

Reduce Rotor Costs with Dura-Bar

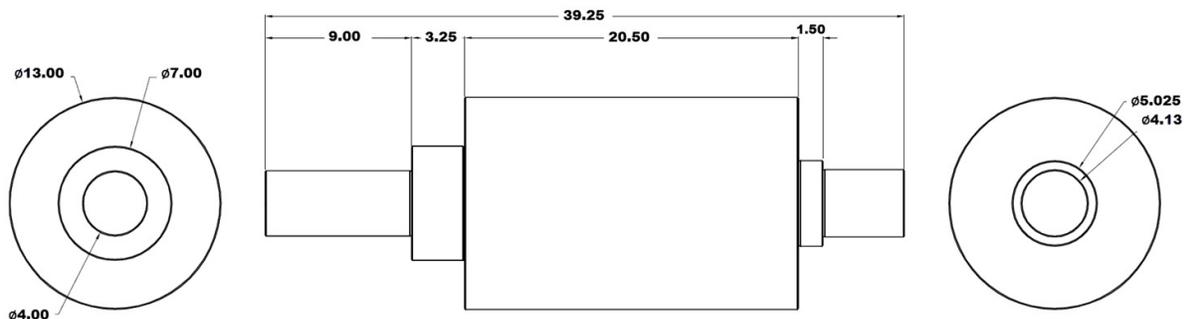
There are several Dura-Bar ductile iron grades with mechanical properties that are similar to or better than that of low and medium carbon steels. The true difference in materials is realized when it comes to machining Dura-Bar compared to its steel counterparts. Dura-Bar ductile iron contains nodular graphite in a matrix of ferrite and pearlite. The structure provides excellent machinability and good surface finishes.

The increased machinability of Dura-Bar yields a reduction in total part cost and frees up machine time for other work. Unlike sand castings, Dura-Bar continuous cast iron is free of sand and carbides making the material easy on tooling and consistent in its microstructure from bar to bar and heat to heat, proven by **Dura-Bar's Zero Defect Guarantee**.



The Application

Dura-Bar worked with a major air and gas compressor OEM to compare Dura-Bar ductile iron head-to-head against 1141 steel for the production of their rotors. To maximize compressor efficiency there is minimal clearance between the male and female rotors, which requires precision machining and grinding to ensure the rotors don't make contact with one another. The drawing below illustrates the rough turning operation.



Milling Operation – 25% Reduction in Spindle Load

A milling operation to prepare the blank for turning was run first with 1141, and then with Dura-Bar 80-55-06 ductile iron. The following observations were made: The typical machine spindle load generated when machining the 1141 steel blanks was approximately 80%. Running Dura-Bar material using the same parameters generated a noticeably lower spindle load, approximately 55% during face milling, and 42% during the interpolation of the chucking diameter. This is typical when converting from steel to ductile iron and is attributable to the free machining characteristics of Dura-Bar as compared to carbon steels. Of special note, there was a significant reduction in the amount of tool deflection when face milling the component.

For this particular customer, the milling operation was not a controlling (gate) operation in the rotor machining cell, so the focus was not on reducing the cutting time. However, there is substantial opportunity for further optimization and reduction of cycle time at this operation if desired. Machining Dura-Bar resulted in reduced tool wear.

Rough Turn Operation – 35% Reduction in Cutting Time

Using the customer’s existing program for rotor turning, initial adjustments focused specifically on depth of cut and increased machining speeds (meters/minute).

Turning speeds were increased by 21% for all roughing cuts and the depth of cut across multiple cutting tools was increased by a minimum of 20%, up to 100%.

Finishing speeds were increased by 50%. No adjustments were made to feed per revolution initially. Typical spindle load averaged approximately 80% when machining steel at original parameters. With the increase in depth of cut and machining speed, spindle load averaged approximately 63% when machining Dura-Bar. Due to the reduced abrasiveness and cutting pressure when using Dura-Bar, the cutting time was reduced by 35% without any detriment to tool life.

21% to 50%
Increase in Turning

20% to 100%
Increase in Cutting

35%
Reduction in Cutting

Grinding – Extended Wheel Life with Dura-Bar

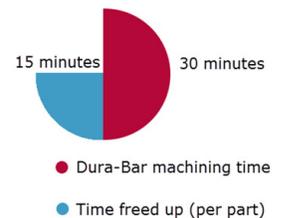
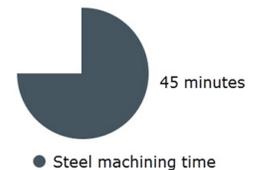
The benefits of machining Dura-Bar are not limited to heavy cutting operations. The precision grinding of the flutes requires expensive cubic boron nitride (CBN) grinding wheels. Dura-Bar generates less wear on the grinding wheel giving them greater life compared with grinding steel. One rotor customer commented that they could have justified the switch to Dura-Bar based on the savings in CBN wheels alone. Due to the stability of Dura-Bar versus steel, customers have found that they have better dimensional size control.

\$60/Hour Shop Rate: 1 Minute Saved = \$1 Saved

With a switch from 1141 steel to Dura-Bar 80-55-06 ductile iron, the customer decreased their turning time from 45 minutes to 30 minutes per part.

Using a generic and conservative shop rate of \$60/hr, each minute of turning time costs our customer one dollar. By shaving 15 minutes off the cutting operation, the switch to **Dura-Bar saved \$15 per part in one operation alone.**

In addition to these savings, the customer is able to take advantage of the 15 minutes of opportunity cost they were losing when machining steel. Those 15 minutes (per part) of machine time can be sold to other customers to generate new revenue streams.



Contact us today to discuss your application and how you can save with Dura-Bar.



MORE PARTS PER HOUR

Increased speeds=
more parts per hour



BALANCING

Consistent microstructure=
easy to balance



WEIGHT REDUCTION

Dura-Bar is 10% lighter
than steel



QUIETER

Vibration damping =
quieter operation