



# Automated Oil Lubrication System for Chain Driven Belt Conveyor

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**ABSTRACT:** Conveyors are commonly used as mechanical handling equipment for transportation purpose. In the case of manually applied lubricant, technicians tend to lubricate on schedule rather than when bearing needs it. This leads to over lubrication and under lubrication. So every bearings of the conveyor needs to be properly lubricated. Improper lubrication scenario leads to the sedimentation of dust, dirt and moisture in the chain driven belt conveyor. This project is to increase the life span and removing the sedimented dust particles by automated lubrication system and continuous air blower by using Programmable Logic Controller (PLC). Automated lubrication provides lubricant constantly at an appropriate amount that allows the bearing to operate at its optimum, which decreases the man power. Sensors are used for protection purpose and also avoid the faults that occurs in the conveyor. The entire process is monitored and accessed by Human Machine Interface (HMI).

**KEYWORDS:** Programmable Logic Controller(PLC), Human Machine Interface (HMI),Automated lubrication.

## I.INTRODUCTION

In the current system, the coal handling process is done manually without any automation. The maintenance of conveyors are processed by technicians which leads to either over or under lubrication. Automatic monitoring is not in the existing system. Here the major cause of the equipment damage occurs as shown in Fig.1.1 is often due to improper lubrication which includes dust, dirt and moisture. This collection of dust leads to wear and tear of the conveyor systems. Due to this, the breakage of chains occurs. Even when the coal is not available, the conveyor system continue to do its process, which reduces the lifetime of the conveyor.

To improve the life span of the conveyor system , the solenoid valve is used for blowing air and oil lubricating purpose. This valve is used for removing dust particles in the conveyor system, which does not allow the chains to get sedimented. The proposed system is also used to avoid wear and tear of a chain driven belt conveyor by using PLC and also the entire process is monitored with the help of HMI. Then this process leads to have Maximum efficiency, Reduce the human possible errors, Low maintenance, Over Lubrication and Under Lubrications does not occur, Pollution free environment.



Figure1:Major Problem in the Conveyor System

# International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijareeie.com](http://www.ijareeie.com)

Vol. 6, Issue 4, April 2017

## II.CONVEYOR SYSTEM

A conveyor system is used for mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transportation of heavy or bulky materials. These systems allow quick and efficient transportation for a wide variety of materials, which make them popular in the material handling and packaging industries. Many kinds of conveying systems are available and are used according to the various needs of industries.

Conveyor systems are commonly used in many industries including the Mining, automotive, agricultural, computer, electronic, processing, aerospace, pharmaceutical, chemical, bottling and canning, print finishing and packaging.



Figure2: Chain Driven Belt Conveyor

In the Chain driven conveyor the belt is bolted to a series of cross-members, the ends of which connects to chains running down each side of the conveyor. The chains connect to the motor via a sprocket. This produces a high degree of linkage between the belt and the motor, making slippage impossible.

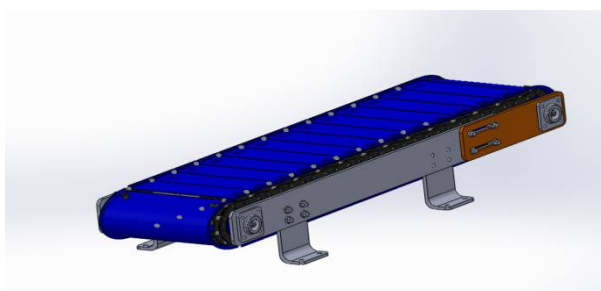


Figure3a

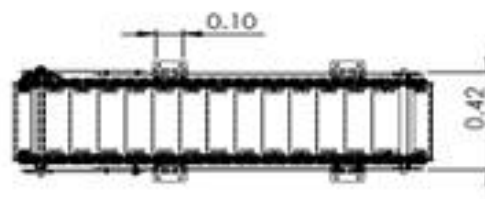


Figure3b

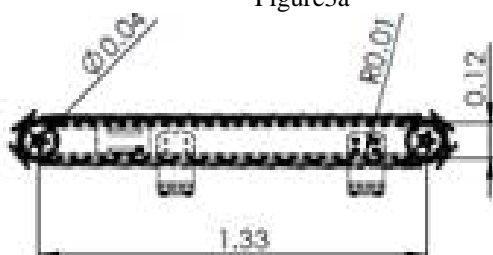


Figure3c



Figure3d

Figure3(a,b,c,d):Design and Dimensions of the Conveyor for 1m.

