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Automatic Mat Cutter

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ABSTRACT

The plastic mat-cutting machine is a recent development in the industrial world. The difficulty of making a successful machine of this kind to meet the new demands for accuracy, speed, convenience, and safety, has been overcome gradually in recent years. Cutting jobs have an important place in the plastic mat industry. All products from the smallest to all types of mats needs to be cut bu its size. For this reason machine cutters are required . With regards to work quality and customer satisfaction, cutting is a highly delicate matter in the printing industry. All cutting jobs produced under rapidly developing technological conditions must adapt to certain standards of quality. Otherwise, printing houses face the risk of losing their customers. The most common cutting range of cutting materials used in plastic mat. Such cutting materials are categorized as soft, normal. This steel alloy composition determines the life of the blade. The durability of the blade is also closely related to the cutting material used. If blades for soft and normal cutting materials are used on hard cutting materials they will quickly wear out and become blunt. The main reason for this is that hard cutting materials display great resistance during cutting.

1. INTROCUTION

This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased. Degrees of automation are of two types, viz. Full automation, Semi automation. In semi automation a combination of manual effort and mechanical power is required whereas in full automation human participation is very negligible.

Need For Automation

Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics form an attractive medium for low cost automation. The main advantages of all pneumatic systems are economy and simplicity. Automation plays an important role in mass production.

Reduction of lab our and material cost
Reduction of overall cost
Increased production
Increased storage capacity
Increased safety
Reduction in fatigue
Improved personnel comfort

2. LITERATURE SURVEY

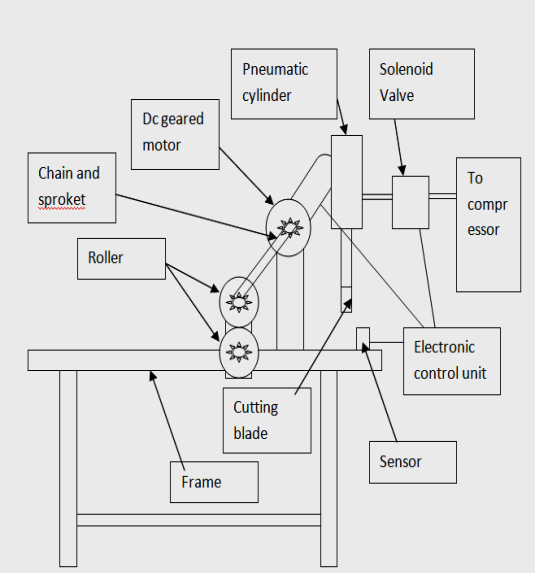
While we have visited the Shri Krushna Polytech we have observed the production plant with production

manager. There is great opportunity to develop the plant by automation. There is only manual workout in the plant. But as we discussed with the plant production manager , he suggest to take the efforts in cutting process. So with the guidance of our project guide and plant manager we observed the total cutting techniques used there.

2.1. PROBLEM FINDING :

While we observing the operation of cutting there is main problem of slippage of mat on the cutting table. Due to the slippage of mat on the table Operator have to reset the mat repeatedly and this tends to increased production cycle time. There is no perfect length measuring techniques available there, which will give inaccurate length of mat. There is only an approximate marking means inaccurate marking on the table. There is use of heating coil to give the heat to cutter which has not properly installed. After one cycle of operation this heating coils get disturbed due to the vibration of paddle linkages which exactly connected to the heating coil plates which is used for the cutting operation. There is no oiling holes provided for the purpose of oiling. There is formation of burs on the cutting wire due to melting of mat repeatedly, which will tends to repeatedly removing of burs on wire will increase production cycle time. There is manual pulling of mat by the operator which will gives hard human efforts and discomforts the human. Assembly is not sophisticated for maintenance.

