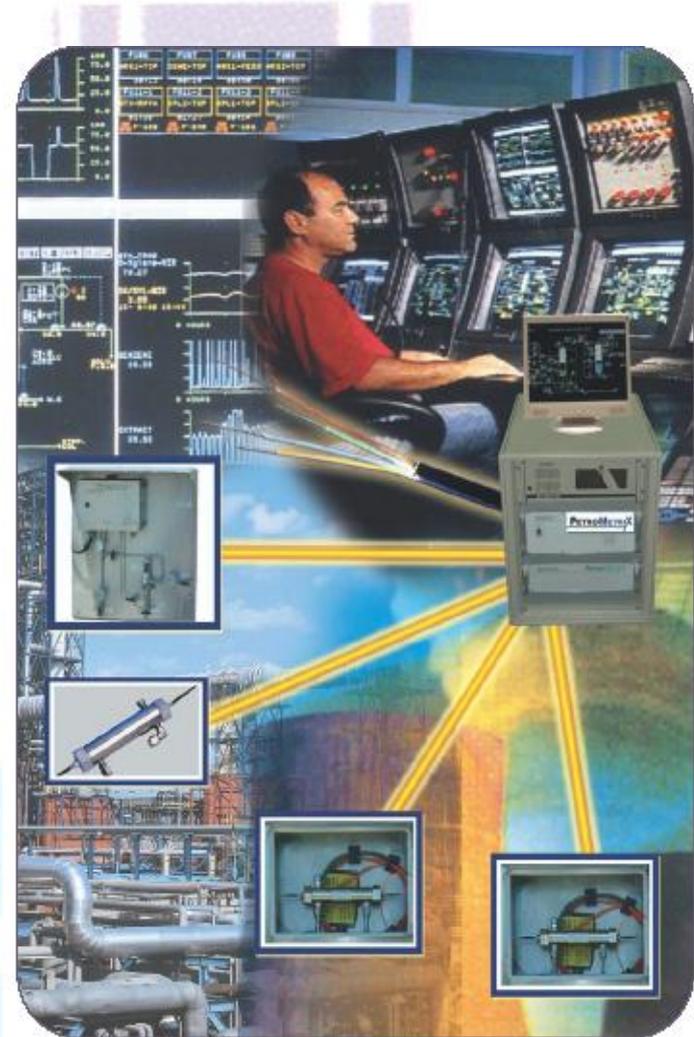


Application Note

On-line NIR Analyzer for HF Alkylation Process



HF Alkylation is an important refinery process in which isobutane is reacted with olefins to produce highly-branched isoparaffins for use in gasoline blending. In this process, hydrofluoric (HF) acid functions as the catalyst and recirculates through the reactor.

The recirculating HF acid catalyst is not pure; it contains a small amount of water and polymeric by-product formed during the alkylation reaction; that is frequently referred to as “acid soluble oils” (ASO) since it is miscible with the HF. The catalyst is also saturated with the hydrocarbons involved in the process (e. g., alkylate and isobutane). In the HF alkylation process, it is important to monitor and control the purity of the catalyst.

Introduction

Alkylate produced from Hydrofluoric Acid Alkylation Units has become a critical blending component in today's environment because of its high-octane gasoline blending and clean fuel burning characteristics. World wide demand for this fuel component has increased and is expected to continue to grow as international environmental regulations are implemented.

Process Analyzer

NIR analyzer for HF Alkylation process measures HF, water and ASO content. On-line monitoring allows to increase octane number in alkylate, optimize water contents and improve catalyst regeneration process. It helps to reduce harmful influence of HF on refinery personnel and to decrease the costs of manual sample grabbing and off-line analysis.

“All-in-One” Beacon-3000 is the most advanced system for NIR process analysis. This breakthrough emerged after many years of Research & Development and field experience, along with uncompromising efforts to find solutions that perfectly meet the needs of the petroleum processing industry.

