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EFFECTIVE RAW MILL TYRE PREHEATING SYSTEM

P.Pandiarajan[1], P.Sureshrajan[2]
PSNA College of Engineering and Technology[1]
NPR College of Engineering and Technology[2]

Abstract
We took the project of "EFFECTIVE RAW MILL TYRE PREHEATING SYSTEM". A raw mill tyre holds the responsibilities for guiding the source materials of cement. We came to know, a problem is occurring frequently in the raw mill tyres.The problem is cracking of tyres in high temperature, and it is rectified by manual welding. This process is followed by heating the tyres manually. Since the company is producing cement through continuous process, there is reduction in production time and output as well as profit. In order to overcome this problem, we have suggested a design of fixtures for preheating the tyres along with a number of nozzles and burners. By adopting this method more than thirty minutes of time can be saved for heating the tyres.

Keywords:- Raw Mill, Preheating etc

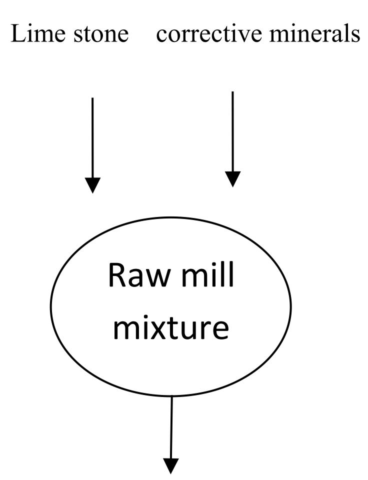
1. INTRODUCTION TO CEMENT

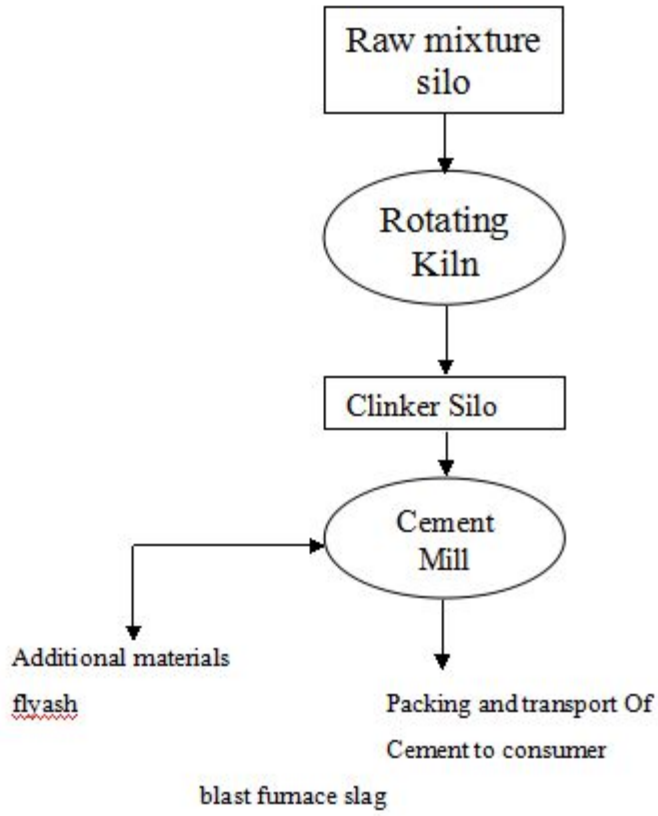
Cement is a mixture of compounds, consisting mainly of silicates and Aluminates of calcium, formed out of calcium oxide, silica, aluminiumoxide and iron oxide Cement is manufactured by burning a mixture of limestone and clay at high temperatures In a kiln, and then finely grinding the resulting clinker along with gypsum the end product thus obtained is called Ordinary Portland Cement (OPC). In India, OPC is manufactured in 3grades, viz. 33 grade, 43 grade & 53 grade, the numbers indicating the compressive strength obtained after 28 days, when tested as per the stipulated procedure. Apart from OPC, there are several other types of cement, most of them meant for special Purposes, e.g. sulphate resistant cement, colored cement, oil well cement, etc. However, there are some general purpose cements, the commonest one being Portland Pozzolana Cement (PPC). Cement is typically made from limestone and clay or shale. These raw materials are extracted from the quarry crushed to a very fine powder and then blended in the correct proportions. This blended raw material is called the 'raw feed' or 'kiln feed' and is heated in a rotary kiln where it reaches a temperature of about 1400 C to 1500 C. In its simplest form, the rotary kiln is a tube up to 200 meters long and perhaps 6 meters in diameter, with a long flame at one end. The raw feed enters the kiln at the cool end and gradually passes down to the hot end, then falls out of the kiln and cools down. The material formed in the kiln is described as 'clinker' and is typically composed of rounded nodules between 1mm and 25mm across. After cooling, the clinker may be stored temporarily in a clinker store, or it may pass directly to the cement mill.

