Using Lean Philosophy to Eliminate the Non Value Factors in Additive Hopper Feeding Belt Conveyor

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Abstract— This paper describes how we can use the lean philosophy to eliminate the problem that is caused due to presence of a non-value component which contributes to high cost and high power loss. Here, Additive Hopper Feeding Belt Conveyor is taken into consideration. The problem is identified. Then, the factors responsible for the problem are identified. Lean philosophy tells how to take certain steps to eliminate the problem causing factors. In this paper, steps are taken in the form of modifications to eliminate the components which are non-value adding. In this way, high power and cost is saved. this experimental work as a paper , to eliminate the non-value factors in additive hopper feeding belt conveyor.

Key words: lean philosophy, Additive Hopper Feeding Belt Conveyor, filter and air lock

I. Introduction

A. *Lean Philosophy*

What is Lean? Lean is the new way of thinking that had grew up in Toyoda family company or the Toyota house. The Lean philosophy was driven by few ideas such as customer values, elimination of non-value activities and wastes. The workforce ideology, involving people in the process of production, also plays an important part in the origin of lean philosophy. In fact, lean is a process management philosophy. Lean aims to produce products and services through using the minimum levels of all factors, like minimum capital investment, minimum human efforts and minimum wastes. The key element in Lean strategy is to develop a learning system that has the ability to identify and distinguish between value added activities and wastes. Implementation of lean has helped many organizations to improve their productivity and efficiency. The core idea is to maximize customer value while minimizing waste. Simply, lean means creating more value for customers with fewer resources.

II. Methodology

A. *General*

In order to achieve the aim, which is to eliminate the non value components, the process taken into consideration should be understood first. The following is the line diagram of the Additive hopper feeding belt conveyor.

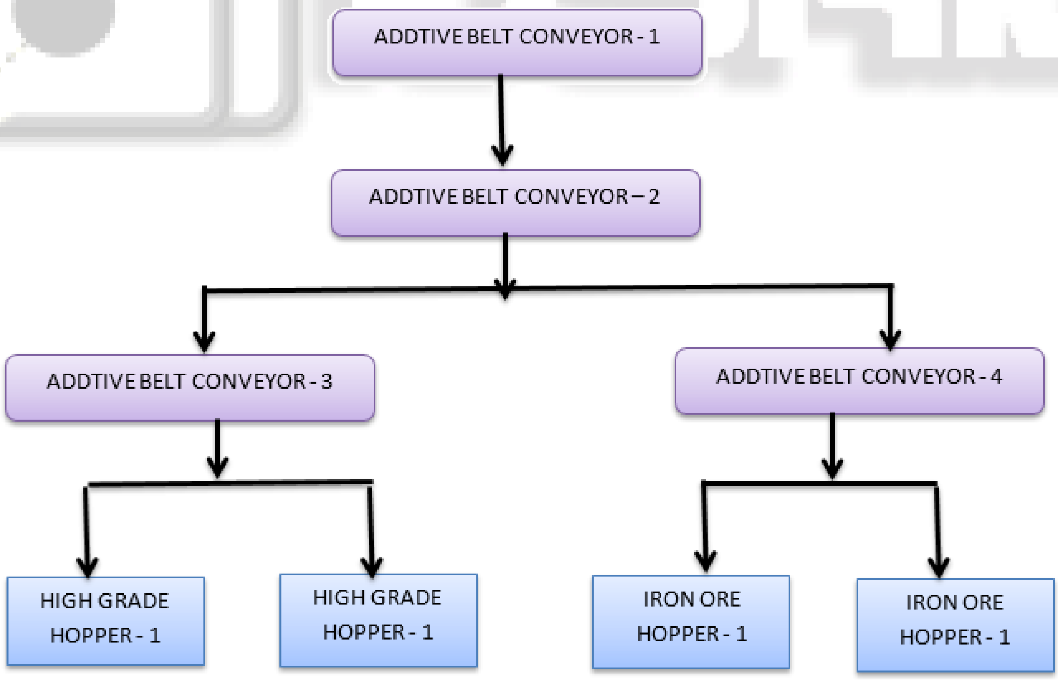

Fig. 2.1: Additive hopper feeding belt conveyor

The problem with this system is that the cost of running the four conveyors is very high, and the electrical power they consume for running is also high. In addition, there are bag filters and rotary air lock, which needs maintenance that adds to the total cost. The cost of the various components of this equipment is shown below:

Equipment	Amount
Running cost of conveyor 1	Rs. 1,60,000 per annum
Running cost of conveyor 2	Rs. 1,60,000 per annum

Running cost of conveyor 3	Rs. 1,60,000 per annum
Running cost of conveyor 4	Rs. 1,60,000 per annum
Maintenance cost of bag filter	Rs. 2,00,000 per annum
Maintenance cost of rotary air lock	Rs. 1,40,000 per annum
Total cost of the Equipment	Rs. 9,80,000 per annum

Table 2.1: Cost of maintenance of the leading equipment

Running conveyor belts spend 48 KW power per day. Bag filter motor runs for 4 hours a day and consume 48 KW per day. The rotary air lock saving runs for 4 hours a day and consume 1 KW per day. It is summarized as follows:

S.No.	Component	Power Loss
1.	Conveyors (4 hrs/day)	48kW/day
2.	Bag filter motor saving 4 hrs/day)	48kW/day
3.	Rotary air lock saving (4 hrs/day)	1 kW/day
		Total power loss= 97KW per day

