PROBLEM OF LUFFING SYSTEM OF STACKER RECLAIMER

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Abstract- A Stacker Reclaimer machine is large equipment used in Coal Handling Plant (CHP). Other than Stacking, Luffing is the basic movement. Although two power cylinders and a boom conveyor belt is introduced in the Stacker Reclaimer. As the cylinders are workings up and down direction, then the boom conveyor of machine also working up and down direction. Thus the whole working is termed as Luffing system. Due to the problem of Luffing system, it may cause stoppage of plant generation with a big financial loss of Rs. 5, 23,300/-. By knowing the root cause, we formulated the solution by using number of tools and techniques. A new modified pipe is then fabricated with the cost of just Rs. 450/-. Through this model we have made trials and follow-ups on a Stacker Reclaimer. And thus finally we solved the problem of Luffing system of a Stacker Reclaimer by saving tangible benefits of Rs. 5,23,300/-.

I. INTRODUCTION

A Stacker Reclaimer machine is a large coal feeding equipment used in Coal Handling Plant (CHP). For identification of our problem we have collected about 105 problems through daily defects cards and log books, problems faced during day to day working and discussing with other department. Then considering only High frequency zone problems, we sorted out 10 main problems.

Out of these 10 problems, problem No 7 cause 24 times break-down in seven months which has adverse effect on the system. So we go through problem No 7 i.e. Problem of Luffing System of Stacker Reclaimer.

II. IDENTIFICATION OF THE PROBLEM

Through the process chart we found exact location of the problem throughout the Coal Handling Plant (CHP). It is located before the reversible direction of conveyor belt No 24 which is placed before the secondary crusher.

Main parts of the stacker reclaimer machine:-

1. Power cylinder (2 Nos)
2. Solenoid valve (1 No)
3. Boom conveyor
4. Bucket wheel
5. Main hydraulic oil tank.

Thus the two power cylinders are situated both sides of the stacker machine and working by pressurized hydraulic oil which is supply from main oil tank through the solenoid valve.

So cylinders are working up and down direction. And thus boom conveyor of the machine also working up and down direction. This whole working is known as Luffing system.

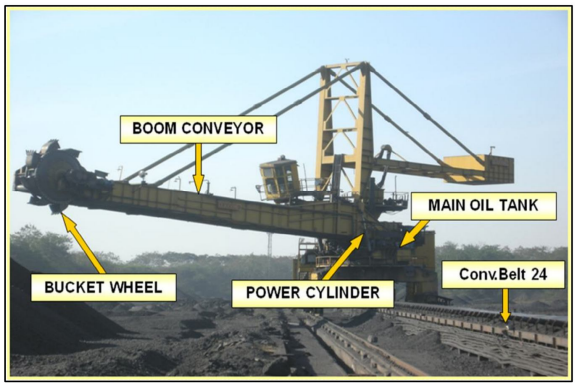

Fig. 1:- Picture of Stacker Reclaimer machine in Coal Handling Plant (CHP).

III. IMPACT AND LOSSES

As the above system fails, it creates the total plant stoppage. Impacts are noted below:-

Sr.No	Loss	No. of Times	Cost (in Rs)
1	Replacement of piston seal kit	03	1,32,000
2	Replacement of piston gland seal	15	52,500
3	Replacement of oil strainer	06	9,000
4	Replacement of oil filter	04	2,000
5	Replacement of solenoid valve	02	1,57,000
6	Replacement of total hydraulic oil	03	34,000
7	Complete oil filtering	25	20,000
8	Repair of solenoid valve	07	28,000
9	Loss of man-days	335 Hrs	88,800
Total			5,23,300/-

Table 1:- Losses observed from June-13 to Dec-13

IV. FINDING OF ROOT CAUSE

By applying cost-effect analysis via 4-M method (Man-Machine-Material-Method) and by observing the data collection from July-13 to Dec-13, we found that root cause behind this problem is due to the contamination of hydraulic oil.

Hydraulic oil is supplied from main oil tank to Luffing system through suction pipe. Rubber element fitted between suction pipe and tank surface. Due the collar on the surface of the tank, water and coal dust accumulated over the surface of tank. Due to the accumulation of coal dust and water rubber element gets damaged. And due to damage of rubber element water and coal dust enter into the oil tank. Water and coal dust mixed with oil and chemical reaction takes place and finally oil gets contaminated.

V. FORMULATION OF SOLUTION

By using PDCA analysis (Plan-Do-Check-Action), we have made new modified type of fabricated pipe as follows:-

1. New pipe is fabricated from M.S. bar of 40X100 mm by making bore of 30 mm throughout the length.
2. One end of this modified pipe is welded to the surface of oil tank.
3. M.S. plate is fabricated from 50X50X10 mm by making the bore of 28 mm to it and groove for the O-Ring is made to the M.S. plate. This plate is then welded to the suction pipe.
4. Leak proof fitting is achieved with the help of O-Ring.

