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FIRST FLUC-SOLID ROASTER IN INDIA DESIGN & OPERATION (*)

J.D. Adhia,
Hindustan Zinc Limited,
Udaipur.

Fluo-solid roaster is now in common application for sulphide roasting to recover gas for acid manufacture and calcines from which metal constituents are extracted. It can also be used for partial oxidation and sulphatation roasting of concentrates and matte to render them suitable for extractive treatments.

Fluid bed operation gives precise control of temperature without any hot spot and feed material to air ratio. These facts are advantageously used in sulphide roasting. The feed is intimately and rapidly mixed with the air or gas introduced from the bottom side of the roaster.

The two important operational parameters are the particle size and gas velocity and there are various phases when the roaster is in operations:

(i) Static phase, nearest of the hearth

(ii) Dense fluidization phase

(iii) pneumatic transport (free board)

The coarsest particle remains in the static bed while the finest particles fly-up in the free-board to exit with gas. The free-board portion of the roaster is made of larger diameter than the lower portion with a view to reduce the velocity of outgoing particles and this checks the excessive fly-outs.

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In the dense phase, conditions are smooth and uniform. A good quantity of gas is carried from the top of the bed to the bottom, with the inculation of the solids, and mixed with the incoming gas which occurs by cross flow between the gas bubble and the gas associated with the inculating solids, and is extremely rapid under the conditions of fluidised bed.

Thus the solids are of uniform composition. Vertically and horizontally, and the gas also approaches uniformity of composition.

The mixing of new feed with finished material within a fluid bed, helps bring it to bed temperature rapidly. The chemical equilubrium between the solid product and the exit gas is helped by the high ratio of solids to gas and the excellent contact between gas and solids. As fluid beds permit almost complete oxidation of sulphide minerals with low excess air requirements, more heat is frequently produced by the oxidation than can be removed by the end products of the reaction.

Temperature control is essential to obtain the required conditions for extractive treatment, to avoid sintering, to limit ferrite formation for reactivity of product and for the protection of brick-lining. Therefore means are provided to remove excess heat from the fluid bed. The common practice is to inject water in the bed through suitable openings in the body of the furnace, although in some designs cooling coils are inserted in the bed to take care of the extra heat and this system helps to produce additional steam. The cooling tubes are made of normal boiler steel. Heat exchange surface is generally low only 35 - 40 square meters is sufficient for 200 ton roaster for pyrite.

Design aspects, constructional features and operational procedure have been studied in detail in the paper.

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