

Design, Analysis and Fabrication of Conveyor Washing and Drying Machine

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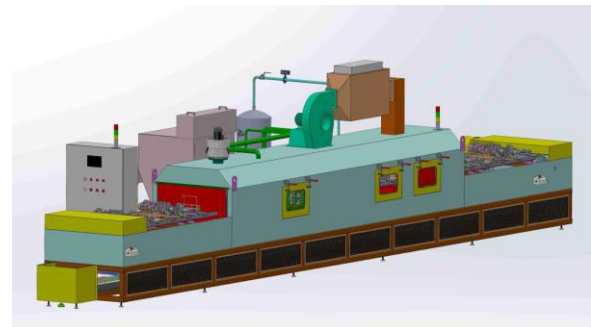
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ABSTRACT

While manufacturing a raw material to a finished product, it undergoes different types of machining process where the changes in the material are to be maintained with high accuracy and precision. Where the primary objective of the project is to remove the dirt, impurities and different substance deposited over the surface of the engine components. The working principle of the machine is based on the linear conveyor movement, and parts are conveyed through the different stages with lightspeed. Parts can be moved at a continuous or indexed motion for precision cleaning of holes and recesses.



machine this solution provides the best method in maintaining the space and a safe environment.

Fig1.Conveyor Washing Machine.

I Introduction

In earlier days the engine components such as crankshaft, camshaft, intake and exhaust valves are washed and dried manually with the physical contact of the human interface where the maintenance, safety, time consumption and chemical interaction with environment plays a significant role in the process.

A. FIELD OF INVENTION

The project involves the invention that relates to an apparatus washing and then drying industrial components.

B. DESCRIPTION OF THE PROJECT

The invention deals with the washing and drying of the engine components that make the process more accessible than the manual work by involving humans, this results in avoiding medical issues faced by the chemical interaction with the human skin and the time consumption more over the process requires in maintaining the safety of the employees and environmental surroundings clean.

This upgradation is a solution for the process followed in an industry in various stages of working sections where they are combined to a single and compact

C. MACHINE WORKING

The process starts when the component is loaded at the end of the conveyor, and that will be a continuous process by loading from the start and unloading from the end of the conveyor the process undergoes through three continuous chambers where different operations are applied to clean the parts kept in the conveyor. In the end, the product is received as a complete dry part for dispatching.

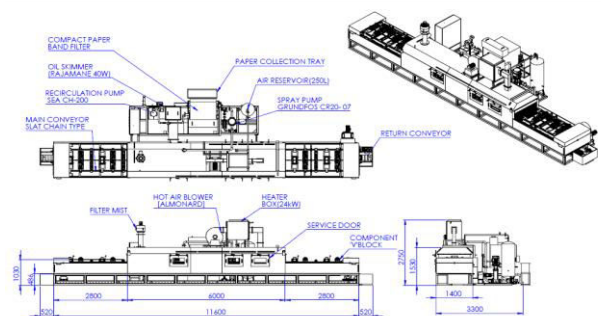


Fig 2. Conveyor Washing Machine Assembly.

1. Description of Chamber assembly

The chambers are classified into three different stages they are

- (1) Hot water washing chamber
- (2) Chemical water washing chamber
- (3) Hot air blowing chamber

(1) Hot water washing chamber:

The chamber is connected to a tank that contains the heater unit where the unit helps in flushing the water throughout the parts to be cleaned where the process starts here by flushing of the impurities and different substance that are present over the components. This chamber also helps in removing the primary greasy substances over the components.

(2) Chemical water washing chamber:

This is the main chamber present at the middle of the machine the process that involves in the machine is by cleaning the entire component using the chemical mixed water this helps in removing the impurities present over the substance, the flow of chemical content is with high pressure that produces a mist inside the chamber that mist is collected with the help of mist collector, where the environmental circumstance is maintained without adding the chemical in air.

(3) Hot air blowing chamber:

This is the final chamber that deals with the blowing of hot air throughout the components that play a significant role in the component drying process this process deals in maintaining the perfection of cleaning the chemical and water particles present on the surface of the component where the hot air of about 80°C

