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Elimination of frequent failure of filter cloth by using quality circle.

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ABSTRACT:
The purpose of this study is to investigate the problem of filter cloth failure in pressure filters at Jindal Steel Works (pellet plant). The research is important since this problem directly leads to an increase in the process's costs. This increases the workload of the "wet grinding department." The PDCA cycle and the fishbone diagram were used to figure out why the filter cloth was failing. The following data was gathered, and it can be observed that the failure rate of filter cloths is growing, while efficiency is dropping. As a result, in light of this, appropriate action should be taken. The main purpose of the project is to extend the life of a pressure filter that has experienced filter fabric attrition on a regular basis.
The biggest economic impact is the removal of filter fabric wear and tear. The goal is to make the pressure filter cloth last longer.
This study shows how advancements in filter cloth design were developed based on cost, resulting in a low pressure filter cloth failure rate. The main goal is to increase the plant's output.
Keywords: Quality circle, Kaizen Method, Pressure Filter.

I. INTRODUCTION:

A quality circle, also known as a quality control circle, is a group of workers that perform the same or comparable tasks who meet on a regular basis to identify, analyse, and resolve workplace problems. It has a maximum of twelve members and a minimum of three. The group is usually small, and it is led by a supervisor or manager who presents the group's recommendations to upper management; where possible, workers implement the solutions themselves to improve the organization's performance and motivate employees. Quality circles were prominent in the 1980s, but they can still be seen today in the shape of Kaizen groups and other employee engagement programmes.
There are 12 steps in Quality Circle:

1. Identification of work-related problems.
2. Selection of problem.
3. Define the problem.
4. Analyse the problem.
5. Identification of cause.
6. Finding out the root cause.
7. Data analysis.
8. Developing solution.
9. Foreseeing probable resistance
10. Trial implementation
11. Regular Implementation
12. Follow up & review

II. LITERATURE REVIEW:

Pressure Filter

In separation operations, an industrial filter press is a tool that is used to separate particles and liquids. The machine stacks numerous filter elements and offers easy access to the filter for removing filtered solids, cleaning, and filter media replacement.
Filter presses cannot be utilised in a continuous process, despite the fact that they can produce good results, particularly when a low residual liquid content in the solid is desired. Filter presses are used to filter water from mud at marble factories, among other places, so that the water can be reused during the marble cutting process.
The separating slurry is normally fed into the press's centre chamber, and each chamber is subsequently filled. The last chamber will be loaded before the mud in the first begins to cake if the press is filled at the correct moment. The pressure inside the system will grow as the chambers fill due to the formation of thick sludge. The liquid is then forced through filter cloths with pressurised air, however in some cases, such as

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when water has been reused from a previous process, water may be more cost-effective.

Types of pressure Filter
Plate and frame filter press

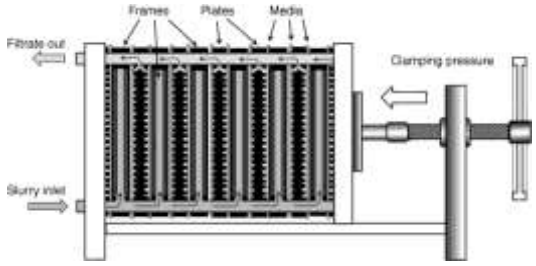
- The most basic design is a plate and frame filter press, which is also known as a "membrane plate filter." Filter membranes are put between each plate-frame pair in this sort of filter press, which is made up of several alternating plates and frames supported by a pair of rails.
- Plates offer pressure support for filter membranes and contain thin gaps that allow filtrate to flow through the membrane into the plate and subsequently out into a collection system.
- Between the membranes and plates, frames provide a chamber into which the slurry is poured and the filter cake collects.

The filter membrane may have an incorporated seal around the edge of the filter material, which acts as a gasket when compressed, and the stack is compressed with sufficient force to establish a liquid-tight seal between each plate and frame.

Automatic filter press: -

The concept of an automatic filter press is similar to that of a manual filter or frame filter, with the exception that the entire process is totally automated. Larger plate and frame filter presses with mechanical "plate shifters" make up this system. The plate shifter's job is to move the plates around and allow the filter cakes that have formed between them to be discharged quickly. It also has a diaphragm compressor in the filter plates, which helps to improve the operating conditions by drying the filter cakes even more.

