Convert Eccentric press machine to Automatic press machine

Dr. S.P.Palekar
Project Guide .
Department Of Mechanical .
Sanjivani College Of Engineering ,
Kopargaon , India .
palekarshaileshmech@sanjivanicoe.org.in

Mr. Mahesh Rajendra Dube
Department Of Mechanical.
Sanjivani College Of Engineering,
Kopargaon,India.
maheshrdube653@gmail.com

Miss. Shraddha Dhanaji Gidhad
Department Of Mechanical
Sanjivani College Of Engineering,
KopergaonIndia.
shraddhagidhad@gmail.com

Mr. Kishor Kondaji Gulve
Department Of Mechanical.
Sanjivani College Of Engineering,
Kopargaon , India.
kishorgulve158@gmail.com.

Miss. Sayali Arun Jadhav
Department Of Mechanical
Sanjivani College Of Engineering,
Kopargaon,India.
jsayali231@gmail.com

❖ ABSTRACT

The conversion of an eccentric press machine to an automatic press machine using a clutch plate system enhances operational efficiency, precision, and productivity. By integrating the clutch plate, which automatically controls the engagement and disengagement of the press cycle, the machine transitions from manual or semi-automated operation to a fully automated system. This modification reduces human intervention, minimizes wear on mechanical components, and ensures consistent, high-quality results. The automatic control offered by the clutch plate improves cycle times, reduces downtime, and enhances overall reliability, making the press machine more suitable for high-volume, precision-driven manufacturing processes.

Keywords:

Press Machine , Clutch plate , Pneumatically Operated , cylinder , compressor , motor , ram , flywheel .

❖ INTRODUCTION

This project transforms a traditional **50-ton** eccentric press machine by integrating a **pneumatic clutch**, ensuring enhanced **safety** and **automation**. The system allows precise **control**, minimizing **accidents** caused by uncontrolled cycles. It significantly improves **productivity** and aligns with **modern industry requirements**, demonstrating innovation and promoting **safe, efficient manufacturing practices** in mechanical operations.

Key Features:

- Automated Operation: Full automation of press cycles, reducing manual control and operator intervention.
- Clutch Plate Integration: Enables smooth and precise engagement and disengagement of the press, optimizing cycle efficiency.
- Improved Productivity: Faster press cycles, reduced downtime, and consistent operation lead to higher throughput.
- Reduced Wear and Tear: Less mechanical strain on parts due to controlled and automated operation.
- Enhanced Precision: Consistent cycle timing and accurate pressing ensure high-quality output.
- Cost Efficiency: Reduced labor costs and improved machine uptime contribute to lower operational expenses.
- Increased Safety: Automation minimizes human error and improves overall workplace safety.
- Adaptability: Can be applied to a wide range of manufacturing processes, particularly in high-volume

In the conversion of an eccentric press machine to an automatic press machine using a pneumatic-operated clutch plate, the manual or semi-automatic clutch mechanism is replaced with a pneumatically controlled clutch system. The pneumatic clutch is integrated between the flywheel and the crankshaft of the press. Compressed air is supplied through a solenoid valve to engage or disengage the clutch plate. When air pressure is applied, the clutch plate engages the flywheel with the crankshaft, initiating the press stroke. Once the stroke is complete, air is released, and the clutch disengages, stopping the ram movement. This allows for precise and repeatable stroke control without manual intervention.

An automatic control system, such as a PLC or timer-based circuit, is used to manage the timing and frequency of clutch engagement. Sensors like limit switches or proximity sensors can be used to detect ram positions and ensure synchronized operation. The integration of the pneumatic clutch enables continuous or intermittent pressing cycles based on the production requirement, significantly improving efficiency, safety, and consistency in operation.

❖ LITERATURE SURVEY

The conversion of a manually operated eccentric press machine to an automatic press system using a pneumatically actuated clutch plate has been a subject of interest in manufacturing process automation. Traditional eccentric press machines rely on mechanical actuation, often involving continuous running flywheels and manual feeding, which limits productivity and poses safety risks. Pneumatic

which limits productivity and poses safety risks. Pneumatic automation, particularly the use of pneumatic clutch-brake systems, has shown promise in improving efficiency, precision, and operator safety. According to studies on pneumatic clutch applications in industrial presses, such systems allow for better control of the press cycle, enabling single or multiple strokes per command, and facilitating integration with automatic feeding and ejection systems.

Research indicates that retrofitting eccentric presses with pneumatic clutch-actuation not only modernizes legacy equipment but also reduces downtime and energy consumption. Various case studies have documented successful implementations where the press cycle is controlled via solenoid-operated pneumatic valves linked to a programmable logic controller (PLC). This setup ensures precise engagement and disengagement of the clutch, allowing for automation of press operations with minimal manual intervention. The literature also emphasizes the importance of proper synchronization between the clutch system and auxiliary mechanisms like feeders and ejectors to achieve smooth and reliable operation in automated manufacturing environments.

.

