Needle Coke Technology

Background

Needle Coke is a premium grade, high value petroleum coke used in the manufacturing of graphite electrodes of very low Coefficient of Thermal Expansion (CTE) for the electric arc furnaces in the steel industry. Only few companies in the world manufacture Needle Coke using own proprietary technology. Indian Oil R&D has developed a technology for production of Needle Coke from low value heavier hydrocarbon streams without any major feed pre-treatment.

Process Description

Production of Needle Coke requires specific feedstocks, coking conditions and calcination conditions. The hardware employed is similar to that of conventional Delayed Coker. Any heavier streams available in the refinery of lower sulfur content can be considered as the feed depending on the type of hydrocarbon molecules present. The optimum set of process conditions are decided by the characteristics of the feedstock through pilot plant experiments.

The feedstock is heated to the desired temperature in the feed furnace and fed to the coking drum where the coke is formed with mesophase crystalline structure. The vapour from the coking drum is fed to a fractionator followed by a gas concentration section to separate into products of desired cuts. The fractionator bottom is recycled along with fresh feed.

The Needle Coke formed in the drum is decoked using high pressure water jets and the coke is subsequently calcined in rotary calciner at optimum severity.

Salient features

- Uses heavier petroleum streams available in refinery without major pre-treatment.
- Employs existing Delayed Coker unit hardware.
- Operating window based on feed characteristics.
- Production of Needle Coke with CTE of less than $1.1 \times 10^{-6}/^\circ\text{C}$ and real density more than $2.12 \text{ gm/cc}$
Advantages

- Significant improvement in refinery margin owing to very high price of Needle Coke
- Does not require special design of Delayed Coker unit and can produce Needle Coke in existing unit without major modification
- Produces Needle Coke using heavier petroleum streams of refinery without major pre-treatment

Our back up strengths

- Successful commercialization in the existing unit of two refineries of IOCL with production of premium grade Needle Coke with CTE of less than $1 \times 10^{-6}/^\circ C$
- Characterization facilities for feed and Needle Coke
- Availability of state of the art pilot plant for tailor-making the operating window with a given feed
- Excellent technical support & troubleshooting expertise

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