The philosophy behind the “All-in-One” Beacon System is that plant-wide, multi-stream, multi-property measurement and analysis can all be carried out by a single central system. This is accomplished by multiple process stream Field Units, situated anywhere in the plant, connected to the Main Analyzer housed in the Central Equipment Room.

Easy to Install

The Main Analyzer is located in the Control Room, protected from the process environment. The Main Analyzer connects, via telecommunications fiber optics, to the Field Units, which are installed up to 3 km (2 miles) away, close to the process. Up to 8 Field Units can be connected to one Main Analyzer.

The Field Unit uses no electricity, and contains no moving parts. This 100% optical probe requires no explosion proof housing or analyzer shelter.

From light bulb and detector array to sample cell and digital communication, the Beacon is a

completely solid-state system – there are no moving parts. This makes it practically maintenance free – which translates into guaranteed up-time and lowest cost of ownership.

Little or no conditioning is required, further increasing the system’s reliability.

Easy to Calibrate

Start-up time is reduced to a minimum by simple and efficient procedure for tuning the calibration models. Thanks to our worldwide on-site support, your new Beacon System will be up and running after only a few days of commissioning.

Freetune software processes measurement results obtained by means of calibration model together with an application specific plant data, to accurately quantify the properties. Freetune includes guarding and correcting mechanisms to maintain the long and short-term accuracy required for confident close-loop process control.

Easy to Expand

Optical multiplexing capability enables to add more streams later to be measured by the same Analyzer, like: Isoparaffin component, additional gasoline components and gasoline product.

Measurement Results

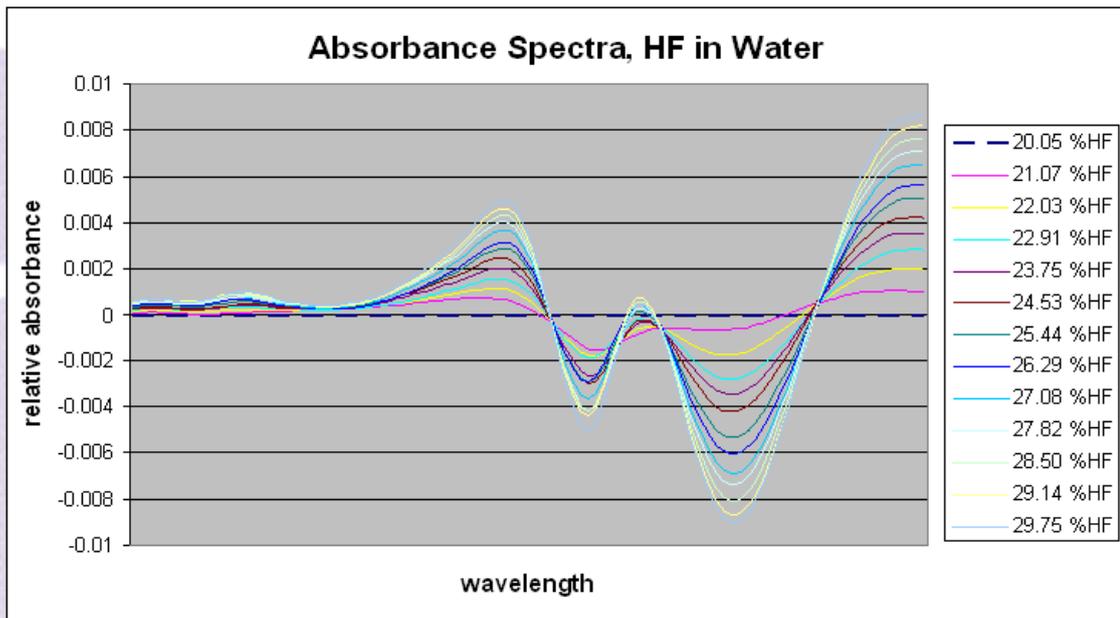


Figure 1: Absorbance Spectra of HF-in-Water solutions. Spectra have been transformed to emphasize the influence of small differences in HF concentration

