

PRECISE TEMPERATURE PROFILES FOR STABLE AMINE PROCESSES AT CHEVRON

A MODEL TC96-M MINIATURE MULTIPOINT THERMOCOUPLE FROM WIKA PROVIDES REAL-TIME DATA FOR OPTIMISED GAS TREATMENT



Image source: WIKA USA/Chevron

To make the operation of its amine contactors more efficient and stable, Chevron relied on measurement technology from WIKA.

The model TC96-M miniature multipoint thermocouple, developed by WIKA specifically for a refinery in Pascagoula, Mississippi, USA, measures the heat distribution along the column – the heart of the process in which CO₂ and H₂S are removed from the gas stream. In real time and without intrusion into the plant. The acquired data enable targeted control of the reaction zones, reduce energy consumption and increase operational safety.



Smart in sensing

Challenge

Process in focus

Gas treatment is one of the most energy-intensive steps in refinery production. In Pascagoula over 350,000 barrels of crude oil are processed daily – any inefficiency in the amine contactor column has an immediate impact on energy consumption, CO₂ emissions and product quality. To ensure stable reaction conditions, temperature profiles must be recorded precisely and monitored continuously.

Lack of transparency

Until now, engineers could only capture individual temperature values from the contactor column. These spot measurements did not allow any conclusions about the actual reaction zone. Whether the absorption had proceeded evenly or energy had been lost remained unclear. Without a complete picture of the heat distribution, precise process control was hardly possible – efficiency potential remained untapped.

Background: the amine column

- In the amine column, acidic gases such as CO₂ and H₂S are removed from the process gas.
- The chemical reaction releases heat and creates the “temperature bulge”, the temperature maximum in the column.
- An even temperature distribution indicates stable absorption.
- Deviations indicate process disturbances or energy losses.



Image source: WIKA USA

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Temperature data tell stories. Our task was to make these stories readable for Chevron and thereby open up a new understanding of efficiency.

Robert Torgerson,
Director of Technology and Applications

Solution

Making efficiency visible together

Chevron sought a solution that would capture temperature profiles in the amine column, fully and continuously, without intrusion into the existing plant. Together with WIKA, a system was created that unites precise sensor technology and process understanding. The customised model TC96-M miniature multipoint thermocouple was tuned precisely to pressure, medium and temperature gradients – a solution that could be integrated directly into the ongoing operation.

Innovation in detail

The developed system consists of a 20-metre-long stainless steel tube with 16 type K thermocouples, distributed across 14 measuring points along the column. The system was inserted through an existing nozzle with minimal installation effort and was thus ready for use in no time. The precise signals are transmitted to the process control system (PCS) and visualised there in temperature profiles – a direct view into the interior of the process.

The operating data show the temperature bulge and indicate (1) a sufficient – and possibly too strong – circulation, (2) an impending breakthrough and (3) an obviously insufficient circulation.

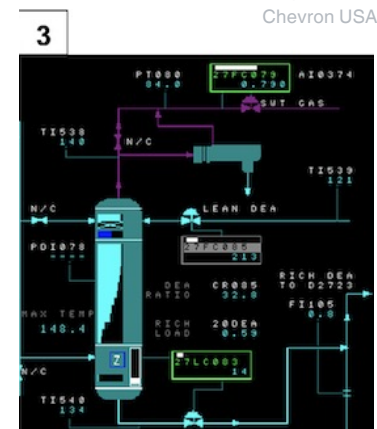
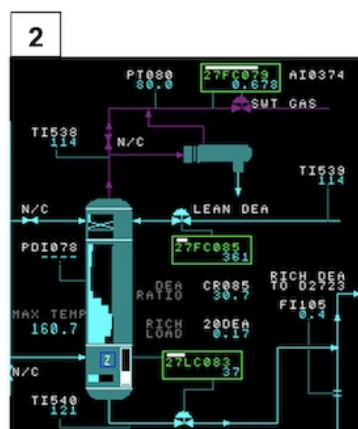
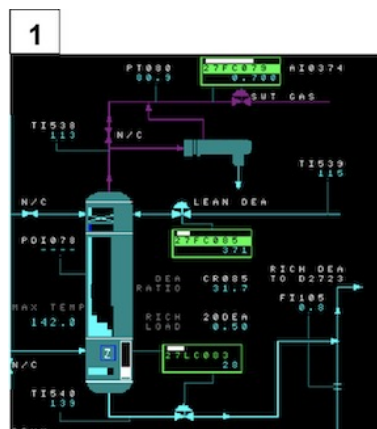
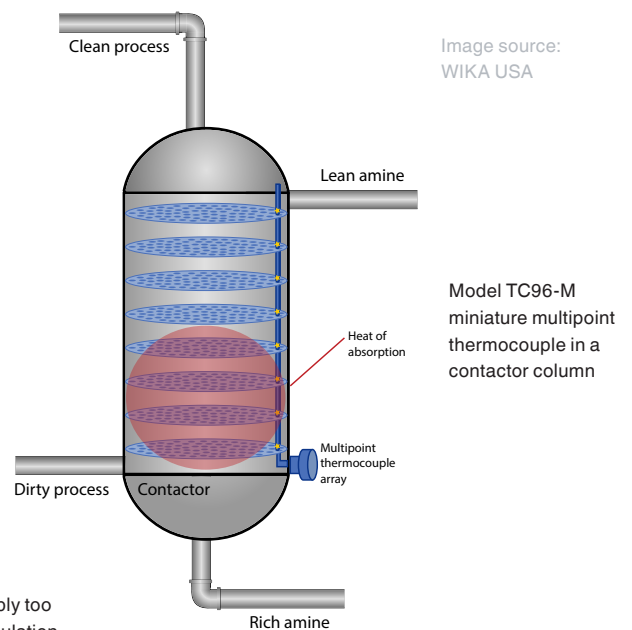


