Keywords: High quality; Metallurgical coke; Blends; Blast furnac; Ajaokuta

Introduction

It has been said that no meaningful industrialization can take [illegible] TD [(co)12(m)19(p)-5(a)9(nies t)6.1(o p)12(r)13(o)-9(d)12(uce s)5(t

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Mechanical support for the burden.

Additionally, the coke should be of such chemical quality so as not [illegible] anthracite and coke breeze. e following principles based on chemical and physical properties of coal for selecting coals are discussed.

Coking capacity as a function of volatile matter

rough this method, a coking coal blend is composed from individual coal components such that the resultant coke is of high quality coke in terms of micum strength (M40). An optimum coking coal charge also presupposed a homogeneous distribution of the properties of its components. It has been established that the coking power can be represented by a numerical index, which re ects the behavior of a coal pencil in a dilatometer

$$G \quad \frac{E \quad V}{2} \quad \frac{K \quad d}{Kv \quad De}$$

Where G=Coking power

E=So ening temperature

V=Solidi cation temperature

K v=Contraction

D=dilatation

e coking conditions can also be represented by a factor Kc de ned below.

$$Kc \quad s.v.\frac{B}{2}$$

Where S=bulk density of charge tons/m³

V=average coking speed

$$\frac{\text{Mean half width of chambe}}{\text{Coking time}}$$

B=Mean width (in cm)

Total dilatation as a function of volatile matter

To obtain high strength coke, individual coal must be blended to produce charge of volatile matter 25-32 (dry ash free) percent. Although low volatile and same high-ranking medium volatile coals produce strong cokes, they exert excessive wall pressure during high temperature carbonization and cannot be carbonized alone in a By-product oven because they can cause damage. In addition to those coals do not contract su ciently during coking and so create pushing problems at the end of carbonization. High volatile coals, on the other hands, possess a lot of contraction property with minimal expansion characteristics. In practice, the two types of coal are blended such that the de ciency in contraction property of low volatile coal is o set by the excess of some property in high volatile coking coal in order to achieve a balanced characteristic through proportioning of the coal components.

Maximum uidity as a function of mean maximum re ectance

From the studies conducted it was established that coals selected from many countries that have the characteristics of an ideal coal blend required for high quality coke have mean maximum re ectance (in oil) of 1.1 to 1.3 percent and maximum uidity of or uidities have to be blended in order to come close to the ideal situation. Gieseler plastomerter (ASTM D2639), which is available at ASCL's Coke Oven and By-product laboratory, will be used to determine the plastics properties of coal during heating. In selecting coal for compatible blending the components should have overlapping plastics rages to guarantee a homogeneous coke structure.

Composition balance index as a function of strength index

is is based on a petrography approach of correlating coke stability with maceral Composition, and vitrinite re ectance. Coke stability factor predictions curve developed by Ammasov et al. were modi ed by Schapiro avid Cray of United Steel Corporation to relate to ASTM procedure. is method has provided a good basis for selecting coals for charge preparation at many steel industries. A composition balance index of 1.0 indicates the optimum coke strength for a given coal. Excess or a de cit of inert or reactive will result in a decrease of strength for a particular coal rank. In the process of composing a coking blend, the individual coal would be so proportioned so that the composition balance index come close to ideal value of 1.0 [4].

Coal chemical composition (Coal grade)

Coals are selected by grade, which takes cognizance of the chemical quality in respect of ash, sulphur, phosphorus, alkali and chloride contents. In any chemical parameter of a particular coal exceeds limit speci ed at a coke plant, the coal may still be satisfactory for speci c use if it is possible to formulate a blend with other coals or materials such that the nal charge lies within the limits speci ed It should be noted that alkalis cause coke breakdown, scabs and other operating problems in the blast furnace. Consequently, the alkali content in a coal charge for coke making is always kept as low as possible.

It is restricted to a maximum of 1.95% in the case of ASCL. Also chlorides pass into By-product section and require considerable water to remove from the tar recovered in the By-product plant. Because of its corrosive nature, chlorides also cause maintenance problems in the coal handling and coke oven plant.

In April 1993, at Vukhim Pilot Plant Russia, a number of above methods discussed were used to compose coking coal blends for the operation of Ajaokuta Coke Oven plant. Six coals from Australia, United States of America and Great Britain were subjected to a series of tests a er which eight charge variants were shortlisted. It was noted that any of variants 1, 2,4,7,8 were good for operation. Sometime in 1993, direct blending test of imported and Enugu coal was carried out on a 250 kg pilot oven at NMDC, Jos [5].

Process of coal handling

e coal handling plant is designed to process the basic raw materials into a homogeneous trouble free coal charge in a number of steps. ese steps are: -

- Receiving, storing and averaging of coal in the open coal stockyard.
- Separation of foreign objects.
- Proportioning of various coal components by the dozing apparatus (automatic batch weigher (No. 1-16).
- Crushing with hammer crushers
- Addition of spent solar oil, sludge and acid tar to coal blend.
- Blending of coal components in the mixing machine.
- Storage of coal charge in the coal tower bins.

e process outlined for the coal preparation shop above is purely a physical phenomenon. By the Detailed project Report (DPR) on the coal preparation shop, coals are expected to be transported to the steel plant by rail from Onne port via Oturkpo to Ajaokuta, e Onne port project has been abandoned while the Warri (DSC) port to Ajaokuta rail line has also been abandoned.

Hence coal vendors transported the raw materials by road to the temporary coal storage be-sides ltakpe to Ajaokuta. From this position, they will be re-loaded onto wagons for onward delivery to the o loading facility (unit 08.45) where it will be unloaded into two lines of receiving bins. From the control room the conveyer line is put into

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