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## III.LUBRICATION

Lubrication is the process or technique employed to reduce friction between, and wear of one or both, surfaces in close proximity and moving relative to each other, by interposing a substance called a lubricant between them. Adequate lubrication allows smooth continuous operation of equipment, reduces the rate of wear, and prevents excessive stresses or seizures at bearings. When lubrication breaks down, components can rub destructively against each other, causing heat, local welding, destructive damage and failure.

### AUTOMATED CHAIN LUBRICATION

Automated chain lubrication systems apply metered quantities of lubricant to the chain, exactly where and when it is needed, while the chain is in operation. Proper metering keeps the lubricant quantity to a minimum, yet ensures sufficient amounts, thus reducing the impact on budget and the life span of the chain can often be increased by ten times and more. Appropriate amount of lubricant prevents the problem of over lubrication and under lubrication.

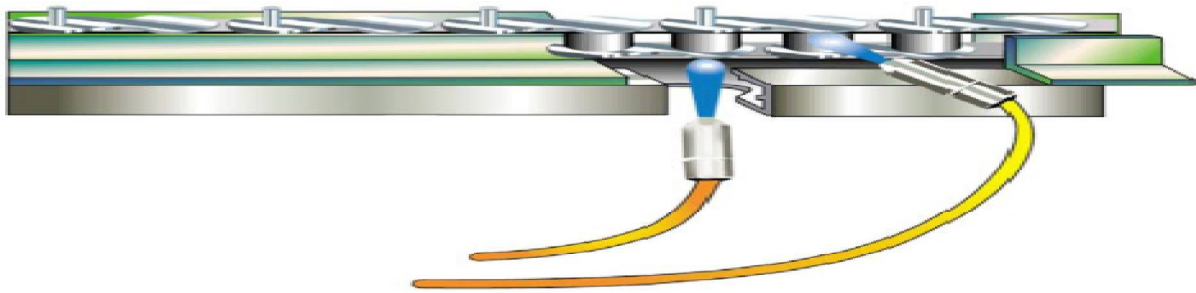


Figure4:Automated chain lubrication

This leads to

- Increase life expectancy of the chain.
- Minimize downtime resulting from insufficient lubrication.
- Reduce energy consumption.
- Cooling of fast-running chains.
- Reduce harmonics.
- Protects the equipment from major damage.
- Improve the efficiency and reliability of machinery

## IV.PLC SIMULATION FOR PROTOTYPE MODEL

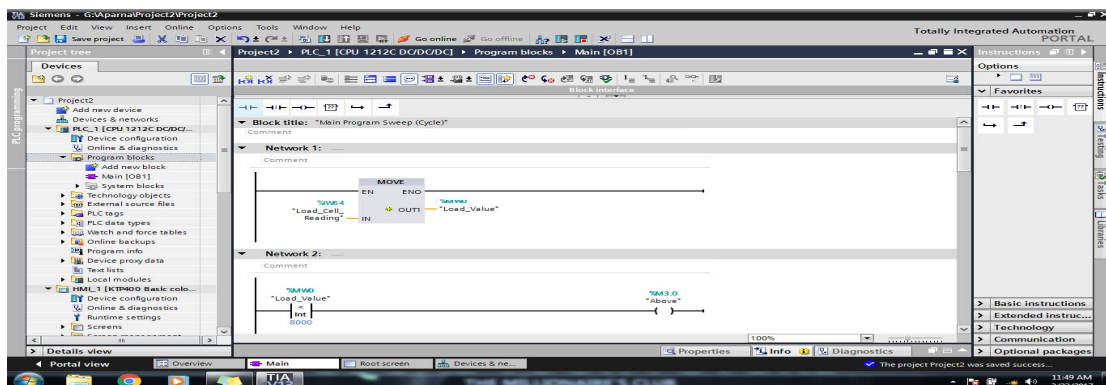


Figure5:Ladder diagram (Rung1 & Rung2)



