

CASE STUDY



A 2025 Grand Prize Winner in the Lawn & Garden category for conventional PM components.

Throttle Pedal for Off-Highway Construction Equipment

Process:
Conventional Press & Sinter (PM)

Material:
FC-0208-50 Copper Steel

Density:
6.7 g/cm³

Weight:
700 g

End Use and Function

The Throttle Pedal was designed for off-highway construction equipment with products produced for similar equipment models. Previous designs utilized stampings and castings that were assembled to produce the pedal weldment ready to be assembled into final application.

Fabrication

Material composition was relatively straightforward, utilizing MPIF FC-0208-50 to mimic AISI 4140 cold-rolled steel. Physical load on the component was determined to be relatively low, with no significant requirements placed on elongation or tensile strength. Tolerances needed to be maintained on the post feature due to bushing size requirements. The diameter of the post is qualified by machining, where the snap ring groove is also created. The rectangular tab is milled from stock intentionally left at the end of the post during the compaction process.

The 700 g part is manufactured near-net shape utilizing hydraulic compaction with fill compensation and selective ejection. Secondary machining is required on the 15.957 mm post for bushing tight-sliding fit, snap ring retention feature, and for the tab on the face of the

post. The final operation is zinc electroplate with clear chromate conversion for corrosion protection.

Preventing cracks at ejection was the largest hurdle to overcome, but with the selective motion provided by the hydraulic press, balancing fill and ejection deflections were possible. For machining, a custom counterbalanced jaw setup was required for part work holding due to the central axis being significantly offset from the center of gravity of the balance of the part.

Results

The solid one-piece design component eliminated the assembly of the Throttle Pedal before going to the production line, significantly reducing cost by eliminating several assembled sub-component part numbers, along with weeks of assembly time before the product could go into production. This eliminated machining scrap and lowered the carbon footprint because additional trucking between plants was eliminated. The multi-level press capabilities allowed this part to be produced in one press operation. PM processing was attractive to the customer because of the near-net manufacturing process as compared to the original stamping & laser cut shape designs.



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