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Ropeway Conveyor and Unloading System using PLC

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Abstract - In this paper the aim is to make a complete ropeway conveyor and unloading system setup for long and non linear transportation of materials using PLC environment. The system is used for the transportation of raw materials from the mines place to the production place. Since it is difficult to transfer it through road, a rope way system is used. The raw materials from the plant is brought through ropeway and given to a vibrator system. From here, through conveyor it goes to the production place. All controls are being taken place in mines.

Keywords **– Bicab Ropeway, Saysaw sensor, Proximity sensors, Load cell, Areal Ropeway.**

1. Introduction

The system consists of timers, driving motors, buckets ,counter , unloader ,conveyor,tacho and load cell. Materials for the plants are obtained from mines which are 8-12 Km away from plant. Path will be complicated because of mountains. Rope cannot be connected like simple ended connection. Directors are used to change the path of rope way. Rope contains about 190 identical buckets. Fixed distance should be maintained between buckets with the use of timer in gate part of conveyor system.Only one bucket should be filled at a time. Another timer at the filling section will do this task. Fixed amount should be filled in bucket, which is also controlled by timer. The return ropeway should extend up to the vibrator of hopper system.

High availability of rope ways, industrial plans choose rope way. By determining the capacity of the plant and requirement we can change the rope way design. Market requires a great variety of types of ropeways with numerous equipment options. There is a considerable potential in the development of ropeways that is not exhausted and is more likely to increase with industrial modification. The model of rope way may be mono or bi cable. Stations (drive tensioning device), The central unit of rope way is the rope system: Track and carrying rope with the units in contact with it such as stations, towers & buckets. There will be a variable friction contact points between rope & support or buckets. Kernel of the program is provided with automated input & transfers riding data to drive program. The additional use of graphical user interfaces makes the operation even easier. And provided better error protection & guarantees simple data maintenance on the other.

The simulation program used to analyze the effect of friction between: Track rope, tower saddle of bicable ropeway. The frictional resistance disturbs the balancing of rope lengths between the span, leads to an increase in the rope tension. Operations in summer with well lubricated rope Normal ambient temperatures produces lower frictional resistance than operations in winter. Advantages are simple and brief explained overview. Any apparatus for the overhead transport of passengers or goods in carriers running along or drawn by overhead cables supported by towers, pylons or other similar structures, together with any machinery, equipment or plant connected therewith. Every part of an aerial ropeway system and its associated equipment shall be designed with consideration given to the safety of the passengers; general public and operating staff, and shall be designed in compliance with this Code of Practice. When planning the location and route of an aerial ropeway the following factors must be carefully considered. An aerial ropeway including any future extension shall be routed so that its effect on the environment is minimal. The paper discusses in detail about the legal and other considerations. Advantages are exact description on planning, legal req. and design steps.

Rules for the Construction of Installations depends on Layout and Freeway, Maximum Speed (For attended cabins: 12 m/s in line and 7.5 m/s over trestles. For

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unattended cabin 7 m/s in long spans Vehicles and 6 m/s over trestles.), Capacity of Vehicles, Rope Guiding, Rescue of Passengers along the Line Crossings, Dangerous areas, Wind action, Wire ropes, Splices and rope termination, Testing and acceptance of ropes, Replacement of ropes, Stations and Driving and braking.
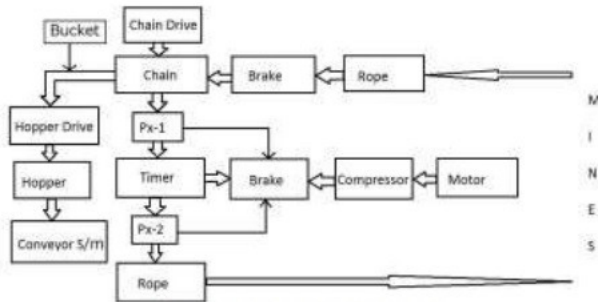
2. Block Diagram

Fig. 1 Block diagram

1. Rope: Main path.
2. Chain: Bucket is transferred to chain from rope for unloading.
3. Px-1: Proximity sensor. Senses entry of bucket.
4. Gate timer: Maintains spacing between buckets. Unload one bucket at a time for filling.
5. Px-2: Proximity sensor. Senses departure of bucket.
6. Brake: Slows down the bucket.
7. Brake at gate: Holds bucket during spacing.
8. Hopper: A vibrator, for proper conditioning of materials for transferring through conveyor.
9. Drive: Motors are used for driving rope, chain, hopper, conveyor and compressor.