Filter presses that are fully automatic give a high level of automation while maintaining continuous operation. For example, the simultaneous filter plate opening technology enables a particularly quick cake release, decreasing cycle time to a bare minimum. As a result, a high-speed filter press with improved production per unit area of the filter has been developed. As a result, these machines are used in situations where high filtration speeds are required, such as with highly filterable materials. Mining concentrates and residues, for example, are examples. Different technologies are available for fully automated operation. Vibration/shaking devices, spreader clamp/spreader cloth variant, and scraping devices are examples of this. A fully automatic filter press can run unattended for 24 hours a day, seven days a week.



III. PROBLEM DEFINITION:

The purpose of an issue statement is to communicate. Problem statements are required for businesses, individuals, and other entities to begin improvement activities. These statements also offer crucial information for making project or procedure decisions.

So, based on our search, lab manual, maintenance record book, and other sources, we have identified roughly 40 faults with the Pressure Filter, which are as follows:-

SR. NO.	PROBLEMS
1.	Air leakage needs to arrest in the instrument airline.
2.	FILTER process valves (butterfly type) malfunction frequently
3.	Sensor problem (cable joint, sensor malfunction, striker problem).
4.	Insufficient illumination in the FILTER area
5.	Improper shaking of all 5 FILTERs
6.	Spray pipe improper flushing.
7.	Material spillage in CC conveyors floor through swivel plate.
8.	EOT crane hoist needs to speed up.
9.	FILTER cloth frequent damage problem.
10.	W/F belt of iron ore bunker getting frequent damage because of improper hopper placement.
11.	Hydraulic leakage problem.
12.	Blaine does not achieve a higher percentage of Hard ore in the feed mix
13.	Hydraulic pump pressure problem of Filter 2 power pack.
14.	The permanent staircase is not available for fixing the banana link or connection link.
15.	CC conveyor belt tension hydraulic unit is not working
16.	Proper fabricated nozzles are required for the water hose.
17.	Membrane getting frequently damaged.
18.	The moisture sensor needs to be replaced from the cf-1 conveyor.
19.	CC belt getting damaged because of the improper approach of idler replacement.
20.	Swivel plate drain pipeline rusting problem.
21.	Slurry feed pump knife gate valve malfunction.
22.	Filtrate tank overflow problem
23.	Unavailability of FILTER plate O ring

SELECTION OF PROBLEM:
The ABC analysis was used to choose the problem. FILTER CLOTH FREQUENT DAMAGE was the chosen issue.

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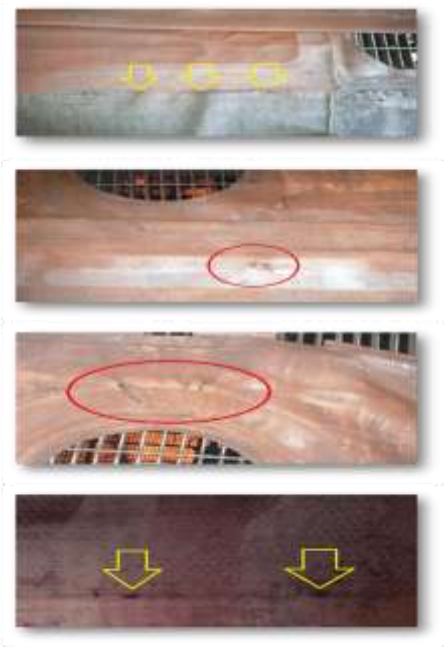
Due to the continual pressure applied by the pressure filter, the filter fabric of the pressure filter is frequently worn and torn.

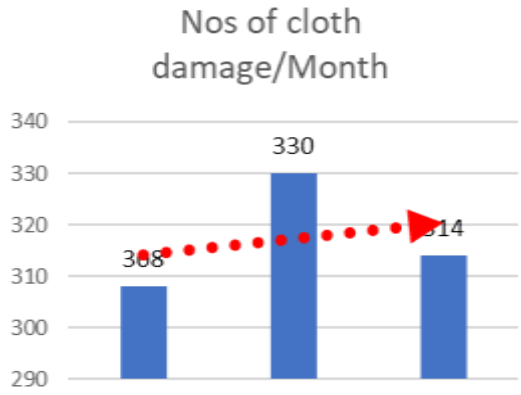


IV. METHODOLOGY:

After discussing and selecting the problem, we further move to our next step i.e., DO. In this, there are further 5 parts or sub-steps which we have to do it are as follows: -

1. ANALYSE
2. IDENTIFY CAUSES
3. IDENTIFY ROOT CAUSES
4. DATA ANALYSIS
5. DEVELOPMENT OF SOLUTION

We must identify the causes when we have completed a team analysis of the situation. Causes that are to blame for Brainstorming and a fishbone diagram are the techniques and methods used for this. With the help of our guide and the machine operators, we've compiled a list of some of the possible causes of oil seal leaking.



