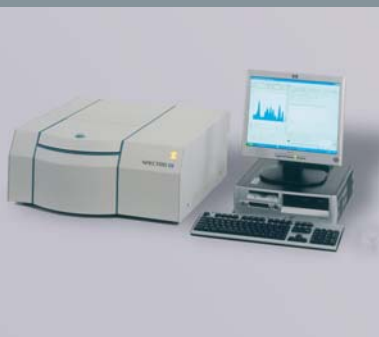


Whether manual or fully automatic... for use in the field or laboratory... flexible multi-element analyzers or highly specialized instruments for measuring extremely low-sulfur concentrations: SPECTRO has the ideal solution for every application in the petrochemical industry.



SPECTRO PHOENIX II

The SPECTRO PHOENIX II is a portable, energy-dispersive X-ray fluorescence (XRF) analyzer using polarized excitation for measuring sulfur levels in crude oil and fuels. Easy-to-use and reliable in operation, it is the ideal instrument for measuring concentrations from low ppm up to percent levels.



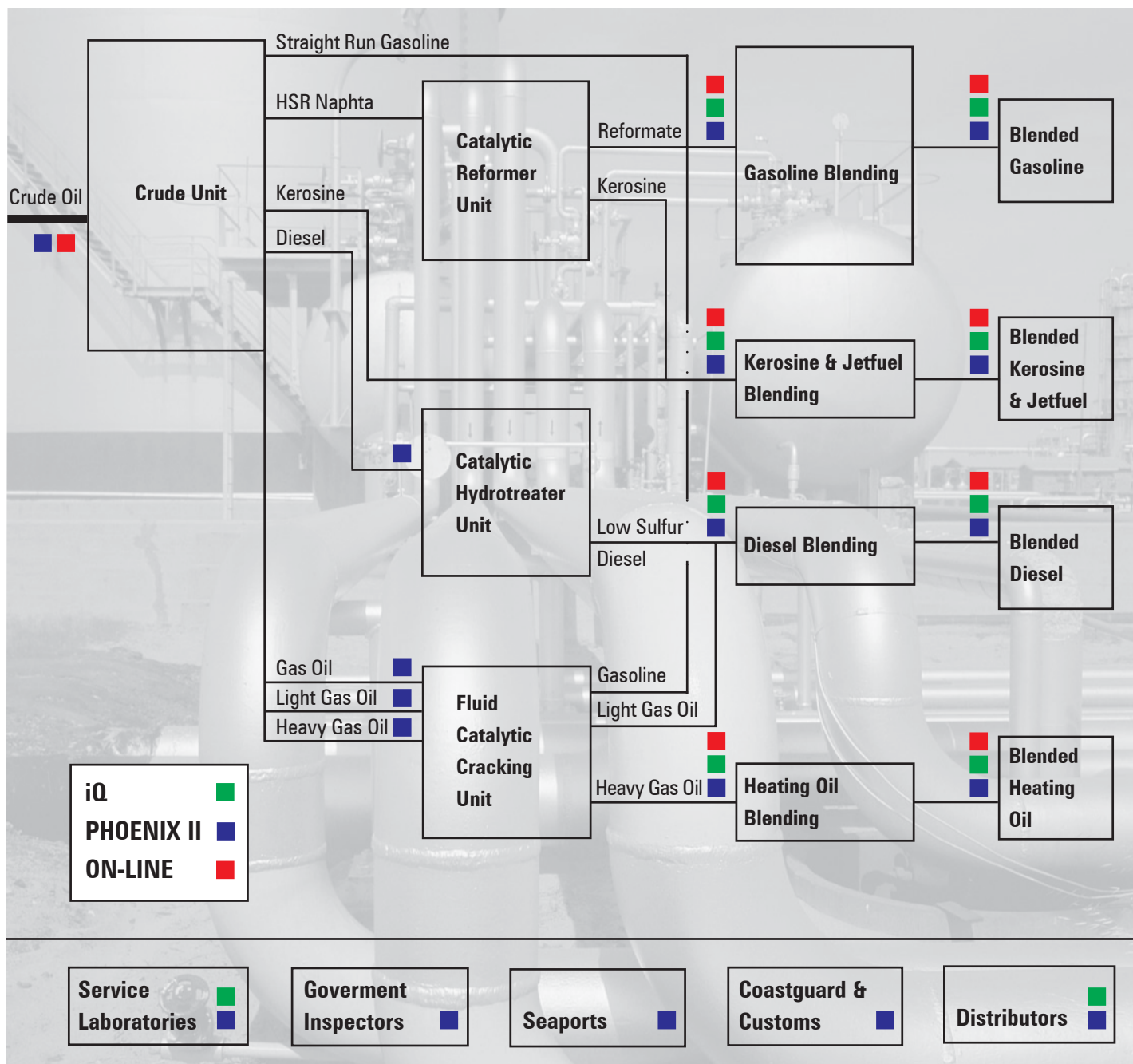
SPECTRO iQ

The energy-dispersive SPECTRO iQ XRF system features third generation polarized excitation. This allows it to achieve performance equivalent to that of significantly more expensive, and difficult to operate, wavelength-dispersive XRF instruments in the analysis of sulfur and other elements. It is ideal for analyzing intermediate and final petrochemical products. Its detection limit for sulfur in fuels is below 1 ppm, allowing the control of sulfur content in ULSD and other elements of interest.