1.2. Scope:

The scope of this project involves the integration of a clutch plate assembly with an existing punching press machine to enhance its operational control, efficiency, and safety. The project covers the design, selection, installation, and testing of a suitable clutch mechanism capable of handling the dynamic loads and operational cycles of the punching press. The primary objective is to enable smoother engagement and disengagement of the press operation, thereby reducing mechanical shock, improving cycle accuracy, and extending the machine's service life. This project includes mechanical adaptations to the press structure to accommodate the clutch plate, alignment and coupling modifications, and necessary adjustments in the drive system. It also involves the development of appropriate control logic to synchronize clutch engagement with press commands, ensuring precise and reliable performance. Furthermore, the scope covers testing under various load conditions to validate functionality, safety compliance, and durability, as well as preparing documentation for operation and maintenance of the upgraded system.

I. OBJECTIVE

- To analyze the feasibility of pneumatic vehicles as a sustainable transportation option.
- To compare pneumatic vehicle performance with conventional and electric vehicles.
- To explore advancements in air compression, energy recovery, and hybrid pneumatic systems.
- To identify challenges and possible enhancements for practical implementation.

III. PROPOSED SOLUTION

Implement a clutch plate system on the press machine. Steps are as follows :-

1. **Safety Sensors**: Strategically placed safety sensors are integrated into the clutch plate system.
2. **Hand Placement**: The operator must place both hands on these sensors simultaneously.
3. **Machine Activation:** Only when both hands are securely placed on the sensors will the machine's power supply be enabled, allowing it to operate.
4. **Emergency Stop**: If either hand is removed from the sensors during operation, the machine will immediately come to a complete stop

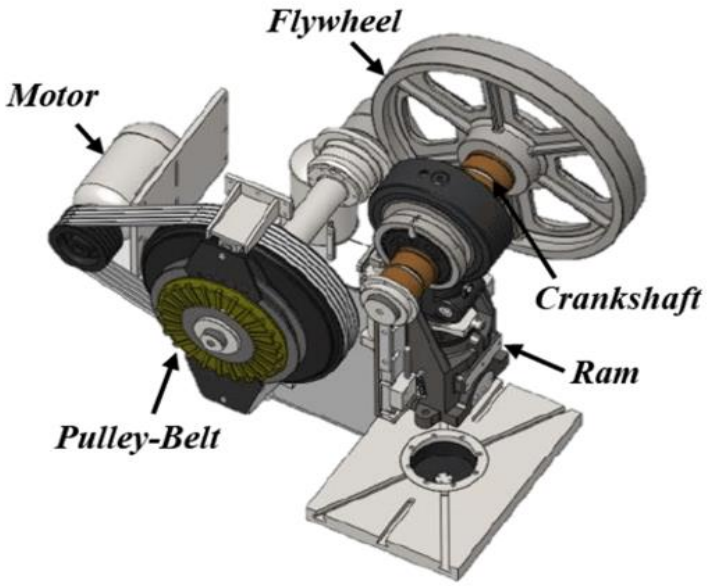
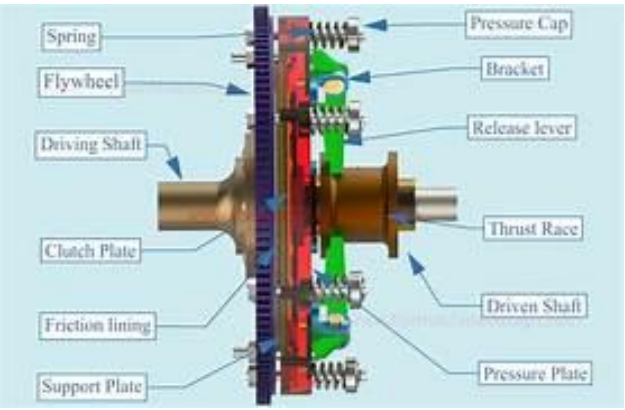


Fig 1 Diagram of press machine integrated with clutch plate

1. **Clutch Plate**



The clutch plate used in a press machine is a critical component that enables controlled engagement and disengagement of the press's power transmission from the flywheel to the crankshaft. It is typically made of high-strength friction material designed to withstand the high torque and repetitive impact loads during press operation. In mechanical and pneumatic clutch systems, the clutch plate allows the flywheel to rotate continuously while only transmitting motion to the ram during the pressing cycle. In pneumatic setups, air pressure actuates the clutch, engaging the plate to transfer power precisely when needed, which improves operational safety, reduces wear, and allows for automation of the press cycle. Proper design and material selection of the clutch plate are essential to ensure durability, thermal stability, and consistent performance under high-stress conditions.

