

Fired Heater

Common Failure Modes and Preventive Actions



A refinery fired heater can fail due to several causes, and preventing these failures is crucial for ensuring the safety, efficiency, and reliability of the refining process. Here are some common causes of refinery fired heater failures and preventive measures:



1. Coking and Fouling:

- **Cause:** Accumulation of carbon deposits (coke) on the heater tubes, which reduces heat transfer efficiency.
- **Prevention:** Regular cleaning and maintenance to remove coke deposits. Proper fuel quality control to minimize impurities.

2. Overheating:

- **Cause:** Excessive temperatures due to poor combustion control, fouling, or burner malfunction.
- **Prevention:** Implement advanced control systems for precise temperature management. Regular inspections and maintenance to identify and address issues promptly.

3. Corrosion:

- **Cause:** Exposure to corrosive materials or high-temperature environments leading to tube or equipment degradation.
- **Prevention:** Select materials resistant to corrosion. Implement corrosion monitoring and protective coatings as necessary.

4. Burner Malfunction:

- **Cause:** Burner misalignment, wear, or blockage, leading to inefficient combustion.
- **Prevention:** Regular inspection and maintenance of burners. Use advanced burner management systems for optimization.

5. Flame Impingement:

- **Cause:** Flames directly impinging on the heater tubes, causing hot spots and potential tube failure.
- **Prevention:** Proper burner design and adjustment to avoid flame impingement. Monitoring flame patterns and adjusting as needed.

6. Fuel Quality Issues:

- **Cause:** Poor-quality fuel containing contaminants or impurities.
- **Prevention:** Ensure consistent and high-quality fuel supply. Implement filtration and purification systems.

7. Insulation Failure:

- **Cause:** Deterioration or damage to insulation materials, leading to heat loss and inefficiency.
- **Prevention:** Regularly inspect and replace insulation as needed. Use high-quality insulation materials.

8. Leakage:

- **Cause:** Gas or fluid leaks from pipes, valves, or other components, posing safety risks.
- **Prevention:** Implement robust leak detection systems. Conduct regular inspections and maintenance of all connections and seals.

9. Thermal Stress:

- **Cause:** Rapid temperature changes or uneven heating, leading to mechanical stress on heater components.
- **Prevention:** Implement gradual heating and cooling procedures. Monitor and control temperature gradients within the heater.

10. Operational Errors:

- **Cause:** Human errors in operation, such as incorrect settings or failure to follow procedures.
- **Prevention:** Provide comprehensive training for operators. Implement automation and safety interlocks to minimize human errors.

11. Age and Wear:

- **Cause:** Natural degradation of equipment over time, leading to reduced performance.
- **Prevention:** Regularly assess the condition of the heater and its components. Plan for timely equipment replacement or refurbishment.

12. Safety Systems Failure:

- **Cause:** Malfunction or failure of safety systems, leading to potential hazards.
- **Prevention:** Regularly test and maintain safety systems. Implement redundant safety measures for critical components.

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Preventive maintenance, advanced control systems, regular inspections, and a robust safety culture are essential for minimizing the risk of refinery fired heater failures and ensuring the safe and efficient operation of the refining process.