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Les Kane, Editor

Consider MRA

About five years ago, Invensys introduced what we considered to be an innovative online process analyzer based on nuclear magnetic resonance technology (see "*HP* Innovations," March 1998, p. 35) which it calls magnetic resonance analysis (MRA). As with most new technologies, the analyzer took a while to catch on. Now with over 20 installations, the benefits of MRA are being documented.

Invensys recently held a series of seminars entitled, "Managing Your Business Performance in Refining and Petrochemicals." I attended one in Houston. In addition to MRA, the seminar presented benefits of the company's advanced control and optimization solutions. The advanced control and optimization software offerings have been discussed before, so I'll focus on how MRA can increase benefits from advanced control and optimization projects.

Basic principle. Passing a hydrocarbon sample through a magnet causes magnetic moments generated by the spinning of hydrogen atoms to align. A pulsed radio frequency (RF) signal is introduced in a coil around the sample. This causes the sample to generate an RF signal corresponding to the resonant frequency of the hydrogen structure, providing a picture of it. Physical and chemical information can then be determined. Since the measurement is noninvasive, all of the sample can be returned to the process (Fig. 1).

The analyzer is claimed to offer fast response (typically two minutes) and low maintenance compared to other analyzer technologies. A single analyzer can measure multiple properties. It provides a direct molecular measurement, so no inferred predictions are needed on critical measurements. Since it is a first-principles measurement, it requires only simple linear models and can predict compositions outside the normal operating range. Direct property correlation provides high-accuracy data for precise control and good repeatability.

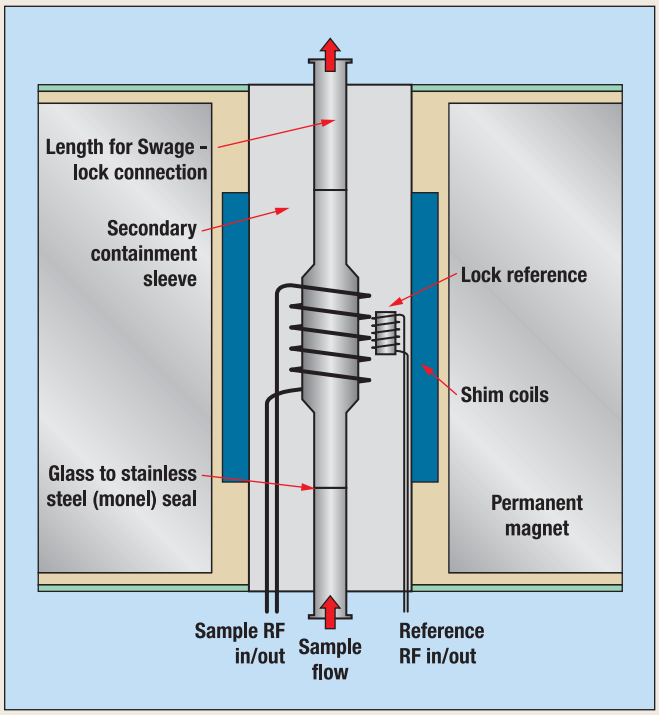

Fig. 1. MRA provides fast, accurate online measurements.

HPI applications. The analyzer can measure a slew of chemical compositions and properties such as: octane, API gravity, ASTM distillation, cloud point, density, sulfur content, Rvp, viscosity, naphthalene content, pour point, PIONA, freeze point, tbp, water content, cetane, MTBE, TAME, flash point, aniline point, aromaticity, etc.

The analyzer has been applied to several refining and petrochemical processes. It can provide a crude assay in about two minutes, offering increased benefits for crude unit/FCC rundown advanced control and optimization, and crude switch control. It has been used to provide measurements for feedforward control and optimization of crude feed and blending, gasoline and diesel blending, naphtha feed and catalytic reformer octane.

The analyzer is claimed to provide accurate measurements of many hydrocarbon compositions and properties that have never been available online and in real time before. This aids in solving one of the major problems associated with advanced process control and optimization projects: getting accurate real-time measurements. Users report good payback from the analyzer primarily by improving return on these types of projects. For more information about the technology, visit www.process-nmr.com or www.foxboro.com/nmr. ■

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