2.2. PROPOSED SOLUTION :



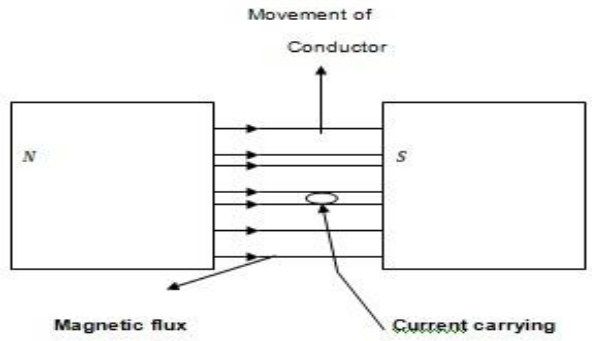
3. METHODOLOGY

COMPONENTS AND DESCREPTION

- DC MOTOR:

PRINCIPLE OF OPERATION:

The basic principle of motor action lies in a simple sketch. The working principle tells that, when a current carrying conductor is placed in a magnetic field, a force is produced to move the conductor away from the magnetic field.



- PNEUMATIC CONTROL COMPONENTS

- SELECTION OF PNEUMATICS:

Mechanization is broadly defined as the replacement of manual effort by mechanical power. Pneumatics is an attractive medium for low cost mechanization particularly for sequential or repetitive operations. Many factories and plants already have a compressed air system, which is capable of providing both the power or energy requirements and the control system (although equally pneumatic control systems may be economic and can be advantageously applied to other forms of power).

The main advantages of an all-pneumatic system are usually economy and simplicity, the latter reducing maintenance to a low level. It can also have out standing advantages in terms of safety.

The pneumatic bearing press consists of the following components to fulfill the requirements of complete operation of the machine. Pneumatic cylinder Solenoid valve Flow control value Connectors and Hoses Control Circuit

1. CYLINDER:

The cylinder is a double acting cylinder one, which means that the air pressure operates alternatively (forward and backward). The air from the compressor is passed through the regulator which controls the pressure to required amount by adjusting its knob. A pressure gauge is attached to the regulator for showing the line pressure. Then the compressed air is passed through the directional control valve for supplying the air alternatively to either sides of the cylinder. Two hoses take the output of the directional control valve and they are attached to two ends of the cylinder by means of connectors. One of the outputs from the directional control valve is taken to the flow control valve from taken to the cylinder.

PNEUMATIC CYLINDER

An air cylinder is an operative device in which the state input energy of compressed air i.e. pneumatic power is converted in to mechanical output power, by reducing the pressure of the air to that of the atmosphere.

TYPES:

1. Single stage single acting cylinder
2. Double stage double acting cylinder

The normal escape of air is out off by a cushioning piston before the end of the stock is required. As a result the sit in the cushioning chamber is again compressed since it cannot escape but slowly according to the setting made on reverses. The air freely enters the cylinder and the piston stokes in the other direction at full force and velocity.

CYLINDER TECHNICAL DATA:

Barrel: It is made of cold drawn aluminimum honed to 25mm.
Piston Rod: M.S. hard Chrome plated
Seals: Nitrile (Buna – N) Elastome
End Covers: Cast iron graded fine grained from 25mm to 300mm
Piston: Aluminium.
Media: Air.
Temperature Range: 0^c to 85^c
Cushions: Adjustable standard - 400mm bore and above.

2. SOLINOID CONTROL VALVE:

SOLENOID VALVE:

In our project electrically actuated solenoid operated 5/2 DC valves are used. Solenoid is another name for an electromagnet. Direction control valves are very often actuated by electromagnets. An electromagnet is a temporary magnet. A magnetic force is developed in an electromagnet when electrical

current passes through it and force drops down as soon as it is de energized. This electromagnet is commonly termed as solenoid. The proper working of a solenoid operated valve depends on the reliability of the electromagnets.

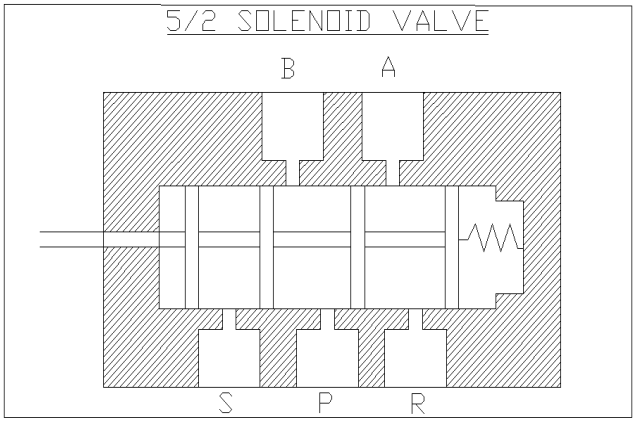
It ensures

- ✓ Quick and sure action
- ✓ Long life.
- ✓ Easy maintenance.
- ✓ Less wastage of energy.

