

Reduction of Oil Content in Degreasing Tank of Phosphating Process by Implementing Suitable Solution

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Abstract:- The main aim of this project is to enhance the Paint Adhesion Quality of ½”, 1/4”, 3/8” Bowl Guards which are to be fitted on Air Preparation Units like Pneumatic Filter & Lubricator after the painting process, by implementing adaptive solution. It is found that when the Bowl Guards undergo Phosphating Process (Paint Pretreatment) a large sum of Free Floating Oil generated and floats on the top surface of Degreasing tank sticks on the bowl guard which relatively reduces the Paint Adhesion Quality. Hence the Free floating oil was removed efficiently by employed suitable oil removal equipment and finally Paint Adhesion Quality of Bowl Guard is improved.

Key words : Quality, Paint adhesion, Bowl guard, free floating oil, removal

INTRODUCTION

Quality in its most simple terms may be defined as “Conformance to requirements”. A product is said to be good quality if it works well in equipment it was meant for. Quality is a relative term and is generally used with reference to the end use of the product[1]. Some of the most popular definitions for quality are listed below,

- A degree of excellence
- Conformance to requirements
- Totality of characteristics which act to satisfy a need

The quality and life of paint applied on the material depends on various factors such that it should withstand the external factors like moisture, humidity etc.,. It is necessary to give proper surface finish on the material prior to painting process which increases the quality of paint adhesion. This project deals with the improvement in painting quality of FRL units. It was found that the Bowl Guards of sizes ½”, 1/4”, 3/8” which are to be fitted on the Filter & Lubricator, facing some quality drawback after the Painting process. The main issue was reduction in the life of **Paint Adhesion** because of oil layer deposition on the bowl guard during **Phosphating Process (Paint pretreatment)**. Since the bowl guards are made of steel, rust prevention oil coating is applied on it. They are

removed in the Degreasing Tank of Phosphating Process with the help of Industrial Degreasers. The removed oil forms a layer on the tank and sticks to the Bowl Guards while they move to next stage of the process.

Usually the oil layer was removed by manual process. A worker should collect the floating oil layer by means of any beaker

, vessel or any other means. The difficulties faced during the manual removing are,

1. Oil layer can be removed only at the commencement or after completion of Phosphating Process. Removing middle is quite risky and may affect flow of the process.

2. Unable to prevent oil deposition on the bowl guard while they move to water tank from degreasing tank

Bowl guard :

The bowl guard is a material made of steel is fitted in Air preparation units like Air Filter & Lubricator. The major function of the bowl guard is that the moisture extracted from the compressed air will collect in the bowl[2]. The bowl guard is fitted in

- Pneumatic Filter
- Pneumatic Lubricator

Pneumatic Filter:

The filter should receive the supply air first from the compressor. The filter will extract most moisture and air-line contaminants typically down to 5 microns, and can get as small as 0.3 microns depending on the type of filter selected[2].

Pneumatic Lubricator :

Most air tools, cylinders, valves, air motors, and other air driven equipment require lubrication to extend their useful life. A lubricator adds controlled quantities of oil into a compressed air system to reduce the friction of moving components. The use of an airline lubricator solves the problems of too much or too little lubrication that arise

with conventional lubrication methods such as a grease gun or oil[2].



Fig:1 Bowl guard



Fig:2Pneumatic Filter



Fig:3Pneumatic Lubricator

PROCESS INVOLVED

1. Chemical Experiment to find Dissolved oil in the degreasing tank

Take 100 ml bath solution in 300 ml capacity separating funnel and cool down to ambient temperature. acidify the solution with 1: 1 sulphuric acid to pH 3-

3.5 and cool down the solution to ambient temperature. Add

approximately 100 ml of diethyl ether to the solution and shake well and allow separating two layers. The lower layer is the degreasing solution and the upper layer is diethyl ether plus dissolved oil. Discard the lower layer and collect the lower layer in pre weighted 100ml beaker and on slow heating hot plate evaporate and reweigh the beaker.

$$\text{Dissolved oil (gm/l)} = [\text{wgt of the beaker after evaporation} - \text{wgt of the empty beaker}] \times 1000$$

Final weight of the beaker [Wb]

$$= 102.5 \text{ gm}$$

Dissolved oil [gm/lit]

$$= [Wb - Wa] \times 1000$$

$$= [102.5 - 99.5] \times 1000$$

$$= \underline{\underline{3 \text{ gm/lit}}}$$

2. Manual method to find amount of oil applied on the individual bowl guard :

In the manual process about 10 bowl guards of each sizes are taken. Weight is noted initially and dipped into thinner for few minutes. Then it is thoroughly cleaned and weight is noted. The process is repeated for all the 10 bowl guards of each sizes. The average of both initial and final weight is calculated and its difference gives the oil present in each of its surface .

