The making of the Treadstone EFR Turbine housing.

The engineers at Borg Warner analyzed every component of a turbocharger and re-engineered the entire unit with the latest technology. We feel that this technology and latest advancement in materials will lead the way of the turbo aftermarket to come. Some key features of these turbo's are below……

-CNC Forged Mill Billet Compressor Wheels
-347 Cast Stainless Turbine Housings
-Integrated Compressor Recirculation Valve
-Dual Row Ceramic Ball Bearings
-Titanium Aluminized Turbine Wheels (50% lighter than the Inconel)
-Integrated electronic boost controller

Borg Warner has a wide array of turbine wheel selections, ranging from 55, 58, 64, 70, 74 and 80mm. This measurement is the inducer(exhaust gasses enter), and is the largest part of the wheel. Other manufactures such as Precision, Turbonetics and Garrett will denote exducer diameters in there sales, ranging from 49, 54, 57, 62, 65 and 68mm trims. These sizes of turbine wheels are the most popular for single turbo applications ranging from 300 to 1000hp, or twin turbo applications up to 2000HP.

Turbo Comparisons

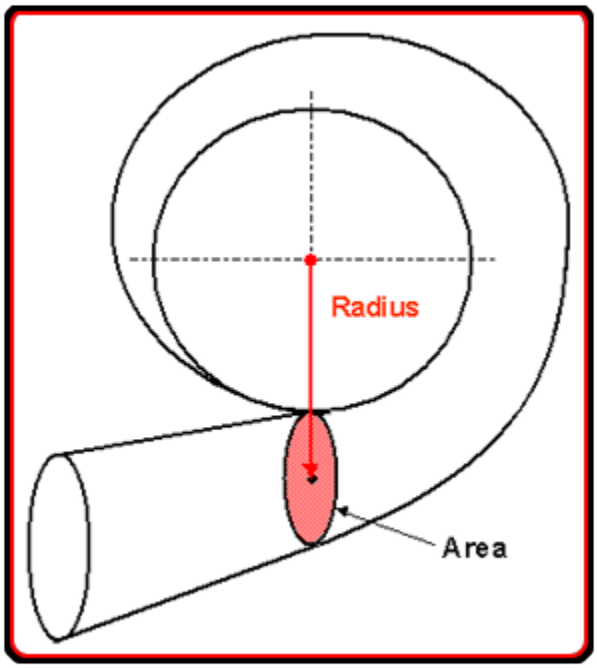
The chart below shows inducer and exducer measurements for the EFR range. For example, the ever so popular Precision 6262, one of the first main stream turbo's utilizing a billet compressor wheel to hit the aftermarket that was a pretty big hit. The 6262 denotation from precision means 62mm compressor inducer, with 82 exducer and 62mm

turbine exducer, hence 6262. The 8374EFR has a compressor inducer of 62mm and Exducer of 83mm, almost exactly the same as the Precision compressor wheel. The 8374EFR has a turbine exducer of 64, 2mm bigger than the 62 from precision. This slightly larger turbine wheel, is closer related to the 65mm turbine wheel from Precision/Turbonetics. The 6265 combination has been more popular lately for guys wanting to push the envelope of the 62mm compressor wheel, making this very similar size to the 8374EFR. Being that the Borg Warner's turbine wheels are made from Titanium and are half the weight of Turbonetics, Precision or Garrets Inconel wheels, you can afford to have a slightly bigger turbine wheel, it will spool up quicker because of the reduced inertia and at the same time eat more exhaust gasses. Turbine wheels are the main factor in limiting HP, so with the same size compressor wheel, the Borg Warner units are able to support more HP than their competitors, while spooling the same, if not quicker!