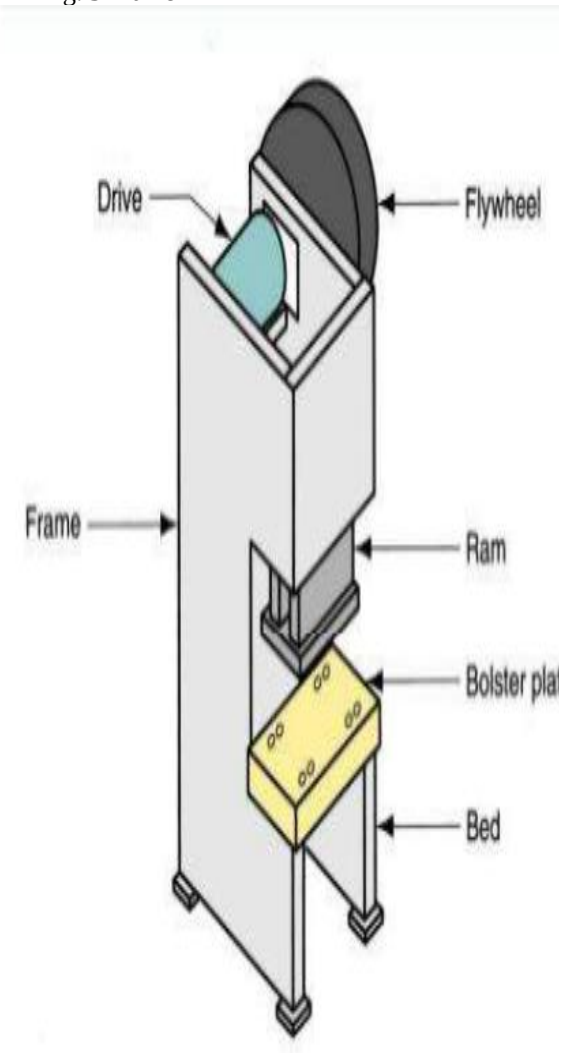
2. **Compressor:-**

Feature	Specification
Compressor Type	Rotary Screw
Motor Power	15 kW (20 HP)
FAD	110 CFM @ 7 bar
Max Pressure	10 bar
Tank Size	500 L
Dryer	Integrated refrigerated dryer
Noise Level	~68–75 dB
Cooling	Air-cooled
Voltage	400V, 3-Phase, 50 Hz

Frame of press Machine:-

- **Frame** It is a main body of the power press. It supports ram, driving mechanism and control mechanisms.
- **Ram** Main operating part of the press is RAM which works directly during processing of a work-piece.
- **Flywheel** In most of the presses driven gear or driven pulley is made of the shape of flywheel, which is used for storing the energy reserve wire of energy for maintaining constant speed of ram when punch is pressed against the workpiece
- **Base (Bed)** Base is the main supporting member for workpiece holding dies and different controlling mechanisms of press.

Fig. 3 Frame



CONCLUSION

The conversion of a conventional eccentric press machine into an automatic press using a pneumatically operated clutch plate significantly enhances the machine's operational efficiency, safety, and precision. By automating the clutch engagement and disengagement process, the system reduces the dependency on manual operation, minimizes human error, and allows for more consistent and accurate press cycles. This not only improves productivity but also extends the service life of the machine by reducing mechanical wear and shock during operation.

Moreover, the integration of pneumatic control offers better responsiveness and allows for seamless synchronization with additional automation components such as feeders and ejectors. The successful implementation of this system demonstrates the feasibility of modernizing existing mechanical equipment with relatively low investment, paving the way for small and medium-scale industries to adopt automation. Overall, the project proves to be a cost-effective and practical approach to upgrading traditional press systems for improved manufacturing performance.

❖ FUTURE SCOPE

- The future scope includes full automation by integrating sensors, PLCs, and automatic feeding systems for continuous operation. It also opens possibilities for remote monitoring, predictive maintenance, and adapting the system for different press capacities and applications..

❖ REFERENCES

1. A. G. Naik, N. K. Mandavgade, “FEA Implementation In Analysis And Optimization Of Top And Bottom Frame For Hydraulic Cotton Lint Bailing Press”, International Journal of Scientific & Engineering Research Volume 3, Issue 7, 2012
2. H.N.Chauhan & M.P.Bambhania, “Design & Analysis of Frame of 63 Ton Power Press Machine by Using Finite Element Method”, Indian Journal of Applied Research, Vol.:3, Issue:7, pp.285-288, 2013
3. Ankit H Parmar and et al, “Design and Modification of Foremost Element of Hydraulic Press Machine”, International Journal of Advanced Scientific and Technical Research, Issue 4, Vol. 3, 2014
4. Bhavesh Khichadia, Dipeshkumar Chauhan, “A Review on Design And Analysis of Mechanical Press Frame”, International Journal of Advance Engineering and Research Development, Volume 1, Issue 6, 2014
5. B. Parthiban and et al, “Design and Analysis of C type hydraulic press structure and cylinder”, International Journal of Research in Aeronautical and Mechanical Engineering, Vol.2 Issue.3, pp. 47-56, 2014.
6. D. Ravi, “Computer Aided Design and Analysis of Power Press”, Middle-East Journal of Scientific Research 20 (10): pp.1239-1246, 2014