Image source:
WIKI USA



Model TC96-M
miniature multipoint
thermocouple in a
contactor column

Image source:
Chevron USA

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Our solution combines measurement technology with process understanding – that is true transparency inside the plant.”

Robert Torgerson,
Director of Technology and Applications

Solution

Customer-specific design

The model TC96-M miniature multipoint thermocouple was adapted, precisely, to the geometry and process conditions of the amine column in Pascagoula. Inserted through an existing nozzle, it could be fitted with minimal installation effort – a decisive advantage during ongoing production. Precise positioning along the column height enables a continuous temperature profile across all trays.

Robust sensor technology

The 20-metre-long measuring system comprises 16 ungrounded type K thermocouples, which are chemically resistant and vibration-compensated. This design prevents corrosion from amine solutions and ensures stable, precise readings even under heavily fluctuating process conditions. The sensors withstand high pressures and temperature fluctuations over long operating periods.

Model TC96-M miniature multipoint thermocouple

- Multipoint measurement over lengths of up to 20 m
- Ungrounded type K thermocouples
- Robust protective guides for chemically aggressive media
- Direct integration into process control systems
- Customer-specific design without plant downtime

Real-time data and integration

All temperature values are recorded continuously and transmitted in real time to the process control system (PCS). There, a temperature profile visualises the heat distribution along the column. This way, engineers can see at a glance where the reaction zone is and whether the process is behaving stably – a decisive step towards data-based process control and energy optimisation.

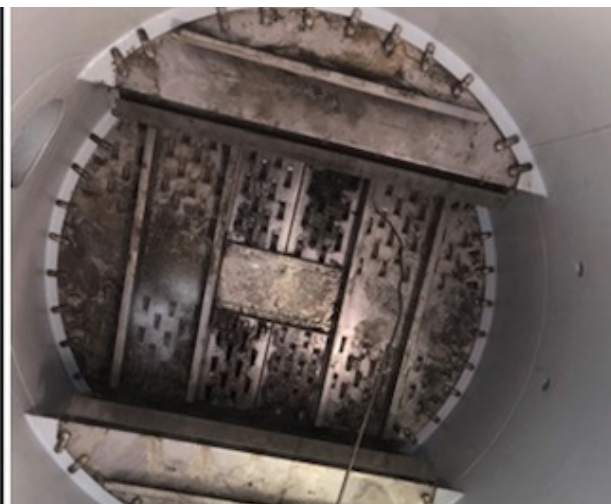
Ease of maintenance

The system is low-maintenance and designed for continuous operation in demanding chemical environments. During scheduled shutdowns (turnarounds) it can be easily dismantled, inspected and reinstalled. The sensors are embedded in robust protective guides that compensate for vibrations and minimise mechanical stress. As a result, the service life of the entire measuring unit is significantly extended.

Energy efficiency

The precise localisation of the reaction zone enables Chevron to control the circulation rate of the amine solution precisely. Steam consumption could thus be reduced by around 1,500 kilograms per hour. At the same time CO₂ emissions decrease, while process stability and product yield increase. A solution that combines cost-effectiveness and sustainability.

Image source:
WIKA USA



The 20-m-long model TC96-M miniature multipoint thermocouple was housed in a specially manufactured crate for transport.

Advantages at a glance

- **Full process transparency:** Precise temperature profile across the entire column.
- **Higher efficiency:** Reduced steam consumption by around 1,500 kg per hour.
- **More safety:** Real-time data enable early intervention.
- **Sustainability:** Lower CO₂ emissions and stable processes in the long term.
- **Low-maintenance:** Robust design for long operating periods and low costs.

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The system makes optimisation measurable and visible. Where experience once dominated, there is now data that builds trust.



Robert Torgerson,
Director of
Technology and
Applications

Image source: WIKA USA

Data builds trust

The combination of WIKA's precision sensor technology and Chevron's process know-how has taken the operation of the amine column to a new level. The system provides reliable data for more efficiency, safety and sustainability and creates the basis for data-driven process control. The successful implementation in Pascagoula now serves as a reference project for further Chevron sites worldwide.

Contact

Learn more about the model TC96-M miniature multipoint thermocouple from WIKA:

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