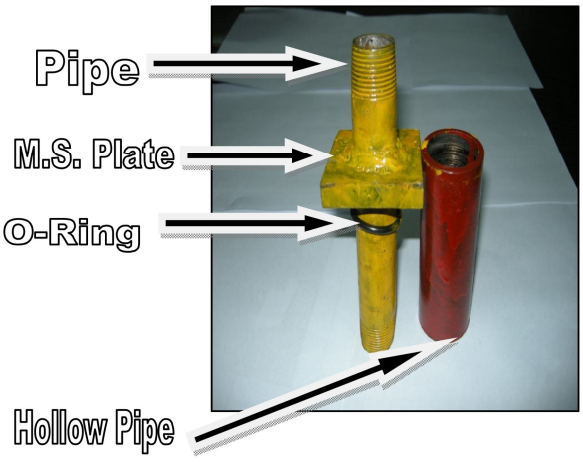

Fig. 2:- New modified type of fabricated pipe

Sr. No.	List of Materials	Qty	Cost (in Rs)
1	M.S. Bar (100X60mm)	01	100
2	Oil Seal (28X50mm)	01	25
3	Welding Rod	05	25
4	Labour Charge	03 men	300
Total			450/-

Table 2:- List of Materials required for Modification

VI. FEED-BACK OF RESULT

By doing trials, follow-ups on the Stacker machine and through Reverse Engineering concept (i.e. No opposition for our solution by any person), we observed that machine is smoothly running without any disturbance and with full satisfaction.

Data-Analysis:-

Before modification:-

Sr. No.	Month	Mal-functioning of Luffing system
1	July-13	11
2	Aug-13	13
3	Sept-13	19
4	Oct-13	10
5	Nov-13	08
6	Dec-13	06

Table 3:- Mal-functioning of Luffing system before modification

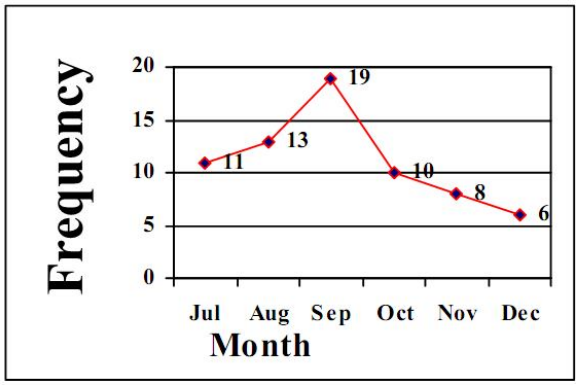

Fig 3:- Graph of Frequency Vs Month of Mal-functioning of Luffing system before modification

After modification:-

Sr. No.	Month	Mal-functioning of Luffing system
1	Jan-14	00
2	Feb-14	00
3	Mar-14	00
4	Apr-14	00
5	May-14	00

Table 4:- Mal-functioning of Luffing system after modification

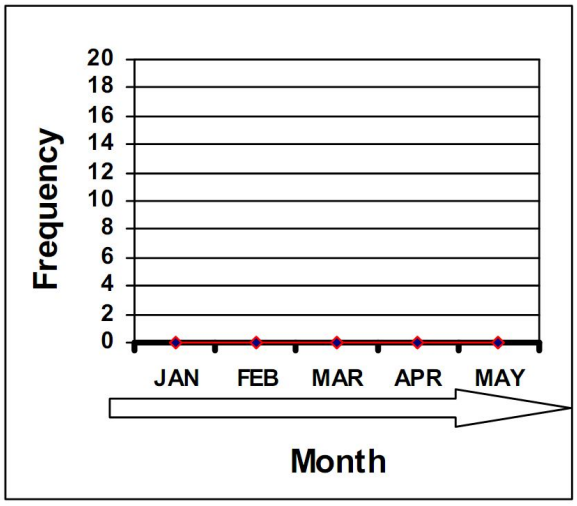

Fig 4:- Graph of Frequency Vs Month of Mal-functioning of Luffing system after modification

CONCLUSION

Thus finally by using modified type of pipe, we have a tangible benefits of Rs 5, 23,300/-. And In-tangible benefits are as follows:-

1. Increases the availability of the Stacker machine.
2. Reduction of Land pollution.
3. Reduces mental stresses in the minds of the workers.
4. And thus, problem of Luffing system of Stacker Reclaimer is then finally solved.

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