The bucket from the rope is dispatched to chain. Two proximity sensors are used in the chain. One is for entry sensing and the next is for departure sensing. As entry sensor senses a value (high) a counter is set to a predefined value (44). The break is applied on the bucket till the count reaches zero which is proportional to the definite distance between two buckets. All units are driven by motors.
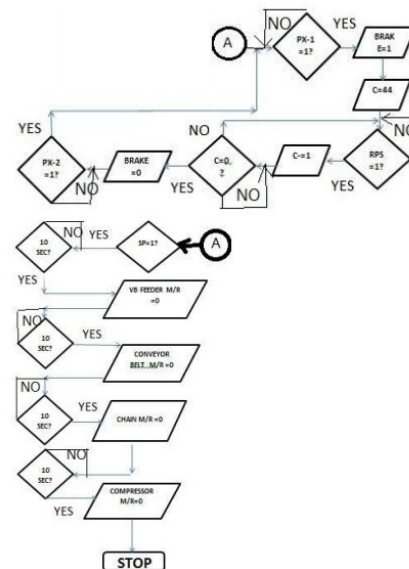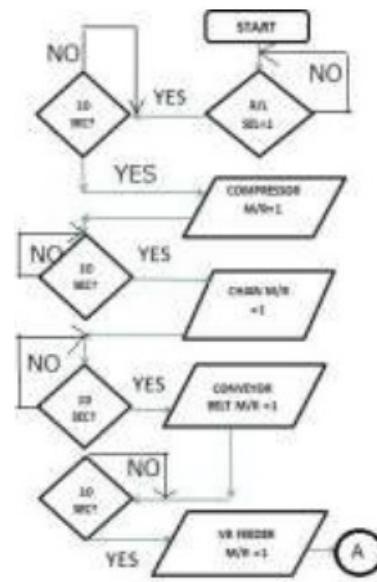
3. Flow Chart

Fig. 2 Flow chart

Each unit should be turned ON in a predefined order so that the complete working is unaffected controversially. So a timer is used and 10 sec delay will be provided by the same during the turn ON of each unit. Entry is sensed by Px-1 and departure is sensed by Px-2. The turn OFF process is done in the reverse order of turn ON process

4. Methodology

A programmable logic controller (PLC) or programmable controller is a digital computer used or automation of electromechanical process .PLC is used in many industries and machines. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory. PLCs are used in many industries and machines. PLC is designed for multiple inputs and outputs arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory.

The system consists of timers, two belt drive system, buckets, belt director system, unloader, conveyor and bucket filler. Materials for the plants are obtained from mines which are 8-12 Km away from plant. Path will be complicated because of mountains. We are providing up to 65 towers for leading the ropeway. The length of each tower depends up on the path. Rope cannot be connected like simple ended connection. Directors are used to change the path of rope way. A dc motor of 1250 kW is used to run the ropeway. It has a driver capacity of 1500rpm/hr. But it runs at 140rpm/hr here. Rope contains about 190 identical bucket containers. Each bucket has a capacity of one ton. A total of 2000 ton lime stone will be transported per a day. Fixed distance should be maintained between buckets with the use of timer. Only one bucket should be filled at a time. Another timer at the filling section will do this task. Fixed amount should be filled in bucket, controlled by timer.

The return ropeway should extend up to the vibrator of hopper system. The return rope way is passed through a wheel over a rail along with a counter weight to stretch the rope. From hear the conveyor system bring the materials to the production part. We are using four load cells to measure the weight of the limes transported. Proximity sensors are used to sense the speed and running condition of the belt. Belt saysaw switches are used to sense the misplace of belt and to control it. The whole process is controlled automatically by plc software. It is an industrial computer control system. It continuously monitors the state of input devices and makes decisions based upon a custom program.

5. Conclusions

Ropeway is a modest simple and efficient method for long and nonlinear transportation and it can be simply implemented using PLC environment. PLC environment is 100% efficient comparing with old relay based system.

Acknowledgments

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