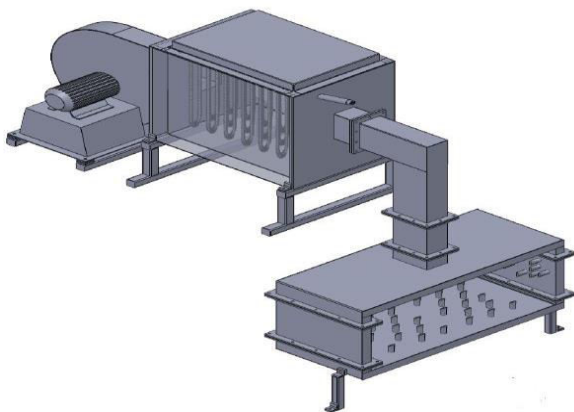
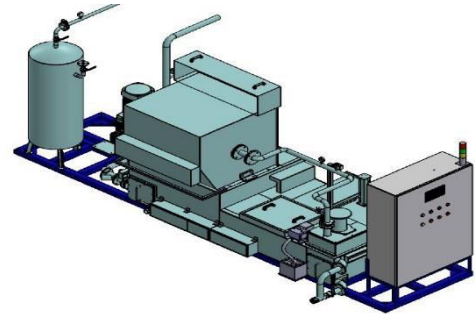


Fig 3. Heater assembly with nozzle tree.

2. Tank assembly

The tank is a significant part that consists of clean dry tank that is used to collect the impure water from the chamber that helps in maintaining the constant flow of water by filtering the impure materials such as grease, etc. chemical water from the chamber is then filtered and stored in a tank, whereas in another tank there



is a combination of chemical and water which is placed with the heater, that combination is maintained at the temperature of about 80°C.

Fig 4. Tank Assembly.

(1) Pumping systems

This assembly has a main pump unit that helps in pressurising the chemical mixed oil that is used to push the water at a maximum pressure of about 8bar. Where there are an oil skimmer and the transfer pump that helps in skimming the oil and the water inside the tank and the transfer pump is used to filter the impurities present in the washed oil mixture.

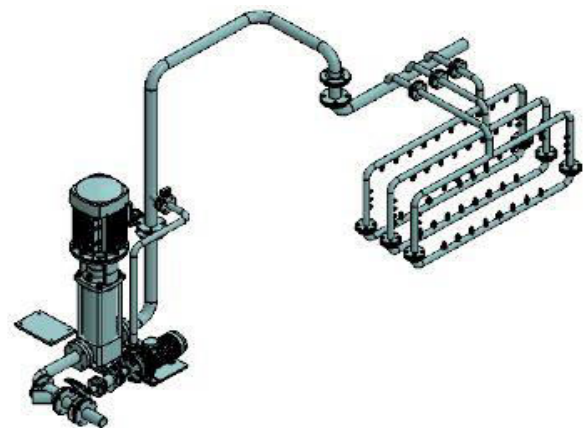


Fig 5. Main pump assembly with nozzle tree.

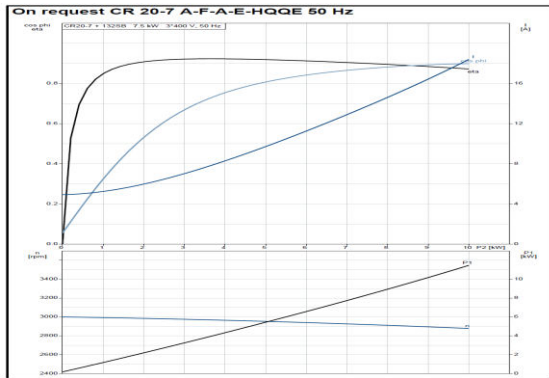


Fig 6. A graph for flow analysis of the pump at 50 Hz.

(2) Filter unit

The filter unit consists of a band that helps in filtering the water that passes through the band and then by removing the impurities present in the water and also the scrap that passes through the tank that helps in maintaining the water to be re-useable this helps in increasing the ability of the water to be used again and again for about 10-15 times from the cycle start until the cycle end of a continuous process of washing and drying the components. The waste band is then collected in the disposable tray and is disposed of in the burning chamber or else disposed of safely without harming the environment.

(3) Compressor cum Reservoir cylinder

The compressor is placed at the end of the tank assembly that helps in blasting the air from the cylinder that removes the water droplets present in the drilled holes and the small provision in the components, and hence they help in adjusting the flow of air using the pressure gauge.

3. Return conveyor assembly

The process involves in sending the bins that contain the small particles that are needed to be washed by the conveyor that helps in loading the components in the bin for the next cycle this is driven by the gear motor where the process is a chain drive.



Fig 7. Return Conveyor Assembly

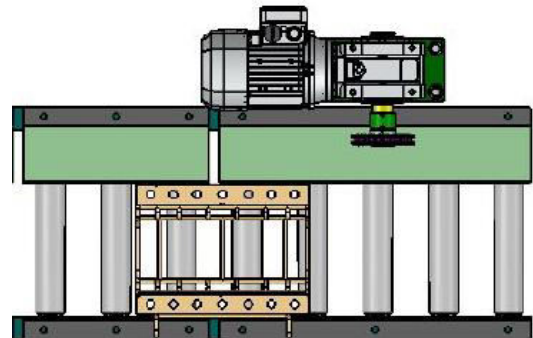


Fig 8. Return Conveyor Drive Assembly Unit.

