

Mobile Piercing Machine

Project Number: A-030

Summary

AIM-Joraco was tasked with producing a machine that would simultaneously punch four holes in the sides of previously stamp-formed parts. The machine would integrate with the client's automated production line, while also being capable of being moved between manufacturing lines at different locations. Balancing the limitations of available space with the geometry of the client's parts, AIM-Joraco designed the machine to utilize remote piston technology to power the punching cylinders. The end result was a fully custom production workcell based around multiple Hydro-Aire Series hydro-pneumatic cylinders.



Tags: Hydro-Aire, integration, punching, piercing, remote piston, manufacturing line, mobile, multiple cylinders

Customer Requirements

- Final machine design must seamlessly integrate with existing production line, accounting for onloading/offloading locations, part orientation, and accessibility for both automated gantries and human operators.
- The machine must punch four slots into the sides of the part.
- The machine must transfer parts between the loading station, piercing station, and the client-provided conveyor.
- The machine must be both mobile and able to be secured in place during use.

Design Challenges

- Complex part geometry necessitated the use of a specially shaped mandrel for containing the dies and controlling the parts' motion.
- The die-supporting mandrel must be removable to allow tooling upkeep, without sacrificing rigidity between the punches and dies.
- Because of spatial limitations of the production line, the relatively long Hydro-Aire cylinders could not protrude for their entire length out from the sides being punched.

Process

- AIM-Joraco designers worked closely with client designers to review manufacturing considerations for the machine undercarriage concept that the client had developed prior to RFQ.
- With previous experience with remote piston cylinders in mind, AIM-Joraco designed a mobile machine stand that had mounting points at a height to hold the multi-stage hydro-pneumatic cylinders.
- Stress simulations and iterative design were used to determine what support would be required for safe, accurate punching, while still allowing partial disassembly of the tool area.
- Designers incorporated purely pneumatic cylinders to perform part movement and part holding.

Results

- A semi-independent punching enclosure allowed tooling to be removed and replaced as needed.
- The tool area was designed to integrate the punches and dies directly into heavy-duty structural supports so that alignment was always maintained, even with the end of the punch doing its work over 7 inches away from the cylinder piston.
- Using the remote piston design, four slots could be punched using work performed by only two full-length hydro-pneumatic cylinders.
- AIM-Joraco incorporated state-of-the-art sensors for use in automation and for real-time machine status reporting.