The directional valve is one of the important parts of a pneumatic system. Commonly known as DCV, this valve is used to control the direction of air flow in the pneumatic system. The directional valve does this by changing the position of its internal movable parts. This valve was selected for speedy operation and to reduce the manual effort and also for the modification of the machine into automatic machine by means of using a solenoid valve. A solenoid is an electrical device that converts electrical energy into straight line motion and force. These are also used to operate a mechanical operation which in turn operates the valve mechanism. Solenoids may be push type or pull type. The push type solenoid is one in which the plunger is pushed when the solenoid is energized electrically. The pull type solenoid is one is which the plunger is pulled when the solenoid is energized. The name of the parts of the solenoid should be learned so that they can be recognized when called upon to make repairs, to do service work or to install them.

Working of Solenoid Valve

The solenoid valve has 5 openings. This ensure easy exhausting of 5/2 valve. The spool of the 5/2 valve slide inside the main bore according to spool position; the ports get connected and disconnected. The working principle is as follows.



Position-1 : When the spool is actuated towards outer direction port ‘P’ gets connected to ‘B’ and ‘S’ remains closed while ‘A’ gets connected to ‘R’

Poisition-2 : When the spool is pushed in the inner direction port ‘P’ and ‘A’ gets connected to each other and ‘B’ to ‘S’ while port ‘R’ remains closed.

3. FLOW CONTROL VALVE:

(a) In any fluid power circuit, flow control is used to control the speed of the actuator. The area of flow through which the air is passing can achieve the flow control. When the area is increased more quantity of air will be sent to the actuator as a result its speed will increase of the quantity or air entering into the actuator is reduced, the speed of the actuator is reduced.

Technical Data:

Size	:	¼”
Pressure	:	0 to 10 kg / cm2
Media	:	Air

(b) Purpose: This valve is used to speed up the piston movement and also it acts as an one – way restriction valve which means that the air can pass through only one way and it can’t return back. By using this valve the time consumption is reduced because of the faster movement of the piston.

4. CONNECTIORS:

In our pneumatic system there are two types of connectors used; one is the hose connector and the other is the reducer. Hose connectors normally comprise an adapter (connector) hose nipple and cap nut. These types of connectors are made up of brass or Aluminium or hardened steel. Reducers are used to provide inter connection between two pipes or hoses of different sizes. They may be fitted straight, tee, "V" or other configurations. These reducers are made up of gunmetal or other materials like hardened steel etc.

Need for pneumatic power

Pneumatic system use pressurized gases to transmit and control power, as the name implies, pneumatic systems typically use air as fluid medium, because air is a safe, low cost and readily available fluid. It is particularly safe environments where an electrical spark could ignite leaks from the system components. There are several reasons for considering the use of pneumatic system instead of hydraulic system, Liquid exhibit greater inertia than gases. Therefore, in hydraulic system the weight of the oil is a potential problem.

PNEUMATIC COMPONENTS CYLINDER:

An (pneumatic) air cylinder is an operative device in which the state input energy of compressed air; (i.e.) pneumatic power is converted into mechanical output power, by reducing the pressure of the air to that of the atmosphere. The bore of the cylinder has very smooth finishing reduces friction and losses. There are to angle plates welded to the cylinder as fitting means.

DOUBLE ACTING CYLINDER: A double acting cylinder is employed in a control system with a full pneumatic cushioning and it is essential when the cylinders itself is required heavy masses. The normal escape of air is out by 'cushioning piston'.

PISTON : Piston is the reciprocating member of this system. It transmits the force developed to the piston rod. It is operated according to the pressure developed inside the cylinder. The piston has ring frictionless movement. They avoid leakage at the piston side; they also avoid wearing of the piston.

