

# **TO INNOVATE AND BUILD FRICTIONAL PIPES TO IMPROVE THE SILO COMPRESSED MIXER RAW'S PERFORMANCE**

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## **ABSTRACT**

Pressure losses are very important factors that effects on the flow in piping systems where concludes different length of pipes, diameters, fittings, elbows and valves. Different actual and theoretical pressure losses were studied and compared. Pressure drop measurement and prediction in curved pipes and elbow bends is reviewed for laminar flow. By considering these factors and implementing appropriate design and operational measures, it's possible to manage compressed air pressure drop effectively in a pipeline within a cement silo storage tank system. This helps ensure efficient material conveyance, minimize energy consumption, and maintain system reliability and integrity. To innovate and design the pipe for reduce the pressure loss.

The Ramco Group is one of the leading, highly reputed and Second Largest Industrial Group in South India. The Ramco cements limited formerly Maduras cements

## **INTRODUCTION**

limited, is a part of the ramco groups. The Ramco cements has 5 integrated cement manufacturing units, and 6 grinding units, and 1 packing terminal across in India. The Ramco cements founder 'P.A.C. Ramasamy raja. The first plant started in 1961 at thulukapatti, viruthunagar district. It is well diversified in the fields of Cement, Ready Mix Concrete, Cement Fiber Products,

Cotton and Synthetic Yarn, Software Systems, Wind Farms, Research & Development, Dry Mortar Plants, Cotton. The Ramco cement is one of a 5s certificated industry.

The raw material for cement production is limestone which is extracted from the mines near the cement factory. The limestone ( $\text{CaCO}_3$ ) provides the ingredients requires for cement production. The other material necessary for cement production are iron ore, clay, and

gypsum are also extracted from their ores. Ramco cement have its own mines located at chun dada, gadhi VDC, jogimara dhading etc. The raw limestone is feed into primary crusher in which their size will be reduced around range of 80-100 mm. The crusher is made up of jaw plate in which one plate is fixed and another plate is movable. A powerful motor drives the movable jaw of crusher and breaks it to minimum size. After then the material is fed into cone crusher in which raw material is converted to size of 20 mm and below according to the specification given by the raw mill. The materials from the cone crusher is supplied to vibrating screen in which strong exciting force separates the standard material while throwing back the other materials towards the cone crusher. The vibrating screen only separated the crushed lime stone of size 20mm and below. The process layout of crushing is as follows. The standard material through vibrating screen is conveyed through the belt conveyor for next step of production process. The details of crusher used in crushing process will be explained in the next chapter.

Stacker is the device use to make pile of crushed limestone. The purpose of stacker is to make raw material

homogeneous so that fixed quantity of raw material is transferred to the hoppers. The other purpose of these devices is also for storing raw crushed limestone

homogeneously so that in the case of maintenance or shut down of crusher the production process do not stop. Reclaimer is

used to transport the pile limestone to the hopper through conveyor belt. It is a computer controlled automatic device consist of large number of buckets which transfers raw material in controlled and fixed quantity by giving to and fro motion in the pile of limestone.

#### **FRICITION FACTOR IN PIPELINE**

The friction factor (also known as the friction coefficient) is a dimensionless parameter that characterizes the frictional losses in a pipeline. In the context of pneumatic conveying in cement silo storage tanks, the friction factor is used in the design and analysis of the pipeline system to estimate pressure drop, determine the required pressure and airflow rates, and optimize system efficiency.

Friction also occurs between the air and the interior surfaces of the silo during fluidization or aeration processes. This frictional resistance affects the airflow patterns, pressure distribution, and fluidization efficiency within the silo. Proper design and operation of the aeration system, including the selection of appropriate air distribution systems

and diffusers, help minimize frictional losses and ensure efficient material fluidization.

#### **FLOW & FLOW RATE**

The flow rate in a cement silo storage tank system can vary depending on several

factors, including the type of material being conveyed, the size and design of the pipeline, the pressure conditions, and the specific equipment and configuration of the system.

**Pressure Conditions:** Determine the pressure conditions within the pipeline, including the inlet pressure at the silo outlet and the pressure required at the discharge point. The pressure gradient along the pipeline will drive the flow rate.

**System Efficiency:** Consider the efficiency of the pneumatic conveying system, including the performance of the compressor, air supply, and control systems. Efficient system operation ensures adequate airflow and pressure to convey the material at the desired rate.

Crusher generally means a device that used to crush or break any kind of raw material. I.e. to reduce its existing size. They use different kind of mechanism to break the material depending upon the types that is to be used. Ramco plant used two kind of raw materials limestone and coal which are to be converted into usable form by using crusher. The different types of crusher that are used in Ramco cement plant are described herein below.

It is used to grind all kind of materials like ore, rocks etc. regardless with their

hardness. It has reliable structure, high

efficiency, easy adjustment, low cost and many other advantage. In this crusher the grinder is concave in shape and the size is reduced from inlet to outlet. The material after jaw crusher is fed into the cone crusher which then again reduces the size of raw material (limestone) to size ranging to 20mm or less.