TECHNICAL SPECIFICATION

S.No.	DESCRIPTION	SPECIFICATION
1	Machine type	Conveyor Washing & drying
2	Application	parts cleaning
3	Overall Size	LxWxH - 12600x 3300 x 2750 mm
4	Loading Height	1050 mm from ground level
5	Material	SS for fluid storage tank , Chamber & pipelines and M.S for other elements
6	Insulation	50 mm thick glass wool for air heating chamber & 10mm thick for water tank
7	Fixture movement	Slat conveyor indexing type
8	Loading method	Hoist Loading Type
9	No. of fixtures	3 Variants x 18 No's
10	No. of components / part name	4 Variants
11	Operating Sequences	Auto / Manual
12	Total Cycle time	150 Seconds per set
13	Approximate weight	11.5 Ton Approx [without water & Air]
14	Result	Removal of loose burrs & coolant
15	Validation	General cleaning
16	Cleaning medium	D M Water (Cleaning agent optional)
17	Storage tank capacity	Clean tank : 600 Its / Dirty tank : 500 Its (Approx)
18	No. of cleaning fluid spray nozzles	40 Nozzles (Working) 69 Ports
19	Cleaning fluid pressure	8 bar [maximum]
20	Cleaning fluid spray pump	Grundfos- CR-20- 07
21	Transfer Pump	Sea pumps - SEA - CH - 200
22	Nozzle check pump	Kirloskar- GMC128
23	Filtration	COMPACT BAND FILTER - SCB 1000 400 LPM / 20 MICRON. PAPER ROLL : 1m W X 100m L
24	Cleaning fluid heater	6 x 5 kW
25	Cleaning fluid temperature	55° - 60° C [Editable]
26	Control panel	PLC [SIEMENS S71200] logic with HMI [SIEMENS make]
27	Power supply	3 Ø 440 V AC / 50 Hz
28	Air Blower	ACL-02-470-2800 RPM 5HP. ALMONARD
29	Mist Filter	Filtermist - S800
30	Conveyor Gear Box	Bonfiglioli-AS 55DP 190.3 P80 B5 B3 LO
31	Conveyor Gear Box Motor	Bonfiglioli- BE 80A 6 with VFD
32	Return Conveyor Gear Box	Bonfiglioli W63 U100 P71B5B3
33	Return Conveyor Gear Box Motor	Bonfiglioli BE 71 B4
34	Min Conveyor Chain	2" SS chain
35	Return conveyor	Powered Roller
36	Reservoir	250 Its

Table 1. Technical specification of the machine.

This is the standard specification of the machine that has been constructed and placed for the working condition. The speed and movement of the conveyor are controlled by the gear motor where the chain drive is used as a drive mechanism. This controlled by the electrical sensors and the actuators using the plc controller. The conveyor system is then lubricated using the greasing setup that is placed at the end of the and the start of the machine to avoid the process of rusting in the conveyor chain that moves so smooth and vibrationless motion.

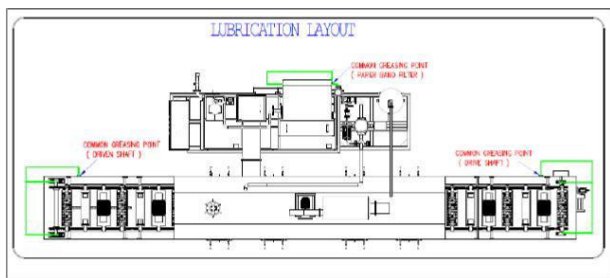


Fig 9. Lubrication system layout.

D. PNEUMATIC CIRCUIT

The pneumatic valves are used for the flow control of the air from the reservoir that is used to maintain the high pressure over the pores where there is the continuous action done for removing the water molecule that is needed to be removed from the washed components that makes the water flow through the drain that will be collected in the tank through the drain chute.

