

## Automatic Cutting Machine

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**Abstract**— In this paper we are concerned about Belt conveyor system not only used in mining industries but also used in cement industries, power plant, food industries, production industries etc. So it is essential instrument for in house material transportation today. The paper presents the review of belt conveyor design modification and latest technologies or working used in different applications to reduce failures, maintenance cost and equipment related fatal accidents occurs during operation. In today's geopolitical climate, ensuring the protection of secure facilities or key locations against resourceful and determined intruders is of paramount importance to the defense of a national border as well as industries of national importance. The greatest threat to national security is "Terrorism" and it cannot be defeated by conventional military force alone. In critical border areas, regular forces or even satellites cannot monitor. These intruding terrorists as the area monitored is quite large and quite complex. To assist the army and security forces operating in these areas, smart dust like micro-sensors with wireless interfaces could be utilized to study and monitor these environments from a certain distance for military purposes. The spiral bevel gear (SBG) is a key component of the power Transmission of intersection axes. Since the mathematical model of the SBG is a basis for stress and thermal analysis, the optimization of machine-tool settings, frictional contact analysis in lubricated condition, and advanced manufacturing technology, research on designing and manufacturing of SBGs based on mathematical models of SBG has long been a topic of considerable interest in the field of mechanical transmission.

**Key words:** Belt Conveyor, Design Modification, Failures, Maintenance, and pulley

### I. INTRODUCTION

The main objective of our project is to perform cutting operations with the help of motor. For a developing industry the operation performed and the parts (or) components produced should have it minimum possible production cost, and then only industry runs profitability. In small-scale industry and some workshops, this increases the initial cost required, large area requirements and large number of machine is required. In our project the rod cutting operation is carried out by small arrangements and easy operations. There will be need to cut similar length of rods in industries such as construction, manufacturing etc. for this purpose industries employ two or more persons to measure the length and then cut the rod. Our project gives a solution for this there is no need to measure each and every rod for cutting.

Today almost all the manufacturing is being atomized in order to achieve the high level of productivity. To achieve mass production, to reduce man power, To

increase efficiency of plant, To reduce work load, To reduce the production cost, To reduce the production time, To reduce the material handling, To reduce the fatigue of workers.

### II. LITERATURE SURVEY

A. Devendra Kumar, R.K. Mandloi Feb. 2013 *Analysis & Prospects Of Modification In Belt Conveyors.*

In this paper we have study about the requirement and utilization of belts for transportation, as a kind of in house continuous transportation equipment, belt conveyor is widely used in today's modern port, especially in the transport of coal and mineral powder because of its high efficiency and environmental protection. Belt-conveyors are more acceptable than other means of transporting bulk materials; they neither pollute the air nor deafen the ears. They operate quietly, often in their own enclosures, which when desirable can be located above and safety hazards of surface traffic or in small tunnels out of sight and hearing. Belt conveyor is one of the main transport equipment in coal mine, driving drum and belt is its key part. Friction principle is used to initiate mechanical drive for belt conveyor. So friction is the driving force. In order to raise transportation efficiency of belt conveyor, driving force of drum must be increased. Energy saving & efficiency, friction, fire & safety, maintenance and inspection are the other key factors of belt conveyor design. Most of the researchers focused on design modification to reduce the pulley (drum) and belt. Failures, maintenance cost, breakdowns, energy consumption and overall cost of the system for continuous transportation of material. The technologies used to reduce failures of the equipment and to increase the operational ability of the system the mechanisms like cam drive system, hydro-viscous soft start, magneto-rheological soft starter, Control strategy of disc braking system to be designed for efficient driving of belt conveyors. Most of technologies focused on Fatigue Failures of Welded Conveyor Drums, shell of drums and fracture analysis of collapsed heavy-duty pulleys and other typical failure analysis on pulley shafts by using finite element method. Conveyor Belt is a key part of belt conveyor system, sometimes its incorrect designing also make an important role in conveyor failure.

#### 1) Working:

There are many methodologies used according to their application and design modification. Most of the researchers focused on design of drive mechanisms of belt conveyors, drum(pulley) and belt failures, energy & efficiency, increasing friction, fire & safety, maintenance and inspection.

