

Design Analysis and Operational Enhancement for Die Press

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Abstract - In the competitive industry of manufacturing, optimizing the efficiency and effectiveness of die press operations is paramount. This abstract explores the critical aspects of design analysis and operational enhancement for die presses, focusing on key elements such as structural integrity, material utilization, and process streamlining. This design analysis helps the metal forming industry improve processes and quality and achieve reduced loss due to injury.

Key Words: Loss time Injury, KPI, enhances quality

1.INTRODUCTION

An introduction to a die press cavity fixture would typically cover its purpose, design, and function in manufacturing processes. In the realm of manufacturing, efficiency and precision are paramount. One crucial element in achieving these objectives is the die press cavity fixture. This integral tool serves as the backbone of various production processes, ensuring the accurate shaping and forming of materials with consistency and reliability.

2. Design Analysis

A thorough design analysis of die presses encompasses a multifaceted evaluation of structural robustness, component compatibility, and ergonomic considerations. By leveraging advanced computational tools and simulation techniques, engineers can assess stress distribution, identify potential failure points, and refine designs to enhance performance and longevity. Additionally, the integration of automation and sensor technologies enables real-time monitoring of operational parameters, facilitating proactive maintenance and minimizing downtime. Image: - CATIA view of the lower cavity

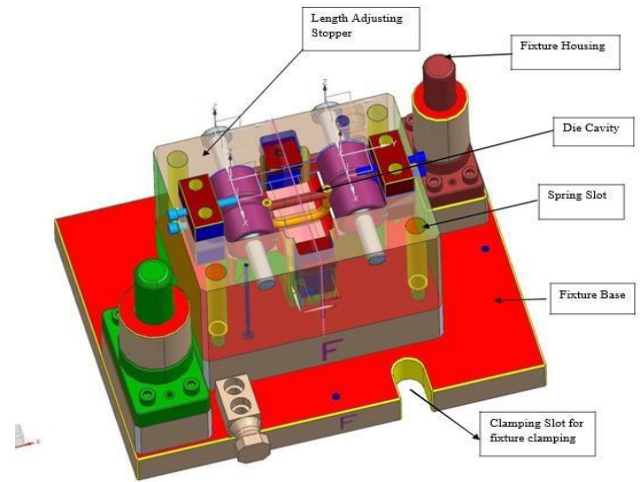


Image: - CATIA view of Lower cavity

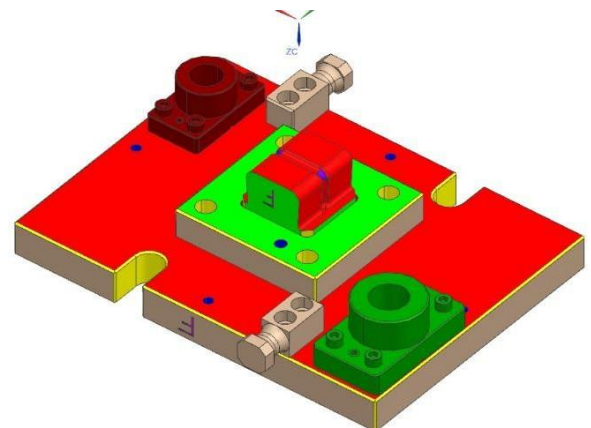


Image – CATIA view of upper cavity

Operational Enhancement: Operational enhancement strategies for die presses encompass a spectrum of initiatives aimed at maximizing productivity, minimizing waste, and improving overall process efficiency. Implementation of lean manufacturing principles, such as just-in-time inventory management and value stream mapping, optimizes workflow and reduces lead times. Furthermore, the adoption of innovative tooling solutions, such as quick-change dies and adaptive control systems, enables rapid setup changes and facilitates seamless transitions between production runs. Additionally, the incorporation of predictive analytics and machine learning algorithms empowers operators to anticipate maintenance needs, mitigate potential disruptions, and optimize operating parameters for enhanced performance.

SPRING-BACK EFFECT:

Reduce tensions in the material cause a sheet of metal to spring again after it has been bent. Due to the elastic recovery, it is necessary to over-bend the sheet to a precise amount to achieve the requisite bend radius and angle. Figure 4-5 Standard spring selection considering length

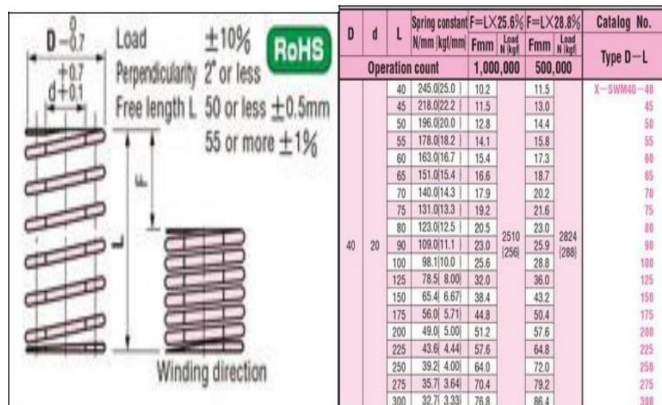


Figure - Standard Spring selection considering Length



Figure - Spring Specifications

3. SAMPLE CALCULATION

Diameter of Mild Steel rod = 8mm

Thickness of Mild Steel rod = 8mm

Length of Mild Steel rod = 310mm

Ultimate Tensile Strength = 400 MPA

Solution: -

Cutting Tool = Perimeter x Thickness x Ultimate Tensile Strength

Using the formula:

Perimeter = $\pi \times 8\text{mm}$

Perimeter = $3.14 \times 8\text{mm}$ Perimeter

= 25.12mm

So, the perimeter of the mild steel rod is approximately 25.12mm.

Cutting Tool Standard = $25.12\text{mm} \times 8\text{mm} \times 400\text{MPa}$

= 399.68MPa

So, the cutting tool is approximately = 399.68MPa

Bending Load = 16% of Cutting Load

Bending Load σ = 34031.04N.mm.

Converted in tons = **3.47 metric tons**

Statement – This formula-based solution stats that shows require force to bend the single side of 8mm rod during single stroke

4. CONCLUSIONS

In conclusion, the convergence of design analysis and operational enhancement holds immense potential for elevating the capabilities and competitiveness of die-press operations. By embracing a holistic approach that prioritizes structural integrity, process efficiency, and technological innovation, manufacturers can unlock new levels of productivity, quality, and agility in their manufacturing processes. As industry dynamics continue to evolve, the pursuit of continuous improvement and innovation remains essential for sustaining success in the dynamic landscape of modern manufacturing.

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5. REFERENCES

- a) OSBOURN DORSEY, Improvement in door holding devices Patent no. US 210764 A, dated December 10, 1878.
- b) www.directdoorhardware.com/baldwin as seen on August 25, 2013.
- c) www.doorsetindia.com as seen on August 27, 2013.
- d) www.directdoorhardware.com/baldwin/doorknobs as seen on August 25, 2013.

Applied Ergonomics 38 (2007), Task demands and human capabilities in door use, by Shih-Kai Chang, Collin G. Drury, Department of Industrial Engineering, University of Buffalo, New York. [6] Assessment of grip force and subjective hand force exertion under handedness and postural conditions, by Kai Way Li, Ruifeng Yu, Department of Industrial Management,