SPECTRO On-line Systems

SPECTRO on-line sulfur analyzers include several instruments capable of handling a variety of tasks. In addition to a X-ray transmission/absorption (XRT/XRA) version with a high-pressure cell for sulfur analysis of crude oil flows, other instruments include XRF versions featuring low-pressure cells for sequential measurement of up to seven sample flows, and an instrument fitted with an electro-chemical detector capable of analyzing ultra-low sulfur levels. It has a detection limit of < 0.1 ppm.



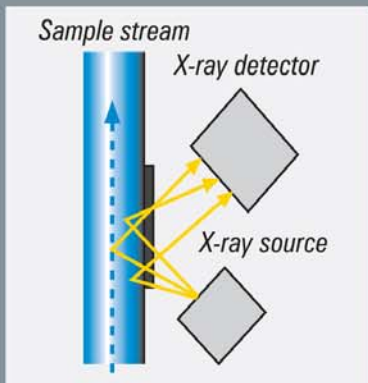
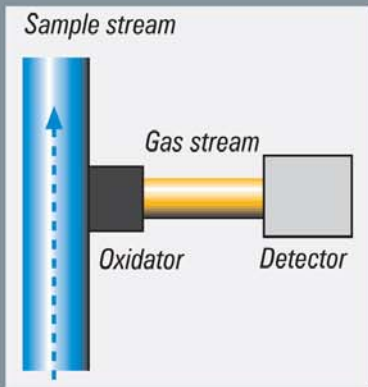
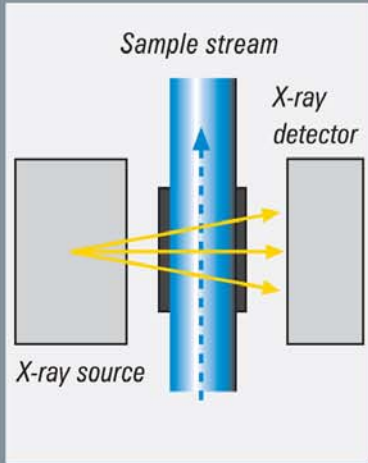
These SPECTRO instruments meet the requirements of ASTM and ISO along with the Energy Institute (IE), formerly Institute of Petroleum (IP). XRT/XRA, XRF and E-Chem are recognized as standard methods.

Application	Process High Pressure	Process Low Pressure	Lab/ Benchtop
Pipelines/Crude	X		X
Terminals	X	X	
Storage			X
Refinery Operations		X	X
Refinery Labs			X
Blending	X	X	X
Reformulated Gasoline		X	X
Finished Product QC		X	X
Independent Lab			X
Field Testing			X
Lubricants			X

	EDXRF SPECTRO iQ	EDXRF SPECTRO PHOENIX II	Online EC SPECTRO 682P-EC
ASTM D7220	X		
ASTM D4294*/**	X	X	
IP 532	X		
IP 496	X	X	
IP 336	X	X	
ISO 8217	X	X	
ISO 20847	X	X	
ASTM D6920			X

**Online HP SPECTRO 682T-HP - Meets performance criteria of ASTM D4294 above 2000 ppm sulfur
 *Online LP SPECTRO 682T-LP - Meets performance criteria of ASTM D4294

Technology



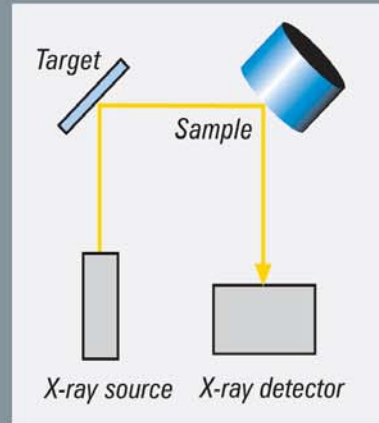
XRT technology is primarily used for online measurements of sulfur at high pressures and temperatures, such as are typically found in the transport of crude oil. The excitation and the source are located opposite one another, while the sample flow passes between them. A measurement is taken of the portion of the X-ray radiation that is absorbed by the sulfur.

In the E-Chem technique, the sample flow is fed to a thermal oxidizer that generates a flow of gas. An electro-chemical detector measures the sulfur dioxide level in this flow with great precision. It is well suited for ultra-low sulfur monitoring.

In contrast, the excitation and detector in the XRF technique are located at a common window to the measured flow (on-line) or to the sample (manual). In this case the secondary radiation emitted by the element is measured in response to excitation by the X-ray radiation.

SPECTRO's polarized excitation technology is in a class of its own not only for more demanding applications, such as ultra-low level sulfur, or trace metals, as it

combines benchtop size with traditional high power XRF performance. This is achieved by modifying the excitation from the tube by "reflecting" it from a polarizing crystal. This procedure effectively reduces background signals by up to an order of magnitude, and therefore achieves extremely low detection limits.



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