INTRODUCTION

The rotary kiln is extensively used for the various processes such as drying, calcining, reducing etc. It is gaining importance in the field of metallurgy for the production of prereduced pellets, sponge iron etc. An industrial rotary kiln is simply a horizontal steel cylinder, lined with refractory brick, having a combustion hood and another hood leading away the exhaust gases, as well as a supporting construction and heating arrangement. Even with its wide applications, the basic understanding of the physical and chemical processes within the kiln is far from complete. During operation of the kiln both the physical and chemical processes take place, but the physical process is predominant. The knowledge of the physical and chemical process has a decisive importance in establishing the optimum industrial parameters and in the rational designing of rotary kilns.

The physical process operating in a rotary kiln is influenced by the following:

(1) Kiln variables, which include kiln diameter and length, height of the dam or retaining rings and number of flights.

(2) Material characteristics consisting of particle size and shape, bulk density, moisture content and angle of repose.

(3) Operating variables, e.g. feed rate, gas velocity, kiln slope and the rate of rotation of the kiln.

The chemical process is influenced by the following:

(1) The percentage of solid reductant (coal) and binder (coal tar or bentonite) added to the material, e.g. laterite powders to form briquettes.

(2) The sizes of coal and laterite powders.

(3) The pressure applied on the mixture of laterite and coal powders to form briquettes.

(4) The time of heating and temperature of briquettes.

For the purpose of investigating the physical and chemical processes taking place in a kiln, limestone was chosen for the former and laterite for the latter both of which are abundantly available in this area.