CASE STUDY







IMPROVING RADIANT EFFICIENCY IN CATALYTIC REFORMERS

PROBLEM

Optimizing the operation of Catalytic Reforming Units is critical as these energy to provide the required heat for the process.

SOLUTION

Cetek partnered with PTTGC, Thailand, for a ceramic coating application in their CCR Platforming Heaters. Upon completion of the successful field results exceeded expectations and provided an excellent projected ROI over the lifetime of the coating.

Catalytic Reformer

The unit of this study is a 27,900 BPD, 4-cell catalytic reformer located in Rayong, Thailand. Each heater has wicket style radiant tube configuration. The metallurgy of the radiant tubes is ASTM A335 P9; 9%Cr, 1%Mo. The refractory lining is ceramic fiber walls and roof with brick floors. The fuel is gas. The initial evaluation required an IR thermography inspection and corresponding operating data from the time of the inspection. Design specifications and general arrangement drawings provided the necessary physical and dimensional data to complete the study.



Tube Scale Formation

The sample IR inspection image shown in Fig.1 provides an insight into the degree of scale formation and the surface temperature of the scale. As evident in the image, heavy scale presence was hindering heat transfer within the radiant section. To overcome the scale, the heater was fired harder leading to fuel wastage. Since natural gas prices are relatively high in this region, this was not a favorable situation and a solution was needed.





Results of Cetek IR Evaluation

The result of the Cetek evaluation was a recommendation that ceramic coatings should be considered for both tubes and refractory surfaces in all four cells. The calculated benefit showed that the improvement in radiant heat transfer efficiency would provide a significant absorbed duty improvement or firing duty reduction, with a generous return on investment over the anticipated life of the ceramic coatings.

As a result, GC have decided to go ahead with the ceramic coating application and plans were put in motion.

Application

Any coating application requires strict attention to surface preparation and protection of areas of the fired heaters where necessary. The 9%Cr process tubes were grit blasted with a proprietary surface profile, required by the ceramic coating. In order to maintain the blast quality, ambient humidity inside the heaters was controlled.

Cetek high emissivity ceramic coating was applied to the process tubes, ceramic fiber surfaces and the brick.



Coated Tubes and Refractory



Tube Scale



Blasted Tubes



Cetek Coated Tubes



Thickness Measurement on Coated Tubes

Sigs

Data Comparison | Before and After

PTTGC have reported significant improvements in their radiant section efficiency and fuel savings.

DATA	BEFORE COATING	AFTER COATING
Year	2015	2016
Capacity Increase	11.6%	
Fuel Savings	10.5%	

Conclusion

The application of ceramic coatings in this heater proved exceptionally beneficial to PTTGC. Whether utilizing the fuel savings or production increase benefit, the payback to PTTGC was superbly quick. The approximate 11% benefit is in line with historical Cetek benefit, which average around 7% efficiency improvement.

RESULTS OF THE APPLICATION

IR thermography analysis from before(left) and after (right) the application is shown below. The heavy scale present before is evident. Clean surfaces are observed one year after the coating application. This was calculated to provide a quick payout and considerable ROI over the expected life of the coating.



Before



After 1 year in service



Cetek Work in Progress



Completed Successful Application

Solution Provider

A division of IGS, Cetek deliver online and offline turnkey fired heater efficiency solutions, including:

- Process tube coating
- Refractory coating

Cetek's solutions facilitate significant operational improvements, including:

- Increased production
- Decreased energy consumption
- Reduced maintenance costs
- Improved reliability
- Significant reductions in CO₂ and NO_x emissions

Decades of experience, unparalleled customer support and commitment to excellence solidified their position as a global leader in fired heater maintenance.