In Ramco cement plant all mill and the kiln are driven girth gear. The girth is attached at the outer shell of the mill and it

### **GIRTH GEAR AND BEARINGS**

Gears are power transmitting devices and have cut teeth on them. Among many types of gears girth gear is also one of the most important gear in power and motion transmission. Girth gear are used where heavy loads need to be carried in rotary tubular kilns, tube mills etc. the use of girth gear serves following advantages.

- Good physical properties in all direction
- No micro-porosities such as gas holes, micro shrinkage and pinholes.
- Absence of macro defects such as hot tears, shrinkage and sand inclusions.
- Very good metallurgical yield.
- Uniform metallurgic al chemistry.

is driven through pinion with the help of gear drive. The number of pinion that are used varies according to the size and power required to drive the mill. In cement

mill-2 girth gear is driven by two pinion due its large capacity than that of other mills.

S.No	Ball Mill	Capacity (TPH)	Length/Dia (m)	Grinding	Speed (rpm)	Type chamber
1	Raw mill	100	8/4	One	16-17	Air swept
2	Coal mill	12	5.75/2.8	One	19.5	Air swept
3	Cement mill-1	35	10.25/3.2	two	18-19	End discharge
4	Cement mill-2	80	12.5/4	two	17-18	End discharge

## METHODOLOGY

Colebrook equation.

The leakage of compressed air pipeline in silo (raw material storage tank) its affect the manufacturing and production. The loss of compressed air in the silo pipeline is affected the fine powder material into hard material. The loss of compressed air its take more time to recover the raw material at standard state. This problem is takes more manual power.

The heavy loss of compressed air its affected the silo and its pipe fittings.

We using the equation of Darcy weisbach is an Empirical equation that relates the head loss or pressure loss, due to friction along a given length of pipe to the average velocity of the flow of air.

We calculate the friction factor using a

Darcy formula

$$dp = (7.57 * q^{1.85} L * 10^4 / (d^5 * p))$$

where;

dp-pressure drop (kg/cm<sup>2</sup>)

q-air volume flow at atmospheric  
condition (FAD) (m<sup>3</sup>/min)

L-length of pipe (m)

d-inside diameter of pipe (mm)

### **CALCULATION**

Find the inside length for 90° Bend in 1 inch  
and ½ inch pipe

formula for find inside length of pipe:

$$R^2 * 3.14 / 360 * 90$$

Where;

R-inside

dia Solution:



$$\frac{1}{2} = 12.7 * 2 * 3.14 / 360 * 90 = 855335.511 / 6835375$$

$$= 19.93\text{m}$$

Meter converted into millimeter = 0.019mm

Inside length\*actual length

$$= 0.81 * 0.019$$

$$= 0.015\text{mm}$$

Calculation for valve length in 1/2 inch pipe

constant k factor for 1/2 inch valve = 0.69

$$= 0.69 * 0.026$$

$$\text{Ans} = 0.002\text{mm}$$

Calculation for Tee joint in 1/2 inch pipe

constant k factor for 1/2 inch tee joint = 0.54

$$= 0.54 * 0.056$$

$$\text{Ans} = 0.003$$

add the above three answers for

summation L = 0.02mm

For Empirical formula:

$$dp = 7.57 * q^{1.85} * L * 10^4 / d^5 * p$$

Flow rate(q)-80(CFM)

Pressure(p)-7 bar

Length(L)-2.5m

Diameter(D)-25m

**Solution:**

$$= 7.57 * 2.26^{1.85} * 2.5 * 10^4 / 25^5 * 7$$

$$=0.0125$$

Final pressure drop = 0.0125

has to deal with each and every problem  
and

### **Calculation for bend & fitting pressure**

**drop:**

$$\begin{aligned} dp &= \\ &7.57 * 2.26^{1.85} * 0.02 * 10^4 / 25^{5*7} \\ &= 6842.68 / 68359375 \\ &= 0.0001 \text{ pa} \end{aligned}$$

Pressure drop for a bend = 0.0001

### **CONCLUSION**

From our Internship training what we conclude is that Ramco Cement is the one of the quality oriented cement production company and there is no any kind of compromise and negligence in the prevention and maintenance of the machinery and mechanical equipment.

This plant can be a good platform for any kind of technical students for training and gaining practical knowledge. There is expertise in all technical department due to which the trainee can get answer in technical way. As we know that experience of non-technical person and technical person differ in many way. Non- technical person are confined in limited area but the technical expertise

must able to give logical answer. This plant can gives the real engineering of production plant and shows how challenging the engineering field.

This plant have enough things for training of technical students as it have its own workshop, automobile workshop and whole the production plant having many machines, sensorized system, electrical technology and self-power production using DG. And finally this plant is very good platform to gain real professional knowledge for technical student.

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