

Daily Thermetrics, a division of Daily Instruments Corporation, is internationally recognized for its excellence in designing, engineering, manufacturing, and delivering superior products to the demanding needs of our customers. The engineering staff and personnel at Daily Thermetrics are highly trained and dedicated to solve the problems and meet the challenges presented by the Refining & Petrochemical Industry. Clients around the world have relied on Daily Thermetrics' experience and expertise for over 35 years. Daily Thermetrics' world headquarters is in Houston, Texas, USA.



DAILY THERMETRICS CORPORATION

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FCCU TEMPERATURE INSTRUMENTATION

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Daily Thermetrics Product Offerings



DAILY
THERMETRICS

Exceptional TEMPERATURE MANAGEMENT for Catalyst Cracking Units

Enhancing yesterday's FCC's with MODERN Temperature Monitoring Technologies

Daily Thermetrics, a global provider of temperature instrumentation solutions for the refining industry, specializes in *designing, engineering, and manufacturing* superior **Fluidized Catalytic Cracking (FCC) thermometry**. Daily Thermetrics is trusted both by major process licensors and end-users as an approved and/or mandatory supplier for critical monitoring and control instrumentation relating to the FCC unit. *Every Daily Thermetrics' product is backed by a promise to all our customers that we will exceed expectations for the safest, most reliable temperature instrumentation (TI) available anywhere.*

Cyclone 'Exit Legs': monitoring *startup fouling* Direct-Contact, *Tube Skin* Thermocouples

Unit start-up is arguably one of the most critical periods for monitoring the FCC. Proper pressure and temperature balances must be met before injecting catalyst into the reactor and regenerator.

During start-up, **moisture buildup** within the mechanical components of the FCC can affect proper flow of catalyst between the reactor and the regenerator. Such moisture can eventually create a bridging effect that may develop into a blockage or **plugging of critical catalyst pathways**. The degree of blockage and amount of time before such a blockage is recognized can determine the severity of its effect. At a minimum, a change in the pressure profile between the reactor and regenerator balance must take place to prevent a pressure bump feeding back into the regenerator. More severe fouling may cause productivity limitations and environmental issues if not caught quickly enough.

Daily Thermetrics manufactures a temperature monitoring solution to **eliminate premature catalyst injection** with respect to moisture buildup within the cyclone's 'catalyst exit tubes'. Using a proprietary design to attach the temperature sensor directly to each of the catalyst exit tubes, Daily Thermetrics assures accurate temperature measurement in locations where moisture is known to collect during start-up of the FCC.



FIGURE 1:
FCC Cyclones &
Cyclone Exit Legs

Fractionator Column Achieving tighter control of *vapor separation cuts*

Separation of intermediate and finished products from the FCC reactor will play an essential role in the productivity and profitability of the overall processing unit. For process engineers, efficiently monitoring and controlling the FCC Fractionator and its temperature variations between each cut can heavily impact the expected product yields.

Daily Thermetrics manufactures all TI products expected to meet and exceed the requirements of each licensor's specifications including thermowells, thermocouples, and tube skin temperature sensors.

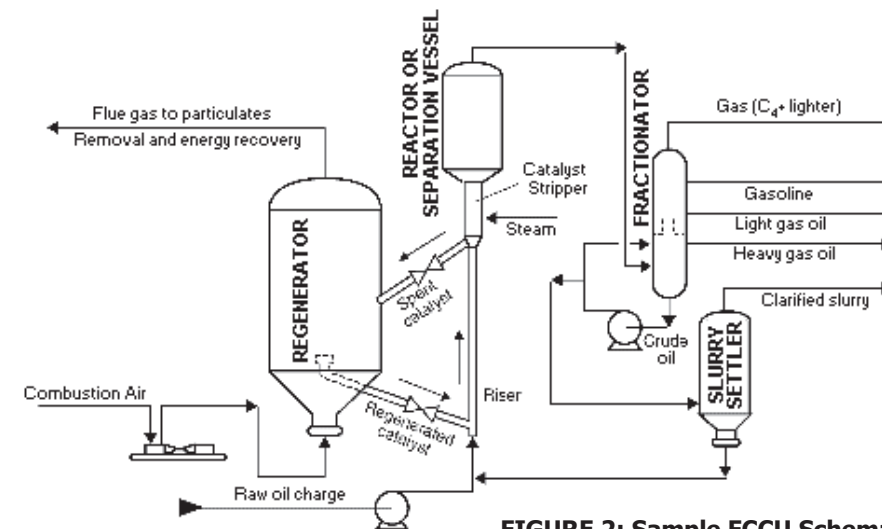


FIGURE 2: Sample FCCU Schematic

CatTracker®'s for Air Grids, Regenerators/Reactors, & Fractionators Flexible Temperature Sensors for Radial & Axial Temperature Profiling

AIR GRID

Identified as an increasingly important location for improved temperature measurement, refiners and licensors are specifying the CatTracker® in the Air Grid section of the FCC Unit to achieve a higher point density and provide a higher level of accuracy and precision.

REACTOR & REGENERATOR

Refiners requiring a more complete temperature profile within the FCC reactor and regenerator have the option to employ the CatTracker® system for increased process control within each vessel. Manufactured with a number of different materials, the CatTracker® can provide virtually unlimited options in sensor density and profiles.