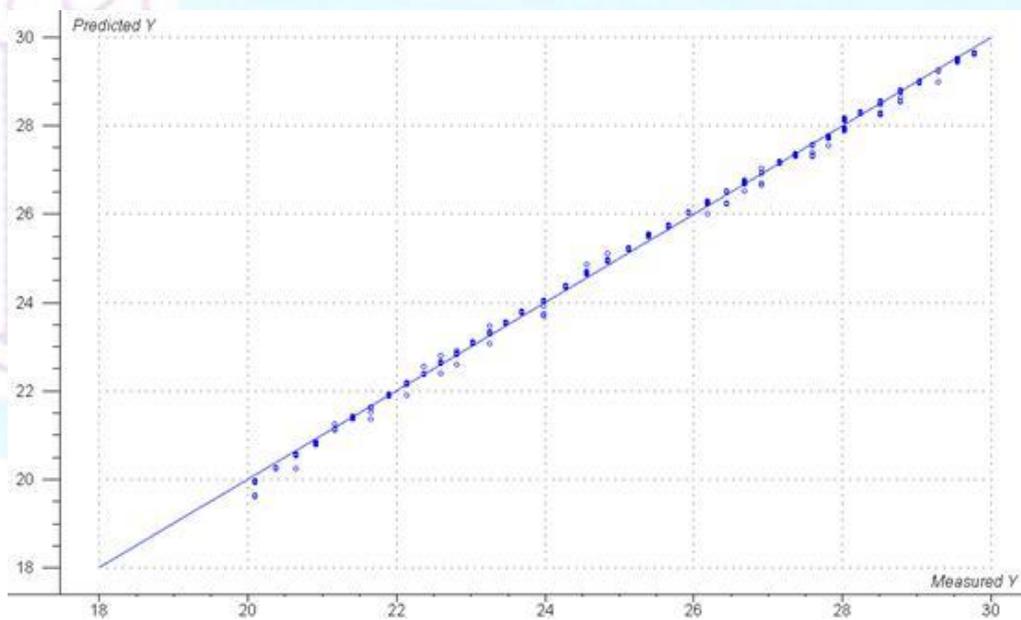


Figure 2: Validation - HF concentrations measured by NIR Vs Laboratory data

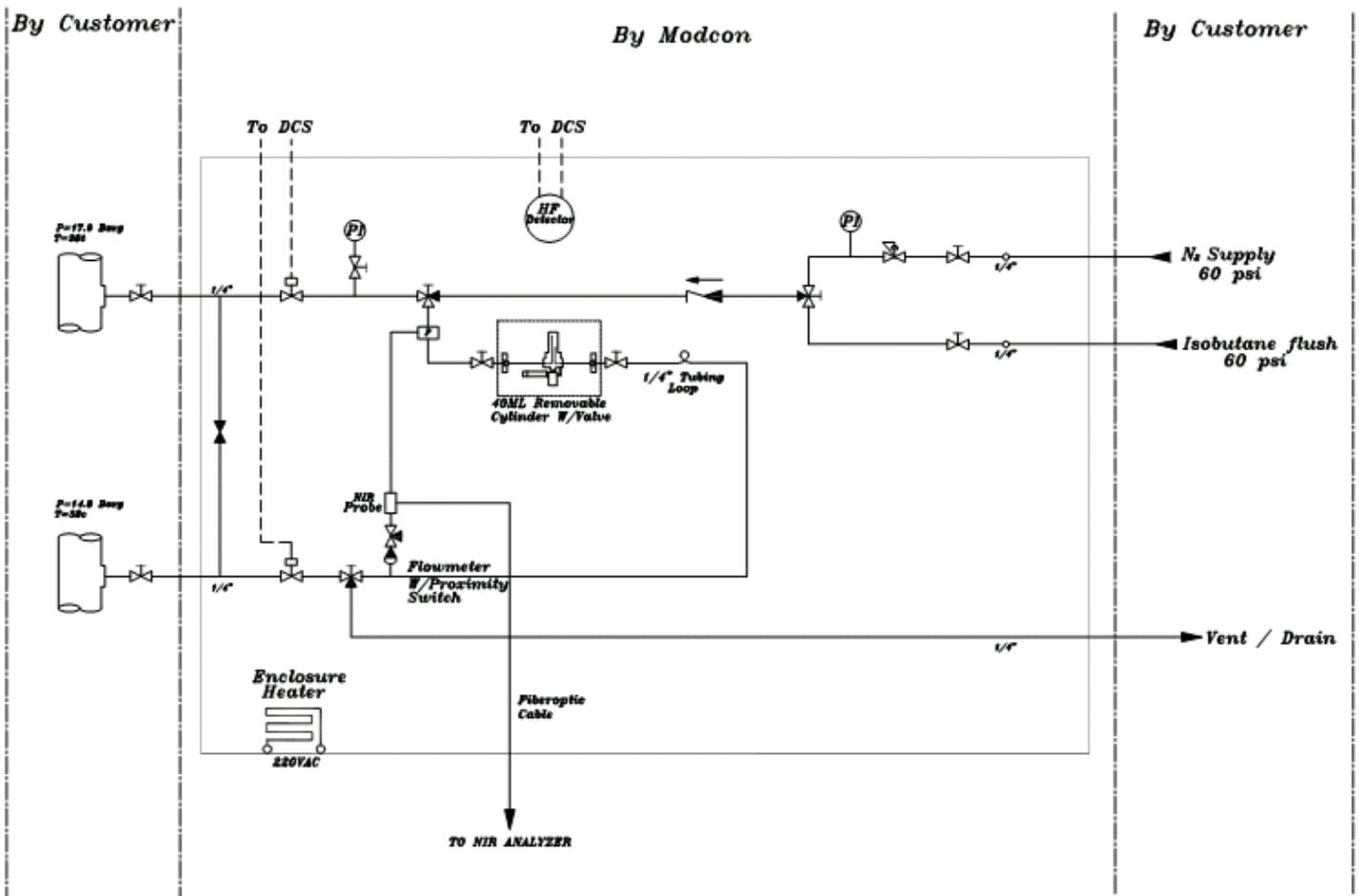


Figure 3: Schematic drawing of a typical diagram for HF alkylation process sampling system.

