DESIGN OF LIFTING MECHANISM FOR HOT SHELL CORE MACHINE

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Abstract : This study has been undertaken to design of lifting mechanism for hot shell core machine. The project work includes selection of parts and their materials to build the mechanism for an organization. We used rope and pulley, C-channel, shaft, motor, bearing, coupling and combination bearing to build. lifting mechanism. This will improve productivity more than 10%, minimize the manpower more than 50% and reduces accidental chances 3 to 4%. It makes profit of organization up to 6, 85,540 rupees yearly**.**

*IndexTerms – Chain pulley crane, Sand, Cores, etc***.**

I. INTRODUCTION

At many technological processes or in any manufacturing processes , especially for core machines or any other machines which are at heighted places lifting mechanism are highly required. However at present time an organization uses chain pulley crane. This equipment is not reliable also it takes plenty of time to install them, sand is lifted to needed altitude by with chain pulley crane.

A channel with box having combination bearing will slide on C channel in straight upward motion with load. Hence this is general solution. The mechanism proposed in this work has several advantages over existing load lifting mechanisms. We did comparative study of results and variations in productivity before and after. Also 3 D and 2D models of parts with assembly and calculations for designing it.

II. STATEMENT

An organization having a hot shell core machine. Currently in the company sand is poured into the hopper by chain and pulley crane with the help of manpower. Due to the above reason we have taken this project to study. We are trying to convert manually operation to automation.

III. OBJECTIVE

- Increase Productivity more than 10 %.
- Minimize the man power more than 50% .
- Minimize accident 3 to 4 % to zero %.

IV. DIAGRAM
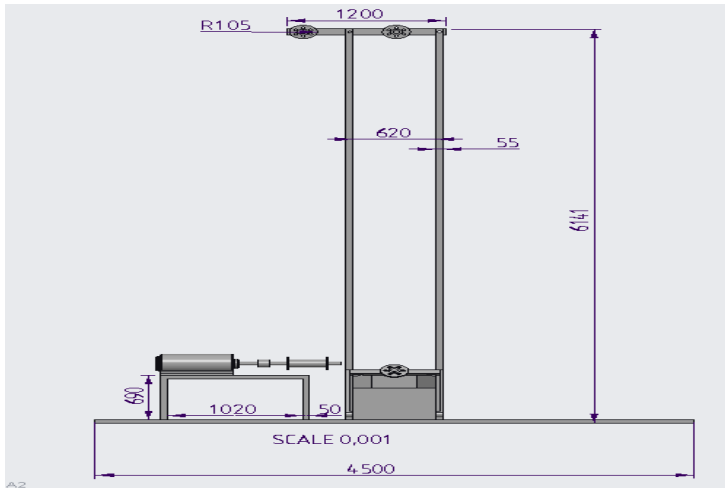
V. SCOPE

Currently industry is using chain and pulley crane for carrying core sand. After study of present problem following are general observations. Using which analysis can be done.

VI. RESULT AND DISCUSSION

i. *Reduced Manpower*

One man for per shift for working loading sand into the hopper

For 3 shift 3 manpower required

Total manpower reduced = 3 Nos.

Wages for one man power = 400 Rupees per day

Cost saving per day

3 * 400 = 1,200 Rupees per day

Cost saving per month

1200 * 30 = 36,000 Rupees per month

Cost saving per year

36000 * 12 = 4,32,000 Rupees per year

ii. *Accident*

in a company, company face some amount of accident at which company face certain losses.

Minimum amount of accident in a month is 3% to 4%

Monthly amount is 15,000 Rupees

Therefore, company faces yearly loss of

15,000 * 12 = 1,80,000 Rupees per year

iii. Personal Protective Equipment (PPE)

As per safety of worker Company requires safety products which comes under Personal Protective Equipment (PPE)

For safety of worker Personal Protective Equipment (PPE) includes,

1) Safety shoes = 800 Rupees
2) Helmet = 400 Rupees
3) Uniform = 1500 Rupees
4) Safety Goggles = 500 Rupees
5) Ear buds = 240 Rupees
6) Hand gloves = 900 Rupees

Total cost of Personal Protective Equipment (PPE) is 4340 Rupees

Note:- Above amount of Personal Protective Equipment (PPE) is on the basis of per worker / year

Therefore, by doing the automation, it saves the cost of Three workers of Personal Protective Equipment (PPE) kit shown below.

4340 * 3 = 13,020 Rupees per year

iv. *Operation performing timing*

- Before the automation company requires 255 min for one cycle

Normal time for one cycle that is for 4 cores is 8 min.

Therefore, sand required for 1 core is 2 Kg of sand

Since, 100 core is made in 200 Kg of sand

1 cycle = 4 cores are made

∴ 100 / 4 = 25 cycles

25 * 9 = 225 min

Additional 30 min for putting the sand into hopper.

∴ Company requires 255 min for one cycle.

- After automation we get for one cycle time is 255 min in which it reduces 30 min per cycle so because of this production is increased

1 shift ➡ 8.30 hours (510 min)

4.30 hours ➡ 1 cycle (270 min)

8.30 hours ➡ 2 cycles (510 min)

1 shift ➡ 30 min saving

3 shift ➡ 90 min saving

90 min ➡ 44 cores are made

3 shift ➡ 44 core * 28 (per core price) =1,232 Rupees per day

1232 * 30 = 36,960 Rupees per month

36,960 *12 = 4,43,520 Rupees per year

- *Cost Benefits to industry*

Sr. No.	Description	Annual Price (Rupees)
	Total Cost Saving per Year	
1	Reduced Manpower	4,32,000 /-
2	Accident	1,80,000 /-
3	Personal Protective Equipment (PPE)	13,020 /-
4	Operation performing timing	4,43,520/-
5	MSEB Cost	85,000/-
6	Worker Cost	1,44,000/-
7	Maintenance cost	50,000/-
8	Setup Cost	75,000/-
9	Inspection Cost	30,000/-
Total Cost		**6,84,540/-**

VI. RESULT:

Sr. No.	Parameter	Existing	Redesign
1	Manpower	3	1
2	Loading Time	15 min	3 min
3	Accident	3% to 4%	0%
4	Quantity of sand/cycle	50 Kg	200 Kg

DISCUSSION:

From above overall study and results, this study is to investigate optimal method of load lifting mechanism and efficiently we had designed rate of production is increased as well as company has gain profit of 6,84,540 Rupees per year.

VII. CONCLUSION

In this project work we have converted manually working lift mechanism to automation working lift mechanism. Also, we have reduced accident 3 to 4 % to zero percentage. We have increased productivity more than 10% of current production rate. Due to above all reason annually benefit of industry is 6,85,540 Rupees.

VIII. REFERANCE

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