

DAPR ENGINEERING: PUNCH PRESS CASE STUDY

SYSTEMS DESIGN AND INTEGRATION OF AN AUTOMATED METAL EXTRUSION PUNCH PRESS

BACKGROUND

An industrial solutions provider with expertise in the fabrication of aluminum extrusions, sought out DAPR to develop a new automation system to create their extrusions. DAPR was tasked with creating a machine that could load blank aluminum extrusions in bulk on a conveyor system, pick and place individual extrusions on a long actuator that pushes the extrusion through the press for pattern punching, present the part to a mill for slot milling, and neatly stack the extrusions on a cart, ready for packaging. To ensure the punch patterns were correct, DAPR also implemented a vision system to inspect the extrusions as they exit the press. Ultimately, this machine stemmed from the Client's need to update their aging equipment to have a more robust and reliable production output.

CHALLENGES AND SOLUTIONS

- **Handling numerous extrusion profiles and punch patterns.** This Client is well known for their ability to fabricate numerous extrusion profiles. As such, it was vital that the machine accommodate all 6 profiles, as well as lengths ranging from 66 inches to 120 inches. Additionally, each of the profiles can have multiple punch patterns. To solve this challenge, the design utilizes a series of grippers and clamps to properly align the extrusions, and a robust, electric belt-driven actuator to maintain positional accuracy. DAPR was able to create a machine that reduced the Client's machine changeover time from 8 hours to approximately 30 minutes and meet the feature positional tolerance of +/- 15 thousands of an inch.
- **Integration with aging equipment.** The Client requested that DAPR utilize their current Bliss Press machine in the design. Not only was DAPR limited by dimensional requirements of the existing equipment, but DAPR was also constrained when trying to communicate with the press due to the lack of documentation available to reference. This required a high level of creativity and numerous electrical and software changes to the existing equipment to create a fully integrated and seamless system.
- **Part inspection and consistency.** Previously, the Client had some issues with part consistency and variance. To provide a more robust part inspection, DAPR implemented Keyence visual inspection system. This system actively checks the location of the punched holes and compares that to the known dimensions found on the detailed part drawings. Not only is this system more robust and reliable, the Client can now inspect every part, rather than every 10 as before. Enabling them to identify non-compliant parts before shipment.

SUCCESSSES

DAPR was able to utilize sound engineering principles combined with a collaborative and creative design approach to develop an Automated Punch Press machine that seamlessly integrated old, outdated technology with new. The machine was successful at isolating raw material, processing and neatly stacking each extrusion.

PROJECT SUMMARY

Successful design of a custom automation solution for the processing of aluminum extrusions.

Industry: Manufacturing

Product: Automated Punch Press for aluminum extrusion creation

Timeframe:

- 13 months

Capabilities Utilized:

- Project Management
- Proof of Concept
- Risk Mitigation
- Concept Development
- Controls Design
- Full System Design and Integration
- Timing Studies
- Tolerance Stack-up Analysis
- Mechanical Analysis
- Motion Analysis
- Multi-axis Motion Control

Results:

- Designed a custom pick and place to accommodate a variety of part sizes
- Significantly reduced Client's machine changeover time
- Successfully integrated existing machinery into the new machine design
- Successfully implemented a robust and repeatable part inspection system