PRAXAIR

Making our planet more productive

The *SANDJET*™ Service: Furnace Tube Decoking

Overview Statement:

The *SANDJET* service rapidly removes coke and scale deposits from furnace tubes through low angle impacts of particles propelled by a high velocity stream of pure nitrogen gas. The cleaning material, usually steel shot, fractures the deposit from the furnace tube walls. The deposits and cleaning material are then carried away in the nitrogen stream.

When cleaning is complete the furnace tubes are left clean and dry with an inert nitrogen atmosphere and the *SANDJET* service is often the fastest method of decoking a refinery furnace When compared with other decoking methods such as hydraulic pigging or steam air decoking. There are many additional advantages including no need for water and no liquid waste generation as well as protection of your furnace tubes from damage and exposure to extreme temperatures associated with steam air decoking.

Praxair Services, Inc. (“Praxair”) has been performing the *SANDJET* service for furnace tube decoking since 1970 and we have the experience and technology to accurately estimate materials needed to effectively execute this service to your requirements.

- No water is required during the *SANDJET* service and no liquid wastes are generated
- Alleviates metallurgical concerns from water pretreatment
- Tube are not exposed to extreme high temperatures as often seen with steam air decoking
- Steel shot cleaning material does not damage tube walls

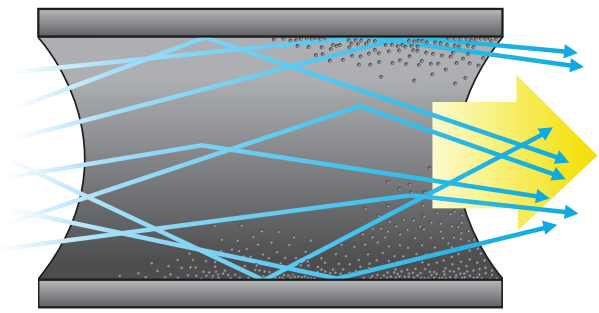
Specifications

Each *SANDJET* service opportunity is individually planned using engineering models and company expertise to accurately predict pressure/velocity relationships throughout the system and select the appropriate cleaning material. A pressure-drop profile is generated providing Praxair with key job parameters, including appropriate nitrogen flow rates and cleaning material feed rates.

Praxair's mobile equipment is then brought to the site. In most cases, three types of trucks are involved at the process inlet: one carries a nitrogen pumping unit and supply of liquid nitrogen, a second carries the cleaning material hopper with a supply of cleaning material, and a third carries additional liquid nitrogen.

Prior to cleaning, the furnace pass is flow-tested to confirm that there is no residual product in the system, establish a reference pressure-drop, and check for unsuspected obstructions.

SANDJET Cleaning Theory



The first cleaning run is performed by loading a calculated amount of cleaning material, usually a few hundred pounds, into the cleaning material hopper. An appropriate nitrogen flow rate is established throughout the system and cleaning material is fed into the injection head where it fluidizes with

the nitrogen and enters the system. The cleaning run continues until all cleaning material and debris are out of the system. The cleaning run process is repeated every few minutes until the system back pressure and observation of the discharge indicate that cleaning is complete. The illustration shows the *SANDJET* Cleaning Theory.

Applications

In the 1970's the *SANDJET* service was developed for decoking furnaces. It was proven that non-abrasive cleaning agent, normally steel shot, applied at the proper velocity can be safely used multiple times to decoke a furnace. Furnaces in a variety of refining and petrochemical process units are good candidates for decoking with the *SANDJET* Service. These include:

Refinery
Atmospheric Crude
Hydrotreaters
Hydrocrackers
Catalytic Reformers

Petrochemical
Vinyl Chloride Monomer
Ethylene Dichloride

Natural Gas and Other
Titanium Dioxide
Hot Oil Heater
Reboilers

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