

Design of Pig Casting Machine

S.N. Waghmare, C.N. Sakale, M.S.Giripunjje and V.M. Sonde

Abstract—Paper reports the design and development of Pig casting machine. A machine is utilized for conveying pig mould from one station to another with the help of conveyor; the paper describes design calculations, modeling and calculation of load torque, its economical viability. The machine is presently commissioned in one of the renowned steel plant. Paper also describes working and construction of machine in detailed.

Index Terms—Chain Conveyor, PIG casting, Mould, Chain pull, Metal transfer Launder

I. USE OF CHAIN CONVEYOR AS PIG CASTING MACHINE

A. What Is Pig Casting Machine:

In Steel Industries iron is produced in Blast Furnace by reducing iron ore (iron oxide) with carbon (coke) at temperature of 12000C to 13000C. The iron metal collects at the bottom of blast furnace and is tapped out from time to time. About 50 to 300 ton of molten metal can be tapped at a time in hot metal ladle. The iron in the molten form is transferred to steel melting shop for conversion to steel. Parts of the iron metal are converted to small pieces called as PIGS in continuous casting machine called as Pig Casting Machine (Pcm).

These pieces of iron produced in PCM are marketed in sizes of 10 to 45 kg/pc. Such small sizes of pieces are produced in PCM by pouring the hot molten metal into the mould having small pockets. The metal is there after solidifies by cooling with air followed by water cooling. This solidifies pieces called as Pigs if they are big in size & piglets if they are small in size. The Pig Iron is used as raw material for production of big size iron casting and other application such as conversion to steel of different grade.

II. DESCRIPTION OF PIG CASTING MACHINE

A. Metal transfer Launder:

The hot metal drawn in ladle from blast furnace is poured into a metal transfer launder of PCM for casting the pigs. The metal transfer launder has a fabricated casing, which is lined with refractory. A continuous slope is maintained in the refractory for smooth flow of molten metal from receiving point to the discharge point. The launder casing is anchored to the pouring end platform.

B. PCM Strand

The PCM strand is an endless chain carrying the pig moulds. The strands are placed at an inclination. The level of the inclination is decided on the height required for receiving the molten metal and for discharging the cast pigs into the transport wagons. The molten metal tapped from the blast furnace and collected in the ladle and then poured in the metal transfer launder of PCM, through which molten metal is discharged into the travelling moulds for casting. The rate of pouring of metal and the take up rate of metal by the PCM are equalized by adjusting the rate of tilting of the ladle and the speed of the conveyor chain of the PCM strand.

The PCM has LH and RH set of chain links. The chain links are fully machined. These chain links are steel casting joined to each other through a hollow shaft and bushing on which the link can run. Replicable bushes are forced fit to the link and then grubbed for preventing rotating motion between the bush and the link. The LH and RH chain links are assembled on a hollow shaft. At the borehole of the chain, a hardened bush is provided through which the hollow shaft passes through. A rectangular flange is provided to the hardened bush, which engages, the machined housing provided in the chain link. This arrangement maintains the correct relative motion between the sprocket teeth and the chain links and minimizes the wear of the sprocket teeth.

Split pins are provided on the hollow shaft for preventing fall out of the chain links. The chain links travels on the rollers fixed to the technological structure of the PCM. The rollers are spaced such that the chain links remain always supported on the rollers. On the ascending track the rollers carry the load of the chain and the moulds filled with metal whereas on the descending track, the moulds become upside down and the chain gets supported on the bottom rollers on its other side. The rollers are provided with a collar for preventing derailment of the chain. The rollers are mounted on the brackets. Holes are provided at the base plate of the brackets for anchoring the roller assembly to the ascending and descending tracks of PCM. Bearing caps of the rollers are provided with seals for preventing ingress of moisture and atmospheric dust. Protection guards are also provided

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5.5 - Hypothesis Testing for Two-Sample Proportions

We are now going to develop the hypothesis test for the difference of two proportions for independent samples. The hypothesis test follows the same steps as ...

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1.3.5.3. Two-Sample t -Test for Equal Means

Purpose: Test if two population means are equal. The two-sample t-test (Snedecor and Cochran, 1989) is used to determine if two population means are equal.

2 Sample t-Test (1 tailed)

Suppose we have two samples of ceramic sherd thickness collected from an archaeological site, where the two samples are easily distinguishable by the use of. Two sample t-test: SAS instruction Note that the test is two-sided (sides=2), the significance level is 0.05, and the test is to compare the difference between two means ($\mu_1 - \mu_2$) against 0 (H_0 ...

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