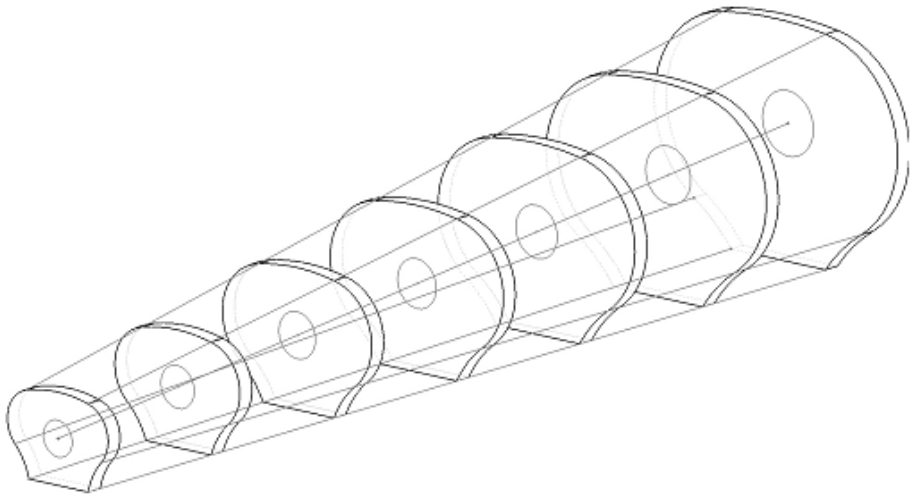
	Compressor Wheel		Turbine Wheel		Compressor Housing			Turbine Housing Selection			
	Inducer (mm)	Exducer (mm)	Inducer (mm)	Exducer (mm)	Power Range	Inlet (in)	Outlet (in)	.64 T25 WG Single	.63 T3 WG Single	.92 T4 WG Twin	1.05 T4 Twin
6255	**49**	62	55	**49**	200-350	2.5	2.0	X			
6258	**49**	62	58	**51**	225-400	2.5	2.0	X		X	
6758	**54**	67	58	**51**	275-450	2.5	2.0	X		X	
7064	**52**	70	64	**56**	300-500	3.5	2.0		X	X	X
7670	**57**	76	70	**62**	375-600	3.5	2.0		X	X	X
8374	**62**	83	74	**64**	475-750	3.5	2.5		X	X	X
9180	**68**	91	80	**74**	600-1000	3.5	2.5		X		X

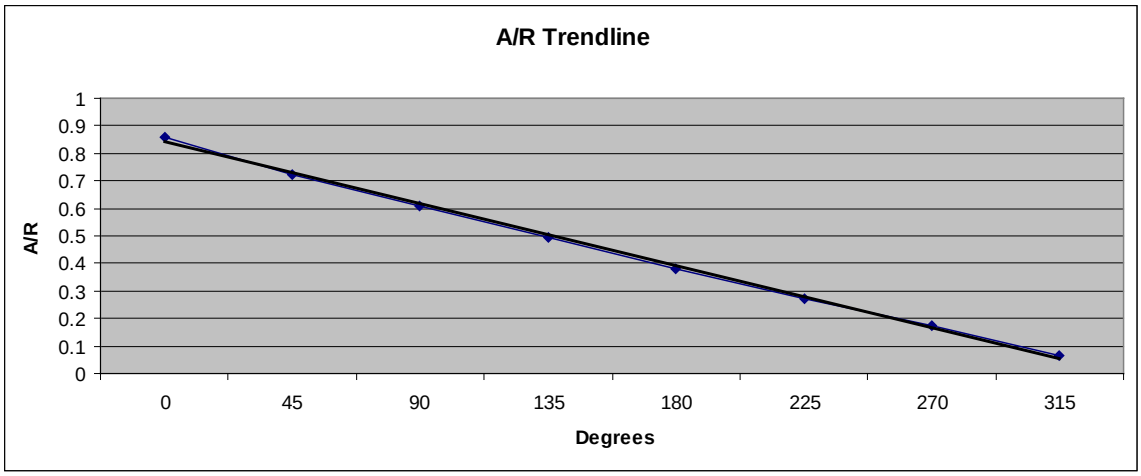
AR Ratio $A/R = \dfrac{Area(in)^2}{Radius(in)}$

This measurement plays a crucial role in the scroll of a turbine housing and effects turbine efficiency greatly 2nd to overall diameter to the turbine wheel. Area is the cross sectional area at the top point of the turbine housing tangential to the scroll, this is know as the critical area and is how your AR is calculated. The area is the cross sectional area at this point, and the radius is the distance to the centroid of that area from the center of the turbine housings



The AR ratio is linear 360 degrees around the turbine wheel. If you measured AR ratio at 45 degree increments around the scroll, and plotted them on a graph, your results should be a straight line.