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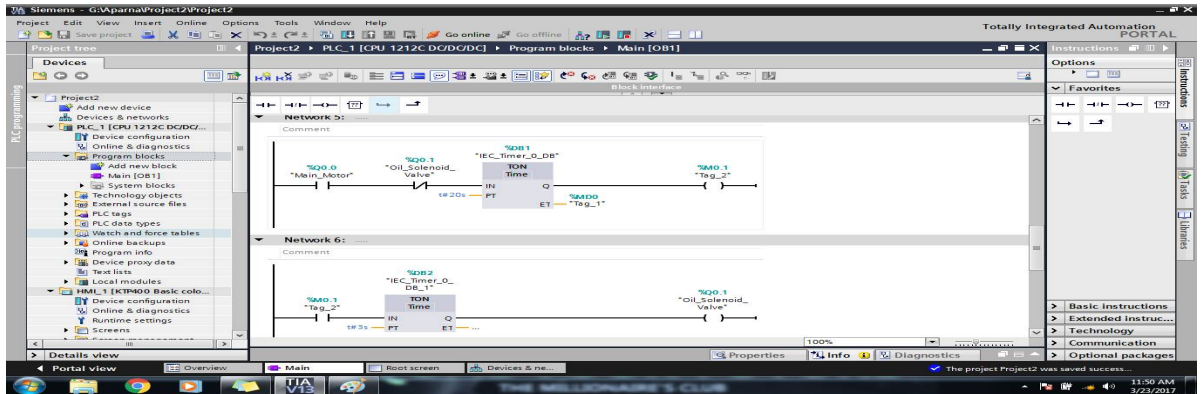


Figure6:Ladder diagram(Rung3 & Rung4)

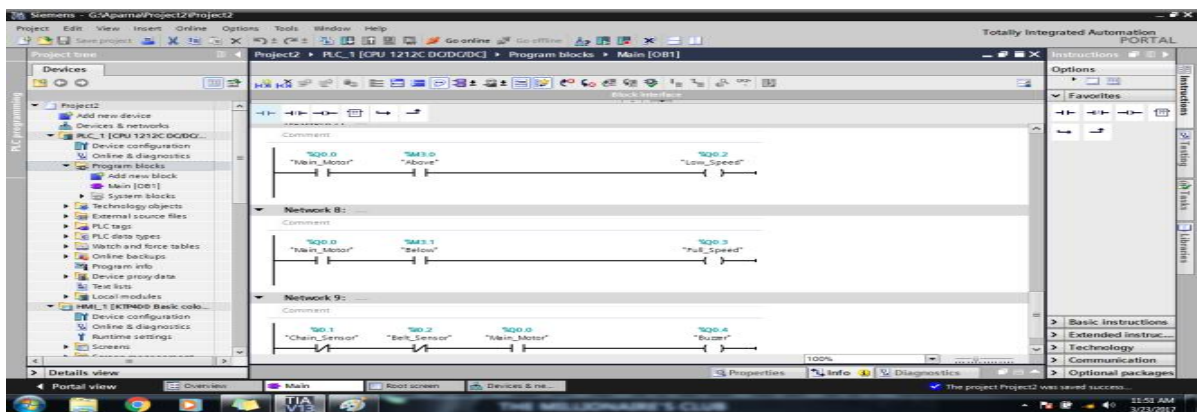


Figure7:Ladder diagram(Rung5,Rung6 & Rung7)