#### 2) Design Modification:

Different designs in the field of drive mechanism and other modification used for reducing starting torque on drive pulley and operational efficiency. 1) Multi-Step Cam

Mechanism: A multi-step cam mechanism is preferred to drive belt conveyor for the self-orientation of the conveyed rigid objects. It is also used as velocity reduction, so doing away with costly gear transmissions; thereby reduce the possibility of failure due to gears. 2) Control strategy of a hydro-viscous soft start device: The control system of hydro-viscous soft start (HVSS) device and a fuzzy – immune PID 3) Control strategy of disc braking systems: A close loop velocity control system is used for disc braking of downward belt conveyors. The proportional electro-hydraulic valve device is used and simulate by MATLAB. A PID (Proportion Integration Differentiation) is designed to increase the performance of disc braking system.

3) *Magneto-Rheological Soft Starter:*

A magneto-rheological soft starter (MRSS) is a device having magneto-rheological fluid (MRF) between the two disks of MRSS and controlled by an external magnetic field for integrating disks for transmitting torque to belt conveyor and torque transmitted can change by increasing the No. of disks.

4) *Multi-Conveyor System for Profit Maximization:*

The Multi conveyor control model is proposed by operating no. of conveyors equipped with combined driving system and handling speed variations and average flow time between adjacent pallets for profit maximization and reliability. Drum and Pulley Failure

a) *Typical Failure and Processing:*

The description of typical failure forms of roller and conveyor are analyzed, and explain the maintenance methods of prevention and elimination of failures to ensure the normal operation of belt conveyor.

b) *Fracture In Collapsed Heavy-Duty Pulley:*

Fracture of pulley is analyzed by FEM and fracture macro examination with use of following formulas:  $S_f = 32.FS.M_b/\pi D^3$ . (.5 SUT) where  $S_f$  is estimated fatigue limit to the pulley  $FS$  is the safety factor,  $M_b$  the bending moment and  $D$  the shaft diameter SUT the material tensile strength.

c) *Conveyor Pulley Shaft Failures:*

The cause for failures of shafts in a conveyor pulley in iron-making unit at JSW Steel has been investigated. Visual, metallographic, chemical, and fractographic studies were carried out. Fracture studies shows that shaft failed in shear because of overload.

d) *Keywords:*

Belt Conveyor, Design Modification, Failures, Maintenance, and pulley.

e) *Result:*

As requirement of continuous transportation equipment, belt conveyor is widely used in today's modern port, especially in the transport of coal and mineral powder. The belt conveyor now designed for industries like food and cement, so the designing parameters varied according to their application such as in food transfer, belt must be non-reactive with the food transported, dust emission control system is required in coal and cement industries, fire & safety is main consideration in coal industries.

B. R. Maguteeswaran, M. Dineshkumar, R. Dineshkumar, K. Karthi:

In this paper we are studied the requirement of multiprocessor machine , The multi process machine is used

to do the multi operations like Drilling, Shaping, Slotting at a time and which is used to save the time and space requirement of an industry. The main concept of machine is to do the operations like slotting and shaping by the use of drilling operation using cam arrangement. The various machining process in manufacturing industries are carried out by separate machining machine. It need more space requirement and time with high expenses. But the fabrication of multi operation machine, which contains three operations in a single machine. The operations are namely drilling, slotting and shaping. It is a new concept specially meant to reduce the work time and save the cost. Instead of using a slotting machine we are using the special arrangements for slotting operation in the drilling machine same for the shaping operation also, so we can save the investment cost of exceed slotting and shaping machine in the industries. The machine operates through drilling machine with the bevel gear and cam mechanism arrangements. Hence exactly we can carry out three operations in this machine, namely drilling, slotting and shaping. It is a simple in construction and easy to operate. Driller, Bevel gear, Drill bit, Chuck, Cam mechanism, bearings, slotting tool, shaping tool and guide are the main parts used in this machine.

1) *Drilling:*

A drill is a tool fitted with a cutting tool attachment, usually a drill bit used for drilling holes in various materials or fastening various materials together with the use of fasteners. The attachment is gripped by a chuck at one end of the drill and rotated while pressed against the target material. The tip of the cutting tool does the work of cutting into the target material.

2) *Bevel Gear:*

A bevel gear is a type of mechanical gear. These gears where the axes of the two shafts intersect and conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone.



3) *Hydraulic Bottle Jack:*

Bottle jacks are hydraulic jacks that are placed in a horizontal position. These jacks push against a lever, which lifts the main lift arm. Bottle jacks have a longer handle than most hydraulic jacks and it is possible to get more lift per stroke with the increased leverage they provide when compared to regular models of jacks. Bottle jacks are versatile because their horizontal position makes it possible to place them in tight spots and provides good leverage. Now bottle jacks have proven useful in search and rescue missions following earthquake damage. As a result, bottle jacks are standard equipment in firehouses and for search and rescue teams.

a) *Keywords:*

Multi process; Drilling; Slotting; Shaping.