Table 2.2: Power Loss in component

Because of such problems of high cost and high power loss in the equipment due to the presence of conveyor belts, the non value component identified is the belt conveyors. Apart from it, bag filter and rotary air lock are also non value components which shall be eliminated.Conveyor 1 cannot be eliminated as it acts as a material feeding medium to the belt conveyor 2, from where the materials eventually lead to other conveyors and finally to the respective hoppers. Hence, only conveyors 2, 3, 4 will be eliminated. The modification is proposed that instead of the belt conveyors 2, 3 & 4, four pipe chutes would be installed starting from conveyor 1 reaching directly to the four destination hoppers. In other words, conveyors are replaced by pipe chutes.The modified drawing is as shown:

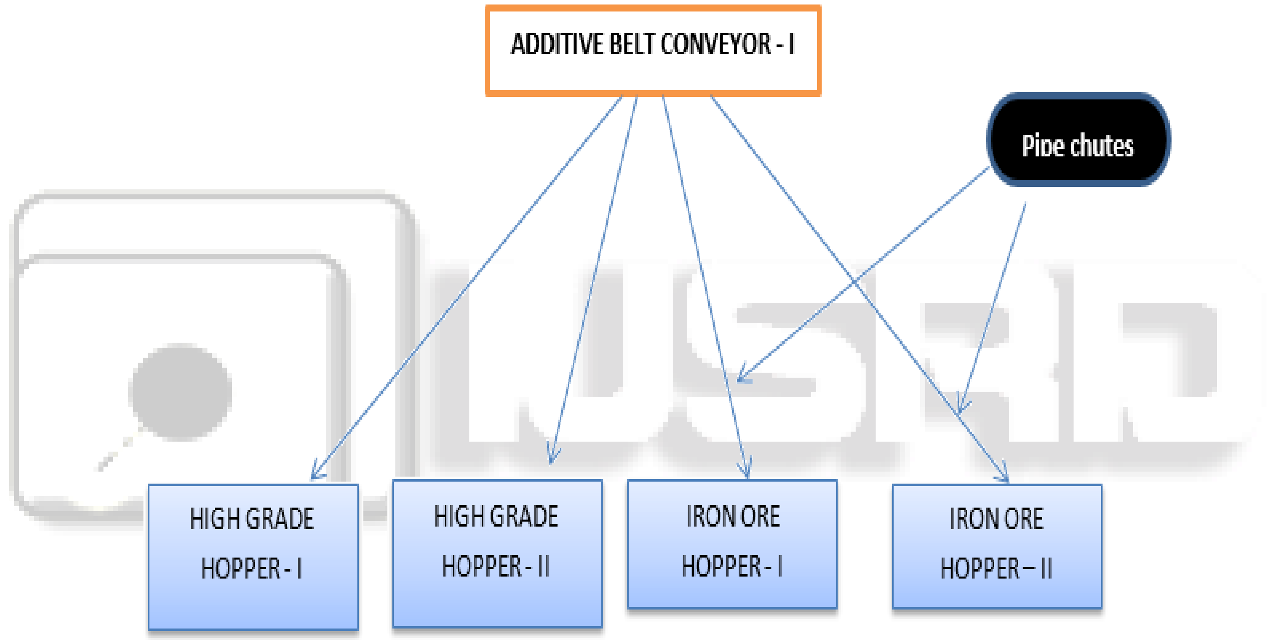

Fig. 2.2: Additive hopper feeding modified design.

The three conveyors are removed and replaced by pipe chutes. Along with the conveyors, bag filter and air lock are also removed. As a result, the running cost and high power associated with them are also reduced. Now, the power will be required only for running conveyor 1. From conveyor 1, the materials will be fed into the pipe chutes, through which materials will automatically fall into the hoppers without any need of a medium to carry them along to the hoppers, as was in original case.

III. Result

The running cost of conveyors 2, 3, 4, and the maintenance cost of bag filter and air lock will be saved, and the power loss is reduced to minimum.

The proposed modification was successful and gave good results, as summarized below:

Cost of running conveyor 2 was Rs.1,60,000/annum. It is reduced to 0.

Cost of running conveyor 3 was Rs.1,60,000/annum. It is reduced to 0.

Cost of running conveyor 4 was Rs.1,60,000/annum. It is reduced to 0.

Maintenance cost of bag filter was Rs.2,00,000/annum. It is reduced to 0.

Maintenance cost of rotary air lock was Rs.1,40,000/annum. It is reduced to 0.

Running cost of conveyor 1 remains the same, i.e., Rs.1,60,000 per annum.

Total cost earlier was Rs.9,80,000.

Total cost saved is Rs. 9,80,000 - 1,60,000

= Rs. 8,20,000.

Hence, Rs. 8.2 lacs is saved.

Other benefits are as follows:

The running power for 4 conveyors is 48 KW.

So, running power for each conveyor individually will be 12 KW. Conveyor 1 is still running.

Therefore total power saved = 97 – 12 = 85 KW.

S.No.	Indicator	From	To
1.	Conveyor power for running four conveyors(4	48kW/day	12kW/day

	hrs/day)		
2.	Bag filter motor saving (4 hrs/day)	48kW/day	0
3.	Rotary air lock saving (4 hrs/day)	1 kW/day	0
	Total Power	97 kW/day	12kW/day

Table 3.1: Benefits achieved.

IV. CONCLUSION

From the paper, it can be concluded that lean philosophy works in a great manner when there is a need to identify and eliminate the non-value factors. Using lean philosophy in an industry can help in cost reduction and power reduction as in this case, where an amount of Rs. 8.2 lacs is saved annually, and a power of 85 KW is saved per day by carrying out few steps.The scope to implement lean philosophy will arise only when the clear problems are identified, especially in those equipments which are causing considerably high loss in several aspects.

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