1. For 1/2" bowl guard

= Actual mean weight – Final mean weight

$$= 151.56 - 151.55 = \underline{\underline{0.01 \text{ gm}}}$$

2. For 1/4" bowl guard

= Actual mean weight – Final mean weight

$$= 58.4348 - 58.3755$$

$$= \underline{\underline{0.0593 \text{ gm}}}$$

Sample collected= 100 ml of degreasing solution
 Initial wight of the 250ml beaker [Wa] =
 99.5gm

For 3/8" bowl guard
 = Actual mean weight– Final mean weight= 92.1964 –
 92.1910
 = **0.0054 gm**

3.Total oil removal equipments/techniques available around the world

1. Tramp oil separator
2. Oil absorbing pillow
3. Grannular activated carbon
4. Organoclay
5. EDGETECH Coolant recovery system
6. Biological treatment
7. Polypropylene pads
8. Oleophilic foam
9. Floating weir skimmer 10.Belt skimmer
- 11.Oil absorbing polymer 12.Dissolved air flotation
- 13.Disc skimmer
- 14.Gravity oil water separator

4.Choosing equipment suitable for degreasing tank and validate its performance :

Oil skimmers are pieces of equipment that remove oil floating on the surface of a fluid. These generally work because they are made of materials to which oil is more likely to stick than the fluid it is floating on. At the same time, the fluid has very little attraction to the equipment. Oil skimmers are usually all that is necessary to remove oil from a liquid. In some cases, however, they may be used to pre-treat a fluid. In this case, they remove as much of the oil as possible before more expensive and time-consuming measures are employed.

BELT SKIMMER

Belt-type oil skimmers use an endless belt of corrosion resistant steel or synthetic medium, which is lowered into the tank or vessel to be skimmed. The belt passes through resilient wiper blades where the oil is removed from both sides of the medium.

Working:

The oil skimmer consists of an basic mechanism that produces an rotating movement from continuously rotary input. It mainly consist of electric motor whose output shaft is directly coupled to the disc which is made up of acrylic material .The oil and water mixture is filled into the steel container and theoil skimmer assembly is kept into the tank. As when the acrylic disk rotates it creates the adhesion force between oil and disk surface so that the oil will stick to the disk and finally oil will removed from disk

with the help of scrubber and it is collected in other tank.

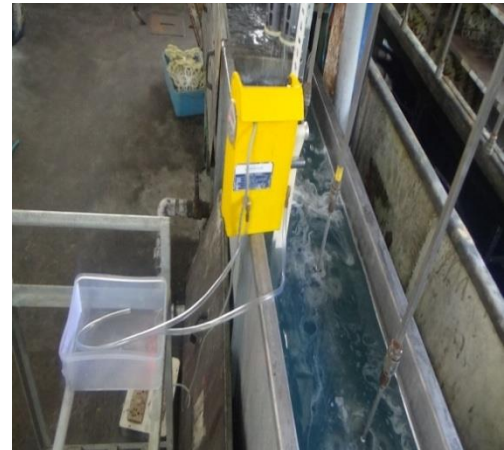
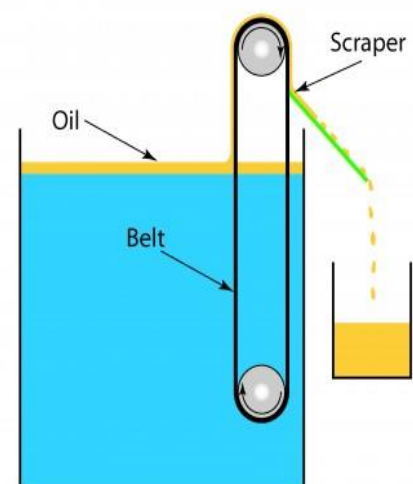


Fig : 6 Back view

Performance measure :

After proper installation of skimmer on the degreasing tank,it is operated and its rate of oil collection capacity is estimated. The skimmer is operated for 4 days with variable time duration for each day. Also it is operated both during the conveyor under running condition and at standby.



**TRAIL 1 :**

Running time = 4 Hrs

Oil Collected = 8 ml

TRAIL 2 :

Running time = 12 Hrs

Oil Collected = 50 ml

TRAIL 3 :

Running time = 24 Hrs

Oil Collected = 100 ml



Fig : 7 Collected oil

Benefits

- Reduce your cost of purchasing new coolant by 45% to 75%
- Cut your cost of coolant disposal 50% to 90%
- Improve tool life and product quality

Fig : 8 Collected oil



- Safeguard worker health & safety
- Minimal operator involvement and training
- Designed for easy installation

RESULT & CONCLUSION

The main purpose of project to remove the waste oil from Degreasing Tank of Phosphating Conveyor. The project is important for increase the paint adhesion quality of bowl guard which is to be fitted on FRL unit .

So the recovery of spilled oil is very necessary. This project is oil skimmer which is one of the method of regaining the oil which is spilled. After designing our project and testing it we have concluded that we can regain about more than 90% by using oil skimmer

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