### C. Satip Rattanapaskorn and Kiattisak Roonprasang:

The purpose of this research is to design, fabricate, test, and evaluate the prototype of a semi-automatic young coconut fruit cutting machine. The design concept is that fruit cutting is accomplished by pneumatic press on a young coconut sitting on a sharp knife in a vertical plane. The machine consists of 5 main parts: 1) machine frame, 2) cutting base, 3) knife set, 4) pneumatic system, and 5) tanks receiving coconut juice and cut fruits. The machine parts contacting edible parts of the fruit are made of food-grade stainless steel. In operation, a young coconut is placed on the cutting base and the pneumatic control is switched on. The coconut is automatically moved to the pressing unit and cut in half by a knife set. The coconut juice flows down to the tank while the cut fruits are separated and moved into the other tank. The machine is found to operate safely without damage to the fruits. The machine capacity is 480 fruits/hr with the total operating cost of about 2.63 USD/1000 fruits.

In Thailand, the Nam-Hom coconut, which is commonly known as the young coconut, is popular for its nice scent, sweet juice and high nutritional value. The young coconut can be consumed fresh or processed into canned products such as coconut juice and coconut jell. The total export volume of young coconuts in 2006 was 33,334 tons and valued at 11.2 million USD. The young fruit sold to the fresh market is usually trimmed to its outer husk so that the coconut looks attractive and can easily be opened. To ready the fruit for consumption, the husk and shell of the fruit must be cut open. Traditionally, a big knife is used to manually chop the husk and shell and create a hole of approximately 60 mm diameter at the top of the fruit. However, this method is hazardous and requires a skilled operator.

#### 1) Working:

Design parameters for a cutting machine consist of the size of young fresh coconut and the maximum compressive force used for cutting the coconut in half by a sharp knife. For the first parameter, 20 uniform and intact samples of mature coconut were randomly selected, weighed and measured by a size-measuring apparatus. The design concept of the machine was that the fruit cutting has to be accomplished by pneumatic pressing on a young coconut sitting on a sharp knife in a vertical plane. So it was necessary to calculate the diameter of the vertical pneumatic cylinder.

#### a) Keywords:

young coconut, coconut cutting machine

#### b) Result:

The cutting direction of the coconut was shown to play an important role on the quality of cutting. It is clear (Figure 5) that if the direction of placing the coconut fiber was parallel to a knife edge, it did not successfully cut the coconut in half at any speed of the pressing unit because the knife could not completely cut the fiber of the coconut fruit. However, if the direction of placing the coconut fiber was perpendicular to the knife edge, the fruit was absolutely cut without any damage at any speed of the pressing unit.

### D. K.Sanmugavallhi, K.Fathima:

In this paper we have studied about the wireless sensor, In today's geopolitical climate, ensuring the protection of secure facilities or key locations against resourceful and determined intruders is of paramount importance to the

defense of a national border as well as industries of national importance. The greatest threat to national security is "Terrorism" and it cannot be defeated by conventional military force alone. In critical border areas, regular forces or even satellites cannot monitor these intruding terrorists as the area monitored is quite large and quite complex. To assist the army and security forces operating in these areas, smart dust like micro-sensors with wireless interfaces could be utilized to study and monitor these environments from a certain distance for military purposes. The paper aims to develop next generation wireless sensor networks for defense industry and homeland security applications. The smart dust wireless sensor mote detects and classifies into vehicles, individuals and groups. The transportation sensing wireless network is recognized as an important component of the intelligent transportation systems. More and academic researchers and people from Industry are engaged in developing them due to the good promise and potential with various application systems. Wireless sensor networks offer the potential to significantly improve the efficiency of existing transportation systems currently, collecting data for traffic planning and management is achieved mostly through wired sensors. The equipment and maintenance cost and time consuming installations of existing sensing systems prevent large-scale deployment of real-time traffic monitoring and control. Vehicle classification information is one of the important calculations that we need to obtain in practice, which is invaluable for various aspects of transportation including engineering and planning. If a mobile target on some key roads can be recognized, it would provide helpful traffic information.

#### 1) Type Selection of Sensors and Node System:

With the rapid development of technology is developed rapidly, the trend of sensor micromation becomes common in many applications. Usually a single sensor is used to provide the information of road targets. In the paper different kinds of tiny sensors are adopted to collect the target data. They are the magnetic Honeywell 1052 sensor and the seismic acceleration ADXL202E are used in figure 1. In order to improve recognition performance, we adopt the concept of peak and valley pattern which is used to deal with the hybrid detection signals from different sensors.