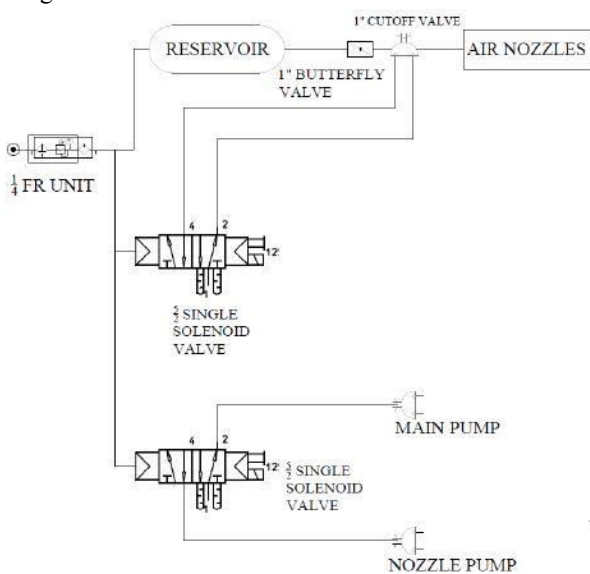


Fig. 10. Pneumatic circuit diagram

E. HYDRAULIC CIRCUIT

The hydraulic circuit is made to be the most complete process that is more common and important part of the machine that helps in the flow of the water and the chemical mixture at the constant pressure of about 8bar that make the perfect flow of water through the nozzle and the stage of forced water that flows through the nozzle at all the angle that are indexed to flow in the regulated path of the mechanism.

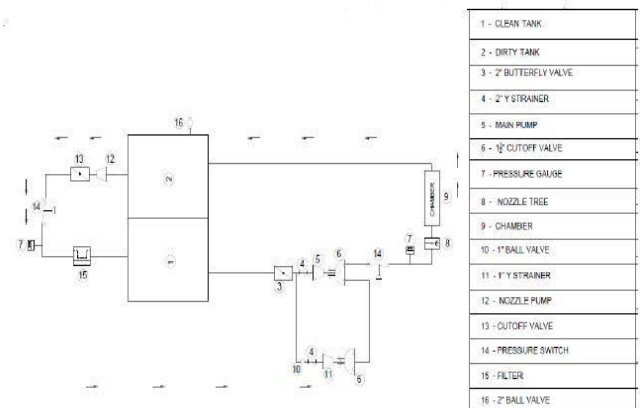
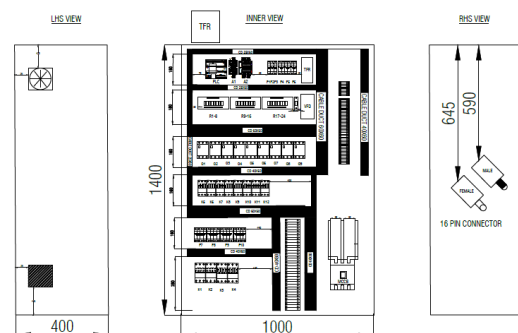


Fig. 11. Hydraulic circuit diagram

F. ELECTRICAL CIRCUIT

The electrical circuit is based on the flow of the water and the air through the respective transmission of the material flow where the change in the analysis is noted and then allowed to maintained by the program that is used for working of the machine where the manual and the auto sequence of the machine conveyor movement is considered for the process of continuous operation that makes the machine function to be perfect. Where the circuit is maintained at the level of high precession that makes the working of the machine more satisfactory. Each sequence



is maintained at the high level of Siemens programming language.

Fig. 12. Electrical panel circuit diagram.

G. METHODOLOGY

The machine function is programmed as a constant flow of the machine as an automatic continuous process for cleaning, ie, Washing and drying the components where it can also be changed into the manual working process with simple steps where the process is fixed with the HMI for maintaining, recording, and also to show the status of the working machine.

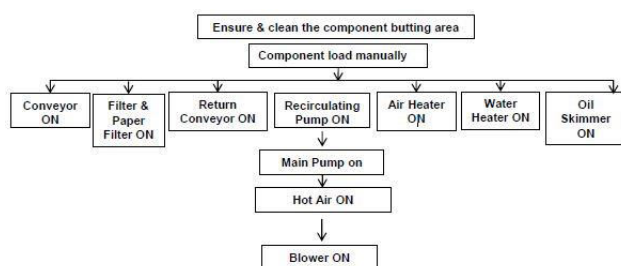


Fig. 13. Auto sequence flow chart diagram

H. OBJECTIVE

The primary objective of the machine is to reduce the size and working area of the machine by increasing the productivity; this makes the process more efficient by reducing the time consumed while washing and drying the components. It also results in odder free environmental circumstance also by avoiding the flow of chemical air mixing in the surrounding.

I. CONCLUSION

Hereby I conclude that the design, analysis, and fabrication of the conveyor washing and drying machine is constructed and it functions well as based on the design and the concept.

The defects detected in the past machines is now analysed and worked out with high efficiency by combining the washing and drying unit which makes the system more comfortable for working by reduction of the time-consuming process it is recorded to about 150 sec/set.

Advantages of the machine are that the machine is compact and can be fixed in a compact place. Human effort

is reduced, machine maintenance is controlled in cost wise, and also the safety of the labour is increased twice as old machine. Environmental aspects are also considered in the machine by which that produces a low level of pollution compared with the older machine.

The component from the machine after all the process is done is obtained to be the cleanest part that can be packed or installed directly in the system where it needs to be placed.

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