Crude Distillation Unit Heater Lining Replacement with Pyro-Bloc® Modules

Industry: Petrochemical
Application: Crude Distillation Unit Heater
Product Solutions: Pyro-Bloc Modules
Location: South Korea

June 2021

Project Background

One of the world's largest oil refiners based in South Korea had a refinery turnaround and wanted to repair the duct of their #2 crude distillation unit (CDU) heater. This heater was very old, causing the temperature of the heater casing to be very high and inefficient.

Customer Needs

- Reduce temperature of heater casing and increase energy efficiency of heater's operation
- Simplify construction and apply latest refractory technology as it is not easy to conduct such revamps frequently

The Challenge

1) Hot spot at #2 CDU heater
2) Using infra-red thermal scanning, results showed a serious thermal efficiency problem at #2 CDU Heater

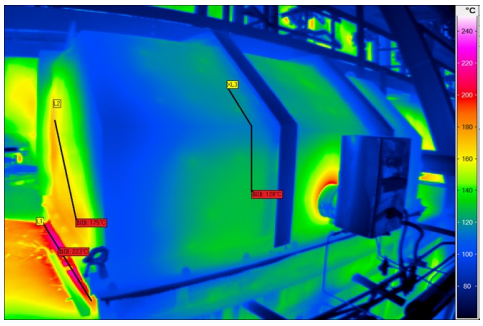

Figure 1: The hot spot reached a temperature spectrum of 130 - 250°C (266 - 482°F)

3) Continuous operation made inaccessible for inspections.
   - The inside of the heater was fully made of castables, which cannot be inspected due to its continuous operation.
3) Lack of detailed and accurate drawings
   - Heater was over 30 years old and no drawing details available.

Proposed Solution: Pyro-Bloc

- Lightweight, strong; exceptional performance-to-weight ratio
- Resistant to chemical attack
- High un-compressed densities give low thermal conductivity for effective energy savings
- Lubricated fibre allows increased compression and tight joints
- Hardening effect on first firing gives a tough hot face, resistant to mechanical damage and high velocity gas flow abrasion
- Easy installation; no dry-out required

To create the new linings and duct designs, the team, despite the hot surface temperature, put in full effort capture the dimensions by hand as there were no drawings.

The team's ability and commitment to the project paid off as competitors were unable to do it. The revamp solutions were presented to HDO with supportive evidence of heat flow calculation and drawings.

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Installation Process

Figure 3:

Demolishing original castable lining

Figure 4:

Measuring the distance for stud layout

Figure 5:

Welding studs for Pyro-Bloc Modules after marking with chalk lines

Figure 6:

Stainless steel foil vapour barrier being installed

Figure 7:

Installation of Pyro-Bloc Modules

Figure 8:

Completed installation

Solutions and Results

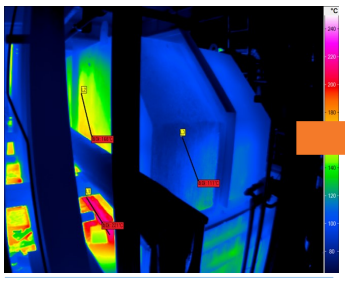

Figure 9:

Duct front & slope - Before

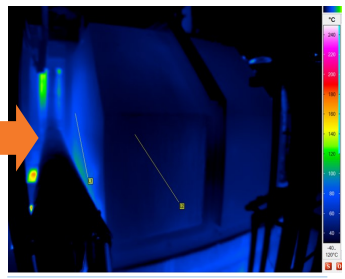

Figure 10:

Duct front & slope - After

CDU Area	Before	After	% reduction in surface temperature
Duct front & slope	114 - 131°C (237 - 268°F)	38 - 61°C (100 - 142°F)	50%-65%
Duct side	157 - 168°C (315 - 334°F)	83 - 112°C (181 - 234°F)	35%-45%

Note: Duct side is affected by the hot surface temperature of the radiant roof which has not been repaired, hence maintaining a higher surface temperature than the duct front and slope.

The project proved to be a success as the duct front and slope achieved a **50% - 65% reduction** in surface temperature from 114 - 131°C (238 - 268°F) to 38 - 61°C (100 - 142°F), while the duct side realised a **35%-45% reduction** in surface temperature from 157 - 168°C (315 - 334°F) to 83 - 112°C (181 - 234°F).

Three years after the revamp, the CDU heater continued to operate smoothly, and the Pyro-Bloc Module insulation lining continued to perform well.

Morgan Korea has gained recognition for their technology and engineering capabilities through this project and has generated more orders especially for Pyro-Bloc Modules from this customer.

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