#### 2) Device Operation:

The Honeywell HMC1052 magneto resistive sensors are Wheatstone bridge devices to measure magnetic fields. With power supply applied to a bridge, the sensor converts any incident magnetic field in the sensitive axis direction to a differential voltage output. In addition to the bridge circuit, the sensor has two on-chip magnetically coupled straps; the offset strap and the set/reset strap. The magneto resistive sensors are made of a nickel-iron (Perm alloy) thin-film deposited on a silicon wafer and patterned as a resistive strip element. In the presence of a magnetic field, a change in the bridge resistive elements causes a corresponding change in voltage across the bridge outputs

#### a) Keywords:

Sensors, smart dust, Intrusion Detection Systems.

#### b) Result:

In this paper we presented an Intrusion Detection System for protecting Critical Information Infrastructures using Wireless Sensor Network technology. The proposed system relies on a hybrid detection approach in the

sense that any node runs a detection agent which is in charge of identifying suspicious nodes.

#### E. G. Mclatchey, J. Billingsley:

In these paper we have studied about Force and position control using pneumatic cylinders. Statically stable walking robots have advantages over wheeled robots in rough terrain negotiation and stability in a dynamic environment with inertial and manipulator forces but their development is not sufficiently advanced to see them used in real applications. Legged robots are complex systems to control. Multiple closed kinematic chains exist between the legs, ground and body of a legged robot. Also, legged robots operate in an unstructured environment where terrain data is incomplete and inaccurate. Much of the existing research is limited by its fundamental method of position control. Position control in an over-constrained system with incomplete and inaccurate system data leads to antagonistic (internal) forces between the legs. These forces waste energy, decrease effective available leg force, cause foot slippage and increase stress in structural elements. Existing research has attempted to alleviate antagonistic forces by wrapping a force or impedance layer around the position control loop (e.g. the quadruped Silo4 and hexapod Katharina). The force feedback response is thus modified to respond to positional errors according to Hook's law. This approach of Active Compliance is designed to adapt position control to cope with incomplete and inaccurate environmental and system data. The increased compliance does reduce internal forces but also reduces the ability of the robot to respond to external forces.

#### 1) Pure Force Control:

Supporting legs under pure force control fully comply with any changes in position (up to the kinematic limit) while applying the target force. Environmental data is now reaction force which can be easily measured and controlled. This makes over-constrained systems much easier to control and antagonistic forces can be easily recognized and minimized which leaves full force available to balance external forces.

#### 2) Actuators:

Position control rather than force control has remained popular in legged robot control, however, due to the prevalence of electric motors. Electric motor-based actuators are commonly used due to their low weight, size and cost, high power and ease of integration. However, they are difficult to use in force control because of their high stiction and reflected inertia. Fluid based actuators such as hydraulics and pneumatics are well suited for force control because controlling fluid pressure controls force. Hydraulic actuators are capable of large forces; however their large weight limits their use to heavy robots. McKibben artificial muscles are not attractive for control due to their non-linear response, hysteresis and small stroke. Pneumatic cylinders are cheap, light, have a compact footprint and are naturally compliant. However, they can have high stiction, making small forces difficult to attain, and they are low in power density. Also their natural compliance makes position control difficult. Researchers who has used pneumatic cylinders in legged robot designs have pursued control strategies other than force control with poor results. For

example STIC and Robot required physical assistance to walk.

### III. FUTURE SCOPE

It is known that conventional power hacksaw machine can be replaced with automated power Hacksaw machine. Automated power hacksaw machine gives high productivity in short time period in comparison with the conventional power hacksaw machines. The major advantage of this machine is intervention of labor is reduced to maximum level. In this rapid emerging industrial section the use of power Hacksaw machine is wide, time and labor plays a major role in production process. This can be overcome by using this type of automated machines.

The automated hacksaw machine can be made use of at any of the industries like pump manufacturing industries that involve bulk amount of shafts that have to be cut frequently. The range of size of work-pieces that can be cut using the automated hacksaw machine can be varied by changing the blade size. Currently, the machine uses 12 inch blade for cutting. An another advancement that can be implemented in automated hacksaw machines is that the user can also get cut work-pieces of different lengths in one cycle itself. This means that the user has to specify the number of work-pieces that have to be cut in each of the different length values specified. This will be possible with the help of an advanced microcontroller than AT89C51, which should have high programmable memory.

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