## V. HMI PROGRAMMING

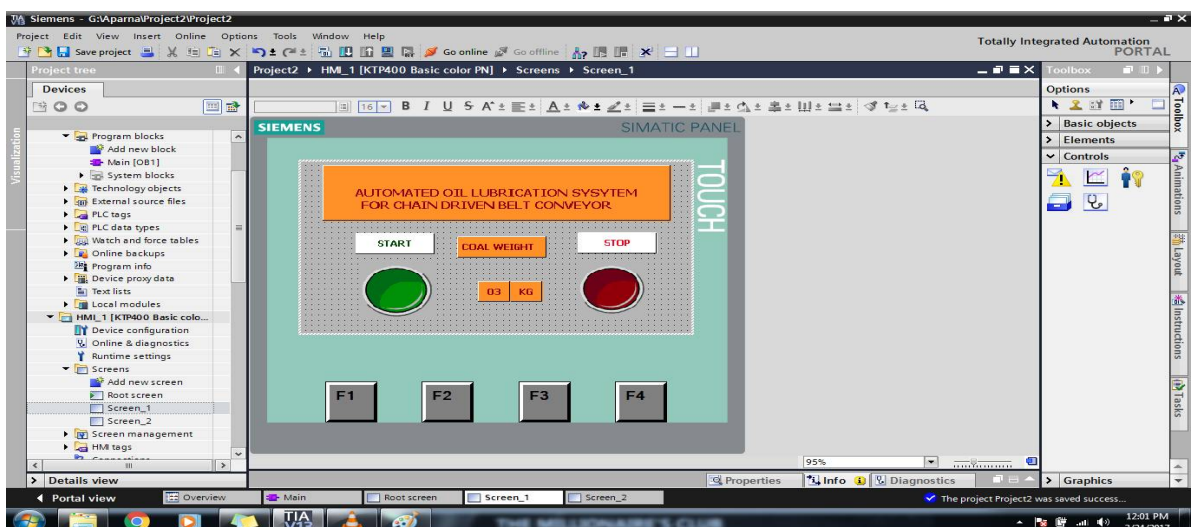


Figure8:HMI Screen 1



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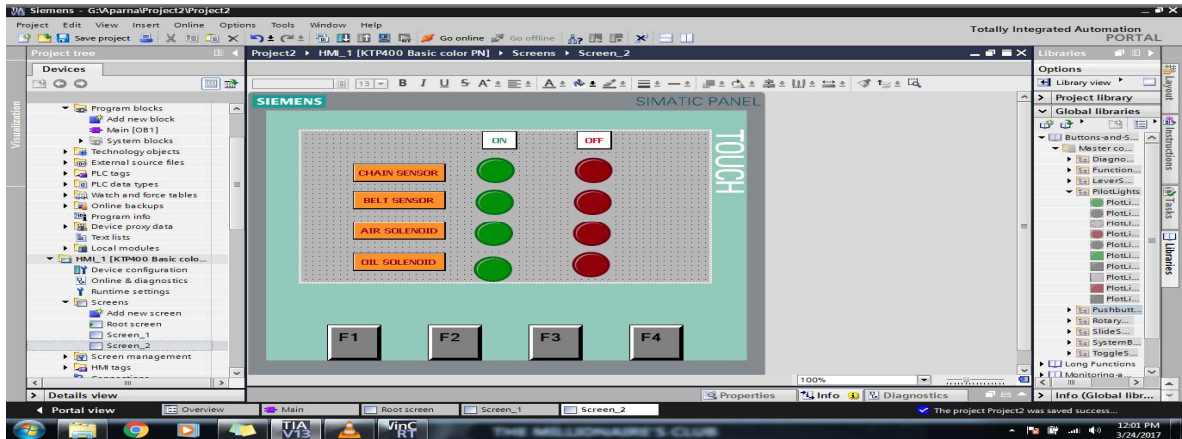
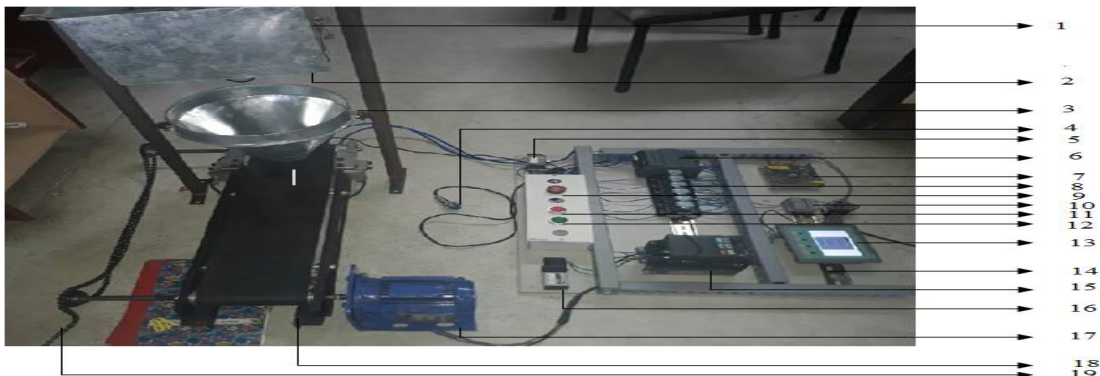


Figure9:HMI Screen 2

## V. HARDWARE MODEL



S. No	Name	S. No	Name
1	Container	11	Stop button
2	Load cell	12	Start button
3	Hopper	13	HMI
4	Proximity sensor	14	MCB channel
5	Solenoid valve	15	AC Drive
6	PLC	16	Solenoid valve
7	SMPS	17	AC Motor
8	Relays	18	Conveyor
9	Hooter	19	Chain
10	Connector		



ISSN (Print) : 2320 – 3765  
ISSN (Online): 2278 – 8875

# International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijareeie.com](http://www.ijareeie.com)

Vol. 6, Issue 4, April 2017

## VI. CONCLUSION

In general, automated lubrication systems offer superior features to manual lubrication. The benefits of automated lubrication include less downtime due to bearing failure, reduced man-hours required for the lubrication task, and increased worker safety, as well as reduced lubricant and cleanup costs. All of these positively affect productivity. There are many variables to consider regarding equipment lubrication. Automatic lubrication process can be adapted over time to specific needs. Maintenance of an automated lubrication system varies with each system. However, there are simple rules that apply to all systems such as compatible and clean lubricant, routine checks of fittings and piping and visual review of reservoirs.

The principle to remember is that smaller amounts of lubricant supplied more frequently results in better lubrication and lower overall maintenance costs.

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