2. CEMENT RAW MATERIALS

1. Limestone ($CaCO_3$)
2. Sand (SiO_2)
3. Shale, Clay (SiO_2, Al_2O_3, Fe_2O_3)
4. Iron Ore/Mill Scale (Fe_2O_3)

2.1 PRODUCTION PROCESS



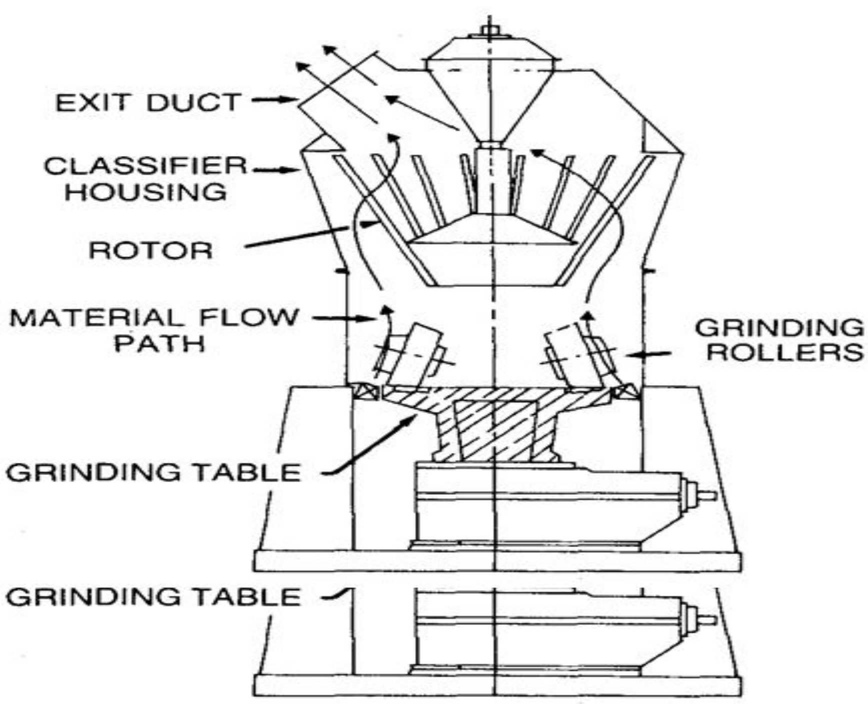


2.2 RAW MILL

The dosed raw materials are dried and finely ground in the Raw Mill to form an intermediate product, called "raw meal". The grinding provides an increased surface area to enhance the heat exchange in the downstream heating process.

3. CONSTRUCTION OF LOESCHE VERTICAL ROLLER MILL

3.1 WORKING PRINCIPLE



The motor dives the grinding table to turn through the speed reducer. At the same time, hot air comes into the roller mill from the air inlet. The materials fall down the centre of grinding table from the feeder. Because of the centrifugal force, the materials move to the edge of grinding table from the centre .The materials are crushed by the grinding roller when by pass of the groove on the grinding table. The crusher materials continue to move to the edge of the grinding table until taken away by the airstream. Then the bigger materials fall down the grinding table and the process of crushing continues. When the materials in the airstream pass the separator on the top of the mill, the materials fall down the grinding table from the taper filler under the force of guide leaf blade. The fine powder comes out with the airstream, and is gathered by the dust catcher of the system. The powder gathered is the final product of roller mill. In the process of the contact of airstream, the materials are dried to meet the clients' need at the proper moisture. Through the adjustment of the angle between the separator and the leaf of wind's direction (not suitable to the small type of vertical mill), and also the speed of the separator rotor, it can reach the proper fineness of the materials.The material to be ground is crushed between the rotating grinding track and the individually guided grinding rollers. Grinding is carried out primarily through the application of compressive force vertically, the secondary effect being the horizontal shear force. In comparison with the grinding of cement raw material, coal and other minerals, further influencing factors have to be considered for the fine grinding of granulated blast furnace slag and clinker. These factors are as follows:

1. Granulated blast furnace slag – feed grain size:

   Normally 0 mm – 5 mm edge length

2. Cement clinker feed grain size: normally 0 mm – 25 mm edge length. Here the biggest quantitative fraction of the feed grain size of clinker is between 50 µm and 100 µm, i.e. in the range of the final product grain size of cement raw meal.