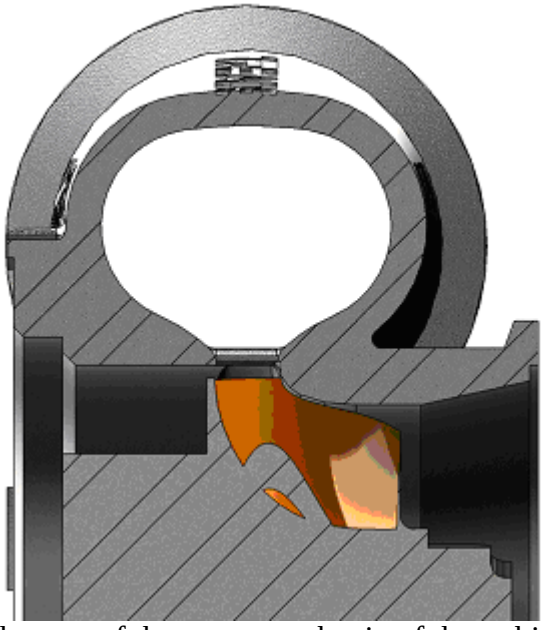
Our first production run of turbine housings will have an AR of .86, a midway point between the large 1.0 and smaller .63 AR ratios we are accustom too.

A common misconception of AR ratio's IS WITHIN different families of turbine housings. Huge turbine housings can have the same AR ratio as tiny turbine housing, because it is just a ratio of #'s. So when picking a turbine housings, you have to look at the overall size turbine housing scroll, compared to the diameter of the turbine wheel. You can see in the comparison below, the Borg Warner .83 T3 turbine housings is much bigger than our .86 turbine housing. This is because the Borg Warner T3 turbine housing is optimized for the largest turbine wheel available for the EFR, the 1000hp 80mm turbine wheel. You maybe asking your self, why is this T3 housing so big compared to what we are used to seeing, ie Precision, Turbonetics, Garrett….etc This is to fit the big 80mm wheel, and be optimized to make 1000hp with the t3 style flange. Yes, they could have just slapped a T4 flange on, but they kept that for the twin scroll versions instead.

However, when you use the large T3 .83 Borg Warner turbine housing in combination with a small 64mm Borg Warner turbine wheel, your combination is far from optimized, and spool time will suffer greatly due to the difference in turbine housing and wheel combo. Going with a twin scroll housing will help, but your combination is still not optimized for that particular housing/wheel combo.

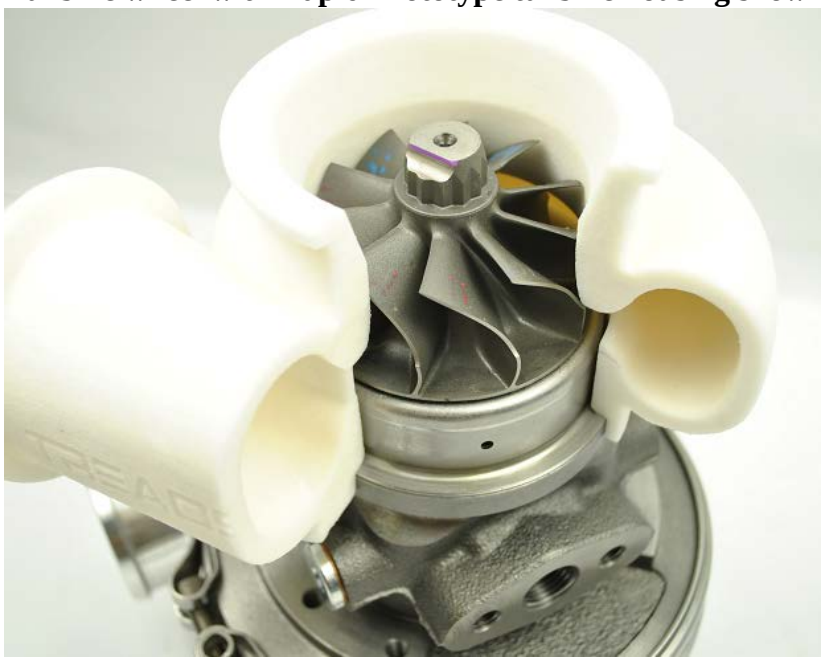
Turbine Housing Optimization

Optimization of turbine wheel to turbine lies within the actual distance from the tip of the turbine wheel, to the tongue of the turbine housing, this is known as optimizing. Manufactures have different clearances for this optimization and is somewhat of a closely guarded secret, and is not advertised by any manufacture to the public. This measurement can easily be measured when taking a turbo apart or showing a cross sectional view below.

