Technical Specification:

The Metallurgical Coke for blast Furnaces for making iron :

Metallurgical Coke For Blast furnace Operation

A. PHYSICAL COKE PROPERTIES

A high quality coke is characterized by a definite set of physical and chemical properties that vary within a narrow limit thereby ensuring consistency in the quality.

Coke is the only solid material remaining below the cohesive zone in the blast furnace (refer Figure-A for various zones of operation in blast furnace). Hence, coke must provide the strength to support the burden and create the void spaces required to maintain the permeability of the bed. Hence, for stable blast furnace operation, the physical properties of coke are of paramount importance.

\he stability measures the ability of coke to withstand breakup at room temperature and reflects coke handling behaviour outside the blast furnace and coke breakage in the upper part of the blast furnace.

B. Chemical Properties

With physically stable raw materials in the blast furnace, further control of the process is achieved through control of the chemical properties. The most important chemical properties of coke are moisture, fixed carbon, and the content of minor elements

Moisture affects energy requirements and higher moisture will carry fines that on drying either leaves the furnace top or contribute to the coke fine loading, thereby offsetting the value of controlling the CSR and stability values. Moisture is mostly controlled by battery operations.

Fixed carbon is the fuel portion of the coke; the higher the fixed carbon, the higher is the thermal value of coke. Fixed carbon is controlled by the rank of the coal and the amount of mineral matter in the coal.

Coke ash content is also critical to blast furnace operation and hot metal quality. As the total ash increases or varies, the available fuel, carbon, decreases or varies which negatively affect the amount of energy and reducing gases available. Higher ash also results in a higher amount of slag, which requires extra energy to melt. Since ash is predominantly acidic, as it increases, additional flux is required to maintain constant slag chemistry so that sulfur can be removed. Also, the higher silica will result in higher silicon monoxide gas release during coke combustion and more silicon will be absorbed in the iron; the net result being an increase in hot metal silicon. The overall effect of high ash is more slag, lower metal yield, and less production. Ash is controlled by the coal depositional environment which affects the mode of distribution of mineral matter in coal.

The most significant minor elements in coke are sulfur, phosphorus and alkalis. Sulfur is removed by using limestone, which is calcined and then reacts to capture sulfur in the slag. Thus, the slag volume and chemistry control the amount of sulfur that can be removed from the blast furnace. Depending upon the coal sulfur forms, one half to two thirds of the coal sulfur will remain in the coke. Phosphorus in the coke is derived from phosphate minerals in the coal. It goes completely into the hot metal. It is not desired by the steel maker as it hardens the steel and causes surface defects. The last significant minor elements in coke are the alkalis, potassium and sodium oxides. Since

these elements have low gasification temperatures, they form a recirculating load in the upper parts. The alkali attack refractory lining and also affects coke and iron ore resulting in loss of strength which ultimately affects blast furnace performance. The alkali content in the coke is controlled by the alkali content in the coal. This brief review of coke properties reveal that most of the properties are primarily controlled by coal and, to a lesser extent, by coke battery operation.. With this knowledge, it is, therefore can be inferred that to obtain high quality met-coke; emphasis should be made in the coal selection for making an economic coal blend charge.