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Over Cracking in Furnace and Corrective Action by Computational Fluid Dynamics (CFD) Analysis

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Abstract : Marun's petrochemical cracking furnaces have a very comprehensive operating control system for combustion and related equipment, utilizing advanced instrument circuits. However, after several years of operation, numerous problems arose in the pyrolysis furnaces. A team of experts conducted an audit, revealing that the furnaces were over-designed, leading to excessive consumption of air and fuel. This issue was related to the burners' shutter settings, which had not been configured properly. The operations department had responded by increasing the induced draft fan speed and forcing the instrument switches to counteract the wind effect in the combustion chamber. Using Fluent and Gambit software, the furnaces were analyzed. The findings indicated that this situation elevated the convection part's temperature, causing uneven heat distribution inside the furnace. Consequently, this led to overheating in the convection section and excessive cracking within the coils in the radiation section. The increased convection temperature damaged convection parts and resulted in equipment blockages downstream of the furnaces due to the production of more coke and tar in the process. To address these issues, corrective actions were implemented. The excess air for burners and combustion chambers was properly set, resulting in improved efficiency, reduced emissions of environmentally harmful gases, prevention of creep in coils, decreased fuel consumption, and lower maintenance costs.

Keywords : furnace, coke, CFD analysis, over cracking
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