DCU Process Control

Protecting Critical Investments & Optimizing Process Control
with Advanced Temperature Measurement Systems

Presented By: Taylor Fama
Regional Technology Manager
AGENDA

I. Intro to Daily Thermetrics
II. DCU Applications
   I. Fractionator
   II. DCU Furnace
   III. Coke Drums
Daily Thermetrics

ISO : 9001 CERTIFIED
QUALITY ASSURANCE

Since 1973
Global Headquarters &
Manufacturing in Houston, TX
## Importance of Temperature

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Coker Fractionator: Example

Traditional TC-TW Assemblies
Coker Fractionator: Example

CatTracker® Thermometry Systems
DCU Fractionator: Downcomer Section
CatTracker® Multipoint Technology

- Snug/Not fixed fitting
- Plunger & Packing protect process bypass
DCU Fractionator: Example

Components
DCU Fractionator: Structured Packing
CatTracker® Multipoint Technology
DCU Fractionator: Wash Bed Section

CatTracker® Multipoint Technology

TI can profile under distributor head

TI can profile *under* or *in* the wash bed
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SHEATH GUIDE CLIPS

PURPOSE #1: TO ALLOW FOR THERMAL EXPANSION WITHOUT SUBJECTING TSTC WELDS TO STRESS.
PURPOSE #2: TO MAINTAIN SHEATH CONTACT WITH PROCESS TUBE/PIPE FOR THERMAL COOLING PROPERTIES.

EXPANSION COILS

PURPOSE: TO ALLOW FOR THERMAL EXPANSION WITHOUT SUBJECTING TSTC WELDS TO STRESS.
- Specially designed for each furnace depending on growth rate and direction.
- Type of tube skin engineering division depends on growth rate.

PROCESS TUBE/PIPE

FEEDSTOCK FLOWS THROUGH PROCESS TUBE/PIPE.

RECOMMENDED: PRECISION SHEATH BENDS

PURPOSE: TO PROMOTE EXTENDED TUBE LIFE AND TO MINIMIZE SHEATH STRESS.
- Precision bends are performed by trained TUBE SKIN ENGINEERING Field Engineers to properly route and align thermocouple sheath without unnecessary stress to the thermocouple sheath.

INSULATED HEAT SHIELD

PURPOSE: TO PROTECT THE THERMOCOUPLE TIP AND JUNCTION FROM BURNER FLAMES.
- Burner flames can cause inaccurate (higher) temperature readings and premature thermocouple failure.
- All heat shields are insulated to provide maximum protection from flame impingement.

IMAGE BELOW: Furnace and internals for illustration purposes only. Not drawn to scale.
DCU: Furnace Tube Skin TI

Engineered Solutions

KNIFE-EDGE™ TIP
with optional Heat Shield

SLOTTED SQUARE PAD
with optional Heat Shield

EZ-PAD™ REPLACEABLE
with optional Heat Shield

"EXTRACTABLE PROBE" PAD
with optional Heat Shield

TUBE SKIN ENGINEERING
A DIVISION OF DAILY THERMETERS

* HEAT SHIELD is removable during Thermocouple replacement & is attached to EZ-PAD.
** EZ-PAD is permanently welded to the process tube.

** HEAT SHIELD and GUIDE TUBE PAD are both permanently welded to the process tube.
DCU: Furnace Tube Skin TI

Engineered Solutions

- SENSOR WIRE MATERIAL
- SHEATH OUTSIDE DIAMETER
- SENSOR TIP SELECTION
- SENSOR WIRE TRANSITION DESIGN
- HEAT SHIELD
- FIRE BOX TEMPERATURE
- SENSOR ENTRY LOCATION
- PROCESS TUBE THERMAL COOLING
- PROCESS TUBE SCALING
- FLUE GAS COMPOSITION
- SENSOR WIRE DIAMETER
- WELDING OF TIP
- ROUTING OF SHEATH
- SHEATH MATERIAL
- WIRE GROUNDING
- SHEATH WALL THICKNESS
- THERMAL EXPANSION
- SHEATH ROUTING CLIPS
TUBE SKIN THERMOCOUPLE FAILURES

Improper Design
TUBE SKIN THERMOCOUPLE FAILURES

Lack of Professional Installation
TUBE SKIN THERMOCOUPLE APPROACH

Engineered Solutions for Heaters, Furnaces, & Boilers

APPLICATION Based Approach

1. Identify Heater process type and design

2. Gather Data, Run Diagnostics and Analyze Temperature Trends

3. Design/Re-Design based on accumulated Data

4. Supervise Installation by experienced Heater Specialists

4-Step Approach
Feed Lines

• Coke fines and particulate promote an erosive environment, creating accelerated wear on internal components, specifically thermowells

  • Reduced temperature visibility

  • Safety concerns when primary seal is breached

• Proper metallurgical selections can mitigate this degradation process to extend the working life of thermowells and temperature sensors through extended runs
High Hardness TWs: Options
Coating Methods & Solid Tip

• Spray and Fuse
• Welded Overlay
  • Tungsten Inert Gas (TIG)
  • Plasma Transfer Arc (PTA)
  • Laser Cladding
• Solid Barstock
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WELD & BOLT Surface Sensor Pads

Conventional Designs for Coke Drum Monitoring

COMMON ISSUE: TRENDING LOWER THAN TRUE TEMPERATURE

TYPICAL / COMMON
WELDED “PAD TYPE” SENSOR

TYPICAL / COMMON
BOLT-ON “ WASHER TYPE” SENSOR

Vessel Skin Sensors Designed for Maximum Acquisition Savings

Requires Successive Welding Each Time Sensor Fails
VSS™ Weld Once: Interchangeable
Engineered Solutions for Vessel Skin Surfaces

WELD PAD: Welded during vessel fabrication.

INSULATION INSERT: Designed to extend to the exterior of insulation.

SPRING COMPONENT

THERMOCOUPLE

Temperature Measurement Solutions
VSS™ MAGNETIC: NO WELD Sensor

DCU: Coke Drum Monitoring

Spring Loaded Easily Replaceable TC

Remote Mount Head Only (not shown)

Insulated Magnet

Specially Engineered Magnet Rated to 1004°F Continuous Operation!
VSS™ MAGNETIC: NO WELD Sensor

DCU: Coke Drum Monitoring
• Process Pipelines
  – In a further effort to proactively detect early coking, pipe clamps with multiple concentric sensing locations can help detect coking on the coker inlet pipe
Temperature critical applications can benefit from improved accuracies, stability and extended life. This allows for tighter process control.

Daily Thermetrics’ Premium™ Line thermocouples are manufactured using proprietary CatTracker® procedures to provide accuracy up to 4x that of standard industrial grade thermocouples.
Delayed Coking Unit