3. Cement clinker is dry and hot, i.e. the temperature is typically > 100°C

4. The product fineness is in the grain size range 2 µm to 50 µm

The axis of the rollers, which are inclined at 15° to the grinding bed, bring about optimum fine grinding and at the same time result in minimum wear Due to the different material structure of cement clinker and blast furnace slag compared to limestone and coal, higher compressive grinding forces are required, with a minimum of shear force. This is achieved through the geometric design of the rollers (small roller width) and the increased distance of the roller from the centre of the grinding chamber. The products to be ground differ from materials previously processed in roller grinding mills mainly owing to the required product grain size and the high material compressive strengths. Ultra-fine products cannot be produced in an air swept vertical roller grinding mill without specific measures being taken to prevent increased mill vibration. Owing to the prevailing frictional conditions; aerated dust behaves much like a liquid. Each roller has to prepare its own grinding bed through de-aeration and precompaction. These processes take place consecutively, and mill vibration is consequently difficult to avoid.

4. INTRODUCTION OF RAW MILL TYRE

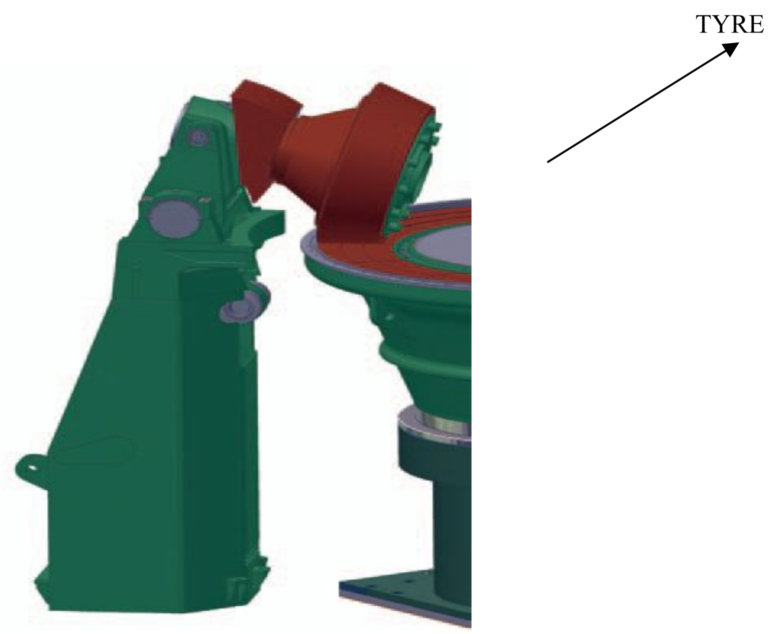


Fig.No.8

4.1 TYRE PREHEATING PROCEDURE

Some of the following methods which are heating and fix the tyre in VRM. The following are,

1) Spare tyre to be heated up to ~70°C for fixing

1) Positioning the tyre & Applying molykote in hub tyre seating area

2) Fix the tyre and clamping ring

3) Fix the 'T' head bolt &nut with washer and tightening

4) Swing in the roller assy.,

5) Position the double half cone

6) Position the roller for side cone and sleeve

7) Fix the side cone and sleeve with Altemp -Q-Paste

10) Rocker arm shaft sleeve bolt tightening

4.2 PURPOSE OF PREHEATING

1) The main purpose of preheating a tyre is to form a thermal expansion by applying some power.

2) The power may be as gases. The following gases are useful for preheating .There are direct acetylene and oxygen.

3) When applying these gases through nozzle and burner surface of tyre may be expanded.

4) Due to this expansion tyre may be located perfectly in the roller.

5) Before preheating tyre should be welded in cracks. Because already we say that raw material is a harden material. So it is not possible to grind those materials without any cracks and damages.

6) After preheating the tyre is fixed at a quick time session. Because expansion in the tyre may be a particular time duration.

7) The tyre may be preheated once in three months.

5. EXISTING PREHEATING SYSTEM

5.1. MANUAL PREHEATING

Presently tyre is heated manually with the help of human operators. Generally minimum 3 operators are required for heating. So that, it is not possible for even heating in all sides of tyre. So, that we are arranging those things in effective manner. The simple picture represents a manual preheating in raw mill tyre.