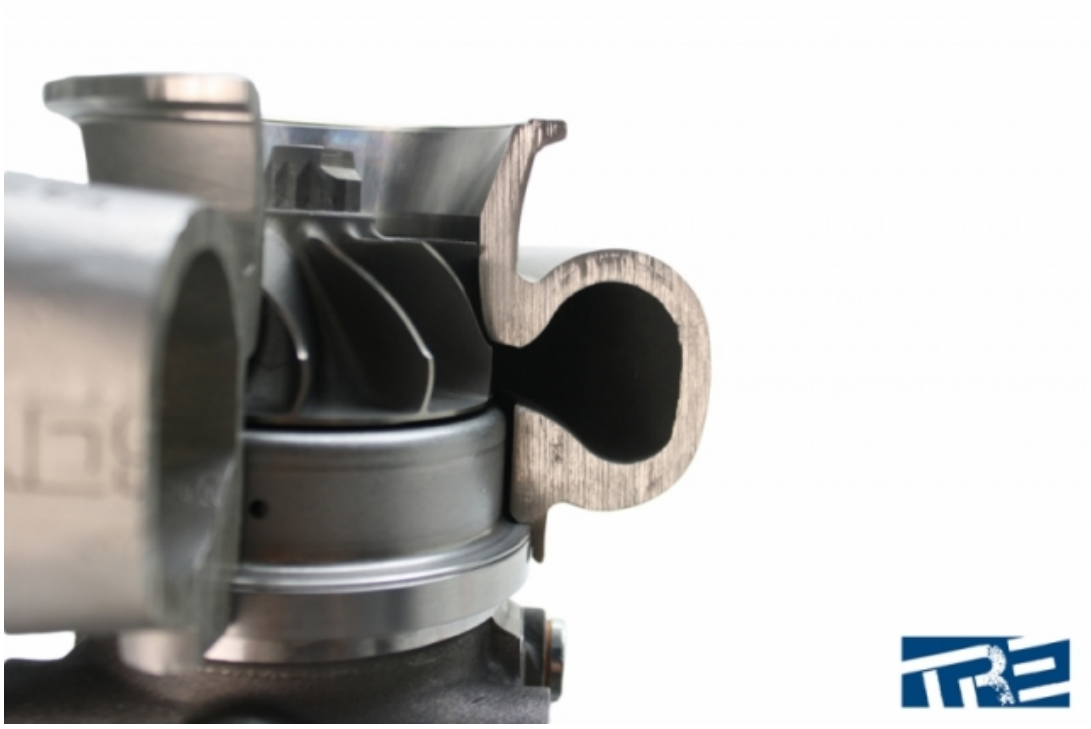


The distance from the bottom of the tongue to the tip of the turbine wheel is tip to tongue clearance. While the 74mm turbine wheel may push the limits of the housing, we feel that the smaller housing with the larger wheel may accommodate some applications ideally pushing the limits of the turbo combination.

70mm Turbine wheel with Rapid Prototype turbine housing shown below



With our design, we optimized our .86 turbine housing around the 70mm EFR Turbine wheel, while still being able to machine it for the 74 and the 64 wheels. This housing will fall into the mainstream T3 turbine housing range, and be similar for turbine wheels of 57, 62 and 65 from the Precision and Turbonetics, as well as the GT30 and GT35 turbine wheels from Garrett. We feel this is the middle of the road size housing Borg Warner didn't make, and our housing will fill in the gaps that Borg Warner left open. This turbine housing will be optimized on the EFR range of turbo's, with power ranges from 300 to 750hp.




VB 7486


TREADSTONE