

## MANAGING FLOW OF CRUDE OIL ALONG 700 KM PIPELINE USING RAYCHEM STS

### PROJECT DETAILS

<b>Location:</b>	Mangala Development Pipeline (Barmer, Rajasthan to Salaya, Gujarat)
<b>Completion Date:</b>	June 2010
<b>Contract Scope:</b>	Pre-FEED, Design / Engineering, Supply, Supervision and Commissioning
<b>Applications:</b>	24" Crude Oil Transfer Heated and Insulated Underground Pipeline
<b>Technology:</b>	nVent RAYCHEM Skin-Effect Heat-Tracing System (STS) nVent RAYCHEM TRACER Turnkey Solutions



### KEY CHALLENGES

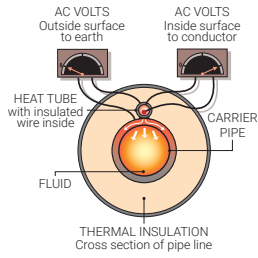
The Mangala Development Pipeline (MDP) Project involved a ~700 km long, 24" in diameter, underground pipeline that needed to transfer crude oil at an elevated temperature from the Mangala Processing Terminal at Barmer, to the Salaya Terminal (pigging and SEHMS station).

The trace heating challenges included:

- Maintaining the temperature of the pipeline above 65°C to ensure efficient flow of the viscous crude oil along the entire length of pipeline.
- Providing sub-stations at regular intervals throughout the length of the pipeline, for supplying power to the heating systems from on-site engine generators.
- Prove STS technology concept in the field on a section of 24" pipeline to show design calculations meet empirical data from the test.

### SOLUTION

nVent successfully integrated state-of-the-art technologies in a heat management system to offer safe, reliable and cost-effective crude oil transfer. The RAYCHEM STS is a versatile heat management system designed to deliver heat for pipelines that can be hundreds of kilometers long. Our TRACER turnkey solutions team with its expertise in construction testing and commissioning heat management systems, engineered and bundled multiple technologies, resulting in a world-class, safe, reliable and efficient electrically traced heated and insulated underground pipeline.

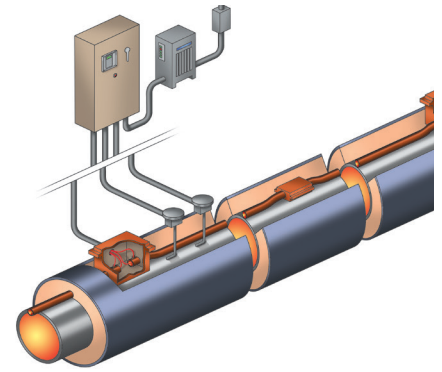


Cross section for typical single tube welded system

## PRODUCTS

To meet the needs of this challenging application, nVent employed the following heat management system:

- An efficient and safe RAYCHEM STS termed as SEHMS (Skin-Effect Heat Management System) in this project, which has high exposure temperatures and efficient heat transfer to the pipe.
- Components and accessories supplied included control & monitoring units, transformers, pull boxes, power connection kits, low profile end termination assemblies.
- Full service global procurement of materials, project management, supervision and commissioning of the system.



## BENEFITS

By utilizing nVent's heat management system, client's crude oil transfer pipeline received the following benefits:

- An efficient and safe system with no electrical potential on the surface of the carrier pipe or heat tube - only useful heat is transferred to the carrier pipe at very low temperature differentials.
- Using the unique properties of the cables, the power feed points for the heating system could be designed at a spacing up to ~18 km, thus keeping power distribution costs for the heating system to a minimum.
- Implementing the RAYCHEM STS technology not only minimized the number of circuits but also resulted in better heat transfer and low temperature differential between the pipe and the cable sheath, thus leading to a safer design.
- By assuming total responsibility of the heat management system, nVent ensured that the project was completed on time, safely and to the satisfaction of the customer.
- nVent's SEHMS are approved by reputed independent certifying agencies - ATEX and FM, for system voltage up to 5000 V and are in full compliance with IEEE:844-2000 standard.



nVent provided an optimum heat management system solution through careful evaluation of the insulation systems available to the project.

The Mangala Development Pipeline originates from Mangala Processing Terminal (MPT) in the Mangala field and passes through two states, Rajasthan and Gujarat and travels up to ~700 km before it reaches its end at the coastal location of Bhogat (distribution) terminal near Jamnagar on the western coast line of India and beyond. About 154 km of the pipeline is in Rajasthan and the rest in Gujarat. The MPT to Salaya section of the pipeline with its delivery infrastructure supplies crude oil to Indian Oil Corporation Limited (IOCL) and other private refiners and export facilities at Radhanpur and Viramgam. This pipeline passes through eight districts and 250 villages and over 700 crossings of various types, including large river crossings

As the inventor of self-regulating heat-tracing and other heat management system solutions, our RAYCHEM brand is recognized for technology leadership in the industries we serve. The industry leader in offering single source responsibility for heat management, nVent and the RAYCHEM brand are uniquely qualified to offer Skin-Effect Tracing Systems that combine system engineering and project management expertise with proven procurement, construction, and quality assurance capabilities.

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