NEEDLE COKE TECHNOLOGY

Introduction

Needle coke is a premium grade petroleum coke, which is used in manufacturing of graphite electrodes for arc furnaces in steel industry. A good quality of needle coke is hard and dense mass formed with a structure of carbon threads or needles oriented in a single direction (flow direction). This coke is highly crystalline and provide the properties needed for manufacturing graphite electrode. Needle coke can withstand temperatures as high as 2800°C. Crystallinity affects the most important properties of the graphite electrodes such as Thermal expansion coefficient (CTE) and electrical resistivity. There are various grades of Needle coke depending on its properties/ specifications.

IndianOil 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 Delayed Coker unit. 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.

Delayed Coker pilot plant

Salient features

- Uses heavier petroleum streams available in refinery without major pre-treatment.
- Employs hardware similar to Delayed Coker unit.
- Selection of operating window based on feed characteristics.
- Production of Needle Coke with CTE of less than 1.1×10^{-6} /°C and real density more than 2.12 gm/cc.

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Advantages

- Production of Needle Coke using heavier petroleum streams of refinery without major pre-treatment.
- Improvement of ex-refinery distillate yield pattern due to upgradation of low value heavier petroleum fractions.
- Significant improvement in refinery margin due to very high price of Needle Coke.

Backup strengths

- Successful commercialization in two refineries of IOCL with production of premium grade Needle Coke with CTE of less than $1x10^{-6}$ /°C.
- 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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