



Tungsten Bolt Weight

PROBLEM

A firearm client needed an inertia weight for the bolt on a direct blowback gun mechanism. Space was severely limited for the amount of weight required: 250 grams.

The design of the weight was complex due to existing hardware.

SOLUTION

The part required a high specific gravity material to be able to get the required amount of weight into the specific volume allotted.

Tungsten alloys (90 to 97%W) provide a material with high density — 17.00 g/cc to 18.5 g/cc — and good mechanical properties. The ASTM B777 and AMS 7725 govern the alloys: Class 1 through 4 of the specification designate the tungsten weight % and density in g/cc as well as minimum physical properties.

MIM was chosen to manufacture this part, due to the choice of 95%W – tungsten heavy alloy (WHA) as the required material. Tungsten heavy alloys are not easily machined, in comparison to aluminum or low alloy steels, and require specialized tooling for machining. The high cost of tungsten alloy raw materials makes the reduction of input blank weight a priority; MIM provides a very high material yield.

The cost of tungsten alloys, being greater than 10x the cost of low alloy steel, requires net shape or near net shape parts to minimize raw material costs. If the part in question was to be machined from bar stock, the input weight would be approximately 1,100 grams: MIM sintered weight of 250 grams achieves **a weight savings of 77%**.