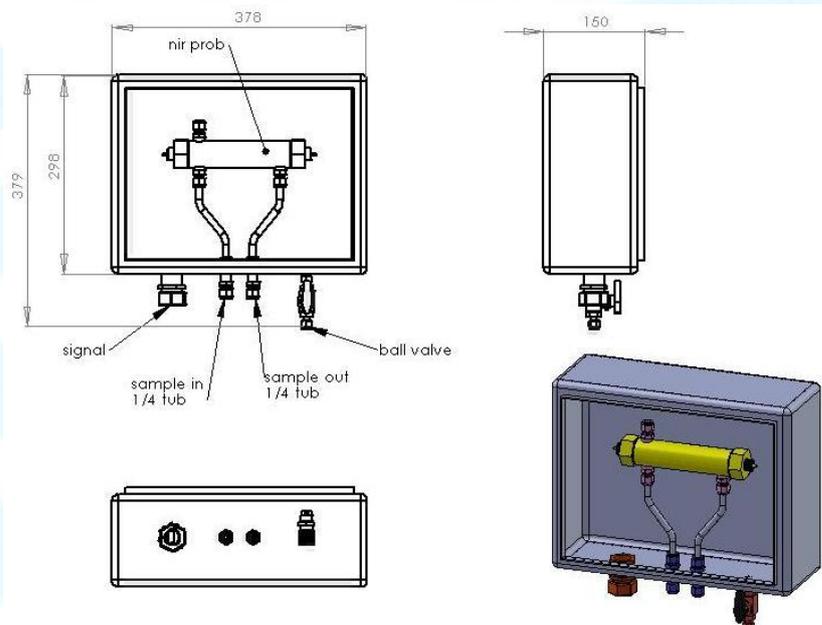
Flow Cell Specifications

Flow Cell body: Monel 400,

Hastelloy C (optional)

O-ring: Chemraz, Kalrez

Lenses: Sapphire



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