FRACTIONATOR

Daily Thermetrics designs and manufactures a specialized version of the CatTracker® for direct monitoring of the Fractionator's separation cuts and liquid/gas temperatures. Both radial and axial profiling is achievable with the CatTracker® System. Custom engineered designs to address various tray arrangements, **random packing** and **structured packing** are easily accommodated with the CatTracker® system.

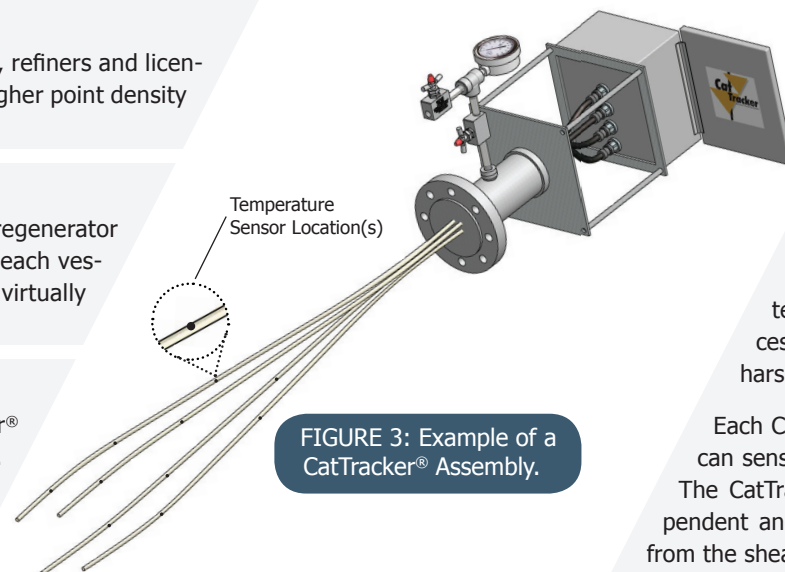


FIGURE 3: Example of a
CatTracker® Assembly.

CATTRACKER® TECHNOLOGY

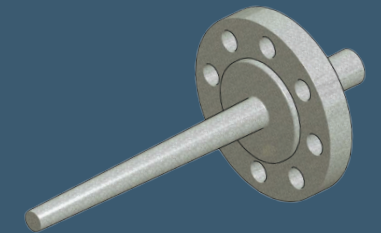
The **CatTracker® Catalyst Temperature Tracking System**, patented by Daily Thermetrics and first introduced commercially in 2001, is a *proven technology* with superior operational service over five continents profiling hundreds of reactors, regenerators, and fractionating columns.

The **CatTracker®**, employing patented aerospace thermocouple technology, offers the process industry the most rugged yet **flexible** temperature probes designed to be in direct contact with the process. CatTracker® temperature sensors are engineered to withstand the harshest environments and the most strenuous temperature demands.

Each CatTracker® probe consists of a mineral insulated (MI) cable which can sense temperature along its length at various predetermined locations. The CatTracker®'s **multiple temperature sensing points** are each independent and isolated from one another, while at the same time ungrounded from the sheath.

CatTracker® is a registered trademark of Daily Instruments Corporation. PLEASE NOTE THAT DAILY THERMETRICS' CATTRACKER® IS PATENT-PROTECTED BY U.S. PATENT #s 6,550,963 AND 6,599,011. IN ADDITION, THE CATTRACKER® IS CURRENTLY PCT PATENT-PENDING WORLDWIDE.

Cat Cracking with
STELLITE® THERMOWELLS
custom-coated or solid construction,
& what's best for the FCC



Erosive environments such as decoking (catalyst regeneration) and particle pulverizing (FCC reaction environment) require the use of high-hardness materials either via coated surface or solid construction.

Stellite® #1 and #6 are commonly used high-hardness metal alloys for thermowell applications in the FCC Unit. Daily Thermetrics can provide thermowells in these or other materials to assure maximum service life and optimum performance.

Daily Thermetrics' standard thermowell offerings for FCCU applications include:

HIGH-HARDNESS MATERIAL SOLID BARSTOCK CONSTRUCTION

For refiners **demanding the longest, safest run-life** from thermowells for erosive environments, Daily Thermetrics recommends using thermowells of high-hardness material (typically Stellite® #6), **solid barstock construction**.

Reviewing total cost of ownership, refiners increasingly agree that high-hardness solid barstock construction thermowells offer **the best return on investment for the FCC Unit**.

HIGH-HARDNESS MATERIAL COATINGS FOR THERMOWELLS

Refiners looking for a more economical way to specify thermowells for protection against erosion may opt for a stainless steel solid construction shank with a high-hardness coating such as Stellite® #1 or #6.

Daily Thermetrics offers a full selection of high-hardness coating materials for thermowells. Coating application methods offered by Daily Thermetrics include **weld overlay** and **spray-and-fuse**.

Typical high-hardness coating thicknesses available are 1/32", 1/16", and 1/8", depending on high-hardness material type, coating method employed, and/or customer requirements.

Stellite® is a registered trademark of Deloro Stellite Group