The fish bone diagram was then used to identify three key causes for filter cloth deterioration.

1. **Improper packing of plates**
2. **Air-drying time is insufficient**
3. **Faulty design of membrane**

The team opted to work on the problem of insufficient sealing at the filling shoe area based on data analysis of valid fundamental causes.

As a result, we devised two further solutions:

1.3 mm packing provided at the discharge end side of plate pack

As per the trial need, the team first implemented the idea of supplying 3mm packing at the discharge end side of the plate pack. The method used was trial and error.

The projected improvement percentage with this method was roughly 20%. And the whole cost was approximately Rs.3190. It was achievable because the implementation period was only one day and the pressure filter was not closed. The advantage was that it was easy to use and had a low implementation cost.

A lack of proper packing on the underside resulted in leaking near the discharge end filling shoe and severe mechanical labour during installation.

REMARK: REJECTED

2. Ring of old cloth was used to provide packing at filling shoe area of 10 cloths near discharge end:

A ring of old cloth was used to offer packing at the filling shoe region of 10 cloths near the discharge end. The anticipated improvement was 50%, with an estimated cost of Rs.800. As a result, it is viable, with a 30-day deployment period and no downtime. It is easy to use and has a low implementation cost.

Remark: Accepted

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V. OBSERVATION:

So basically, in this section we see two important step that is:

1. REGULAR IMPLEMENTATION
2. FOLLOW UP AND REVIEW

1. Regular Implementation

The goal is to keep the solution up to date, and it should be implemented on a regular basis. Regular implementation is the next step in the process. The Gantt chart is used to overcome the problem of regular implementation. A Gantt chart is a means of planning work ahead of time so that employees have a chart or guideline to follow in order to complete their tasks on time.

2. Follow up and review.

We noticed that the filter cloth's life extended when the ring of old cloth was used to provide packing at the filling shoe location. The benefit of the treatment is that the filter cloth degradation is reduced. As a result, filter cloth life has improved, maintenance replacement costs have decreased, and equipment availability has improved.

So, before adopting this method, the total number of broken filter cloth was around 317, and after delivering the solution, it was significantly reduced to 281 resulting in a 15% reduction in cost. We were able to cut the industry's annual spend by 15% by applying quality circle methodologies.

VI. FUTURE SCOPE:

As previously stated, we are packing the filled shoe region with an old Filter cloth ring. Because there will be less wear and tear on the filter cloth, the efficiency of the pressure filter will improve. Furthermore, because the pressure filter will be more dependent in the future, there will be an increase in profitability because no further costs will be required to repair the filter cloth. And all of these activities, such as removing the old filter cloth ring and replacing it with a new filter cloth ring, will be carried out under the supervision of the industry, with no additional labour required.

VII. CONCLUSION

1) The major purpose of this research was to reduce the amount of damage to the pressure filter's filter fabric. Using a quality circle, we attempted to overcome the problem of frequent filter cloth failure. We were able to solve the pressure filter's main issue.
2) We examined how the pressure filter works first, then used the stratification approach to identify the numerous problems in the pressure filter.
3) We noticed that filter cloth is frequently damaged, and this is affecting production. As a result, we chose the filter cloth issue..
4) We were able to reduce the amount of filter cloths that were damaged. This project has 12 phases and is based on the Deming wheel. In order to solve this difficulty, we followed each step.
5) We discovered three distinct causes of frequent filter cloth failure: poor membrane design, insufficient air-drying time, and inappropriate plate packing.
6) We established the first solution after completing all Deming wheel phases and considering all factors. On the discharge side of the plate pack, we provided a 3mm packing, which was later rejected.
7) Following more debate, we devised a new solution: 3mm packing at the plate pack's feed end, which was also rejected.
8) After the last and final discussion, our proposal was adopted, which was to use an old cloth ring to provide packing at the filling shoe region of 10 cloths near the discharge end, reducing the amount of filter cloth that was damaged. As a result, the industry adopted this option.

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