REACTOR ZONE MONITORING SYSTEM – RZMS FOR THE STRATCO® CONTACtor™ REACTOR

OPERATE WITH CONFIDENCE IN THE ALKYLATION REACTION ZONE WITH RZMS
The RZMS for the DuPont™ STRATCO® Contactor™ reactor allows operators to measure sulfuric acid to hydrocarbon ratio and sulfuric acid strength in the Contactor™ reactor more effectively than a typical ratio glass and acid sampling system assembly. The DuPont RZMS combines the features of an easy-to-read ratio glass, robust acid sampling system, refractometer, Coriolis meter, specially engineered piping, along with the DuPont expert knowledge of Contactor™ reactor operation to provide the customer with an effective tool to monitor the Contactor™ reactor performance. Too often, ratio glass assemblies function poorly, are difficult to use, are poorly maintained, or are removed from service.

Without this important information, alkylation unit operators must rely on secondary or delayed data (sometimes up to 4+ hours) to verify conditions in the reaction zone. Acid sample data is often available in other parts of the unit, but may not represent current operating conditions. Many times when problems develop, the lack of real-time information (acid strength in the reactor, accurate acid/hydrocarbon ratios, etc.) can lead to decisions that exacerbate the problem rather than correct it. The consequences of these decisions will not only impact the unit economics, but may also create an unsafe work environment.

The RZMS unit will give you more confidence in operating the alkylation unit especially at lower acid strengths and will help to avoid acid run-away.

COMMON PROBLEMS ASSOCIATED WITH IMPROPERLY DESIGNED, POORLY INSTALLED AND POORLY MAINTAINED RATIO GLASSES:
- Data is not available in the DCS.
- Leaking isolation valve prevents a representative acid to hydrocarbon ratio measurement.
- Incorrect layout and/or installation prevents a representative acid to hydrocarbon ratio measurement.
- Assembly corrodes and is taken out of service.
- Darkened ratio glass makes readings difficult or impossible.

COMMON PROBLEMS ASSOCIATED WITH SOME ACID SAMPLING SYSTEMS INCLUDE:
- Sample procedure is complicated.
- Potential safety issues and operator exposure.
- Plugged piping prevents acid sampling.
- The sample system may be installed with multi-turn valves with easily damaged seats.
- The sample system may be installed on run-down acid piping, which is not necessarily representative of reaction acid due to time delay.

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Stratco® Has Developed the RZMS Which Has the Following Features and Benefits:

- **A Window into the reactor**
  - Ratio glass allows operators to clearly see the emulsion circulating inside the Contactor™ Reactor
  - Allows for analysis of emulsion characteristics, acid color, emulsion break time, and acid to hydrocarbon ratio
  - LED illuminator provides excellent back-lighting
  - Safe, closed-loop acid sampling
  - Sample bottle vent ensures the sample is depressurized
  - Vented hydrocarbon vapors are routed to the acid are header, preventing releases to the environment
  - Acid sample is contained in a sealed bottle, preventing unnecessary exposure to operations personnel or release to the environment
  - Sample size is small to reduce exposure potential
  - Acid sampling instructions are simple, easy-to-read, and locally mounted

- **Online acid strength monitoring**
  - Refractometer continuously measures sulfuric acid strength (wt%) and temperature which are displayed at the RZMS unit and can be displayed at the DCS
  - Real-time, representative reaction zone data allows operations to optimize product quality, reduce acid wastage, and avoid acid runaway conditions

- **Online acid to hydrocarbon ratio monitoring**
  - Coriolis meter continuously analyzes the emulsion properties and transmits both acid to hydrocarbon ratio (output as % acid) and density at the RZMS unit and at the DCS
  - Real-time, representative reaction zone data allows operations to monitor reaction conditions, and avoid hydrocarbon continuous emulsion conditions

- **Operations panel**
  - Local mounted stainless steel panel
  - Simple, easy-to-read, permanently etched and painted operating instructions
  - Dedicated mounting area for refractometer and coriolis meter transmitters provides operators with real-time operating data in the field
  - Pre-calibrated acid to hydrocarbon ratio scale adjacent to the ratio glass for accurate operator reference

- **Diagnostics to help with acid runaway**
  (see Example2 on page 4).
EXAMPLE 1: NORMAL OPERATION

REDUCE OPERATING COSTS WITH BETTER CONTROL

— Alkylate Production = 10,000 BPD
— Fresh Acid Cost = $150 USD/short ton
— Fresh Acid Strength = 99.2%
— Target Spending Strength = 90%
— Actual Spending Strength = 91%

PROBLEM:
• Actual acid spending strength is higher than the target acid spending strength.

SOLUTION:
• Installation of the new RZMS allows fine tuning of the acid spending strength such that the target acid spending strength can be achieved confidently and reliably. In this example, acid consumption can be reduced by 1,500 ton/year, resulting in acid savings of $229,950 USD/year. Savings will be greater if fresh acid strength is lower.
EXAMPLE 2: ACID RUNAWAY
PREVENTION IS THE KEY

PROBLEM:
- Changes in reaction zone operation, drop in reaction temperature and drop in Contactor™ motor amps, purple alkylate.
- Sample from the Acid Settler stilling zone sent to lab; hours later, acid sample is 89% (target is 90%).
- Fresh acid rate is increased to raise acid spending strength; olefin charge rate increased to raise reaction temperature back to normal operating range.
- Sample from the Acid Settler stilling zone sent to lab; 4 hours later, acid sample is 65%; operation of alkylation unit has become erratic.
- ACID RUNAWAY!

SOLUTION:
Installation of the new RZMS provides on-line acid strength and acid to hydrocarbon ratio measurement, as well as safe acid sampling capabilities directly at the Contactor™ reactor. This real-time view of critical alkylation reaction zone parameters coupled with the ability to set critical alarms can reduce the potential for an acid runaway.

Acid runaway will result in lost production and increased acid consumption. An acid runaway could potentially exceed $10 Million USD considering damage from corrosion and loss of containment.

WORLDWIDE SALES AND SUPPORT

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