5.2. DISADVANTAGES

1. Heating is not uniformly in all sides around 360°.
2. More labours are needed to perform a work
3. Heating time is very high.
4. Working cost is also very high compare than effective pre- heating.
5. Acetylene and oxygen gases are unnecessary for preheating.
6. It is not suitable for heating all the 4 tyres.

5.3 EXISTING COST & TIME ANALYSIS

5.3.1 PREHEATING ONE SINGLE TYRE COST

ITEM	COST(Rs)
1 ½ DA CYLINDER	Rs.2025/-
4 O2 CYLINDER	Rs.756/-
Labour rate at 1 ½ hours	Rs.316/-
TOTAL	Rs.3097/-

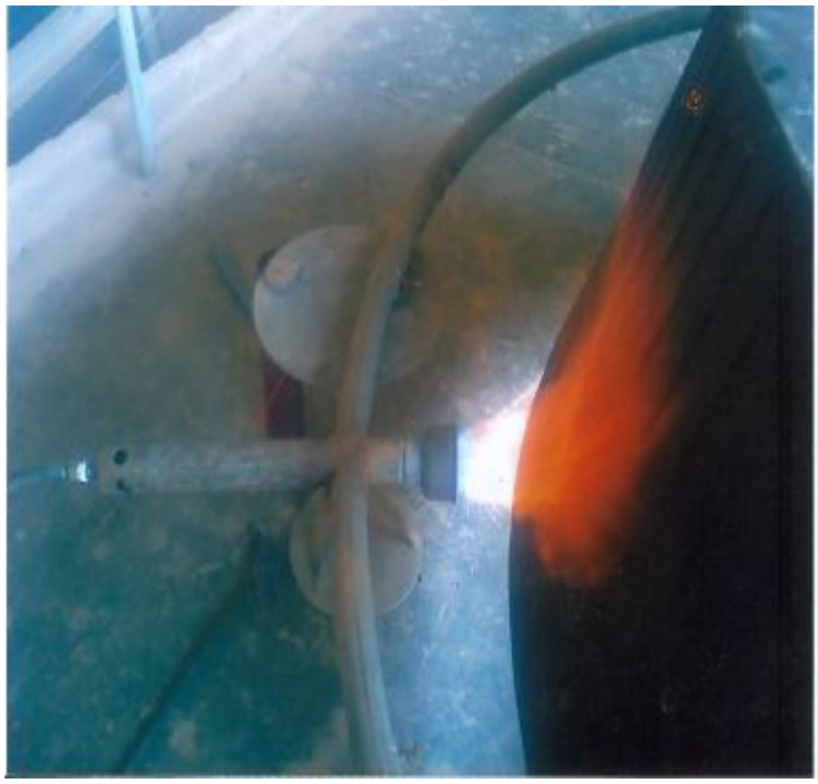
5.3.2 CYLINDER RATE

ITEM	RATE(Rs)	VOLUME(M3)
1 ACETYLENE CYLINDER	Rs.225	6 m3
OXYGEN CYLINDER	Rs. 27	7 m3

5.3.3 TIME ANALYSIS

WORK	TIME IN (min)
TYRE REMOVING	12
TYRE HEATING	90
TYRE FIXING	8
TOTAL	110

6. PROPOSED DESIGN [EFFECTIVE PREHEATING SYSTEM]



6.1 DESIGN CONSIDERATIONS

1) Design a fixture for heating a tyre around 360°.
2) Design a nozzle for preheating.
3) Select a Burner for a nozzle design.
4) Comparision about acetylene and LPG gases for heating tyre at 70° and select which one is best.

6.2 EFFECTIVE HEATING SYSTEM

The word effective preheating system represents that a fully modified and rectify these problem in effectively and accomplish our objectives. Our objective may performed by using latest operating techniques. Already we describe that the above considerations are performed and do the project effectively. We are planed to attain our objectives by utilizing all the available resources in the factory. So this is our main criteria to done the work effectively. There are so many factors consider for pre heating a tyre. We are suggest to perform a task by utilizing all the resources as well as it did not affect the process in the factory.

6.3. ADVANTAGES

1) Easy to heating a number of tyres effectively.
2) Lesser human workers are used to perform a task.
3) Cost of the production may be genuine.
4) Process time is low

7. CONCLUSION;

Finally the project work is done in most economical as well as new modern conditions . Through our project we have reduced the cost of tyre preheating from RS.3097 to RS.2195. Similarly we have reduced the time from 110 minutes to 85 minutes as well as the labour requirements. We have altered the existing fuel of tyre preheating from oxyacetylene gases to Liquid petroleum gas (LPG). We hope certainly there would be a few improvements in the organization through our project.

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