CUTTING BLADE : They are made of MS high tensile metal.

SOLENOID VALVE : Direction control valves control the way the air passes and used for controlling the commencements, termination and direction of air flow. Depending on the number of paths the air is allowed to pass, directional valves termed two way, three way, and four way or multi way valves. The different number of rays by means the number of controlled connection of the valve. Inlet connection to the compressed air supplies outlet connections to the air consumer and exhaust connection to the atmosphere. The solenoid valve is used to control the air flow direction. This is the direction control valve in our project.

DESIGN

DESIGN OF BEARING:-

Deep Grove Ball Bearing

Bearing Type = Deep Groove Ball Bearing

d = 6 mm , D = 20 mm, B = 8 m

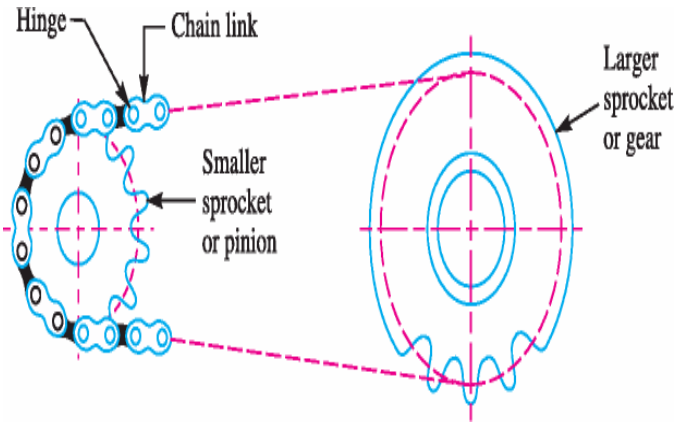
Basic load capacity, C

C = 3924 N

Limiting speed, n , n = 20000 rpm , Mass, m , M = 0.020 Kg Designation - SKF 6001 , d = 17mm , D = 35 mm,

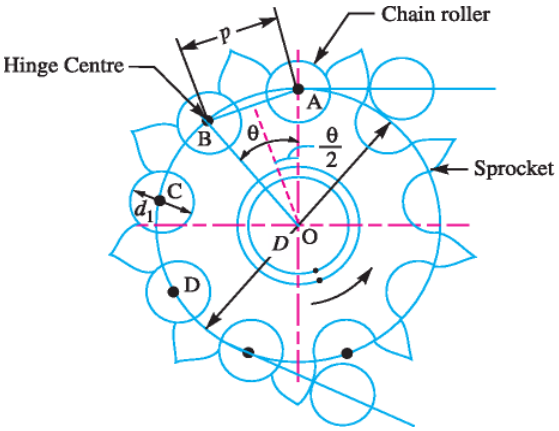
B = 10 mm , Basic load capacity, C , C = 4562 N , Limiting speed, n, n = 20000 rpm , Mass, m, m = 0.040 Kg , Designation - SKF 6003.

CHAIN DRIVES



BODY FRONT VIEW

BODY SIDE VIEW



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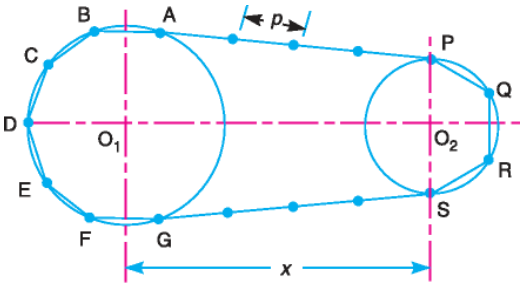
Length of chain drive



DC MOTOR

SPROCKET

RESULT AND DISCUSSION :

After implementation of the proposed solution production cycle time get minimized and human discomfort while working got decreased. Safety percentage of the plant got increased. Dimensions of the product tends to perfection. Due to Automation employee cost got reduced.

CONCLUSION

This machine is very useful for small and medium scale industries. This machine is used to cut the mat of small thickness. Therefore there may be the chances of increase in production rate by simultaneously cutting the number of sheets in a single pass. Reduction of man power. Reduction in cost as compare to conventional machines. Is the major advantage of this project.

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