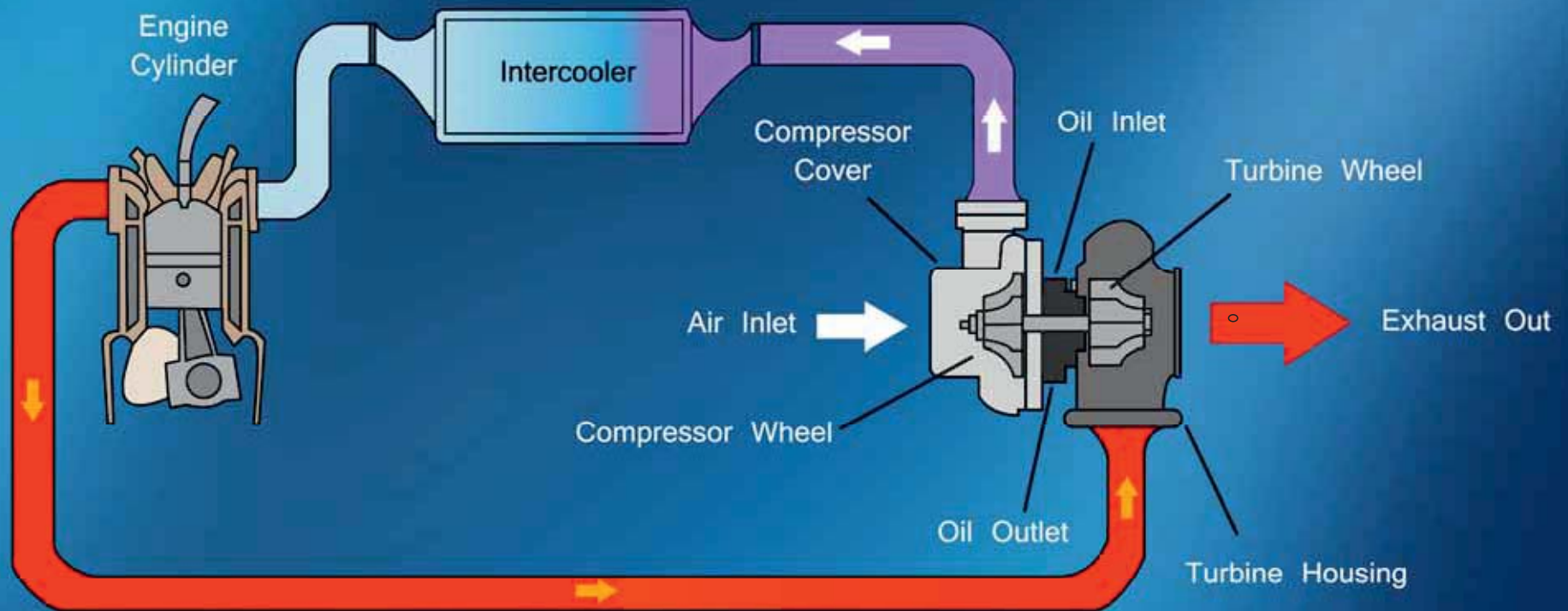


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QUALITY REPLACEMENT
TURBOCHARGER PARTS

*Quality Replacement
Turbocharger Parts*

Principles of Turbocharging



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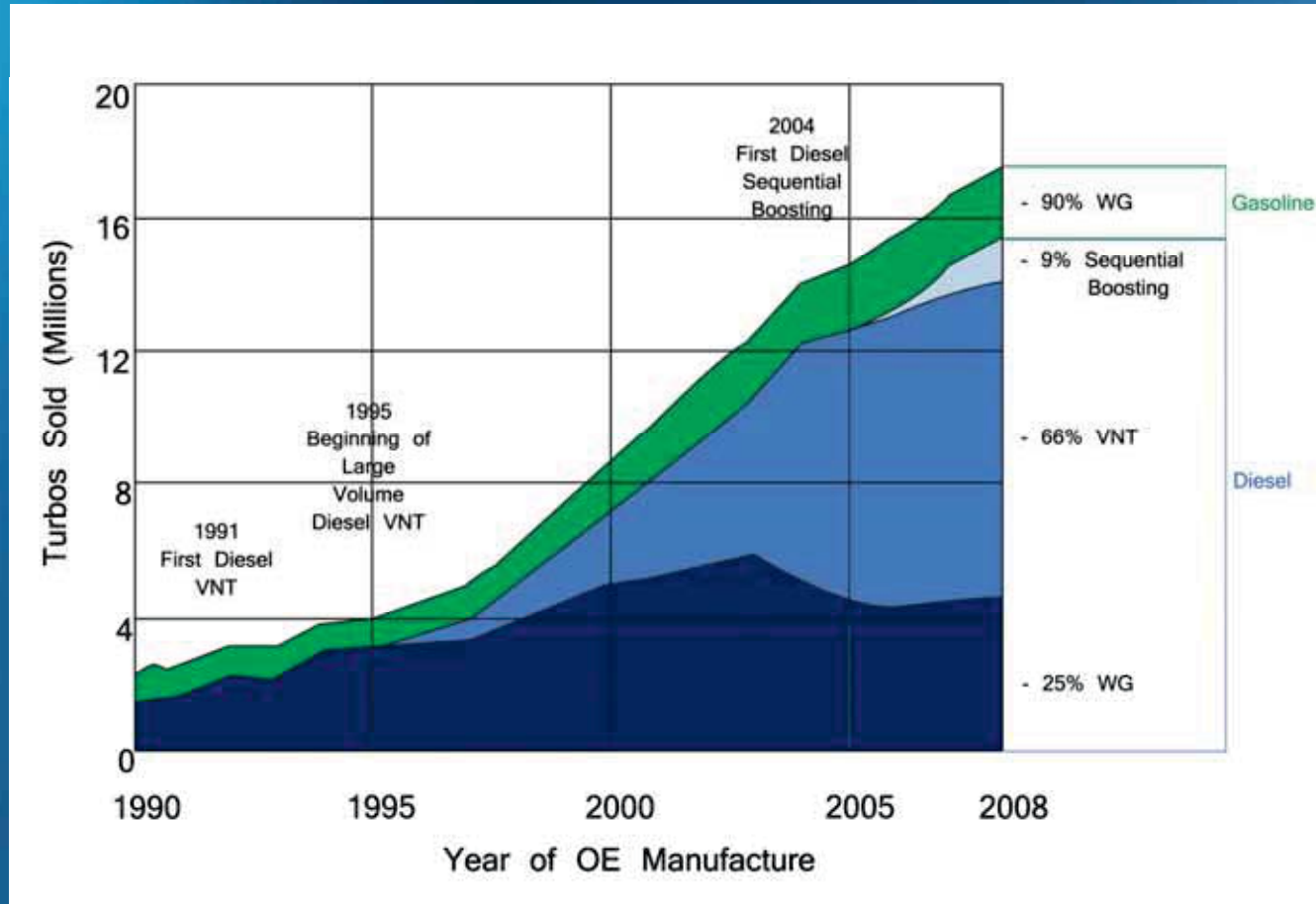
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Turbocharger Components

History and Growth of Turbocharger Market- OE Manufacture



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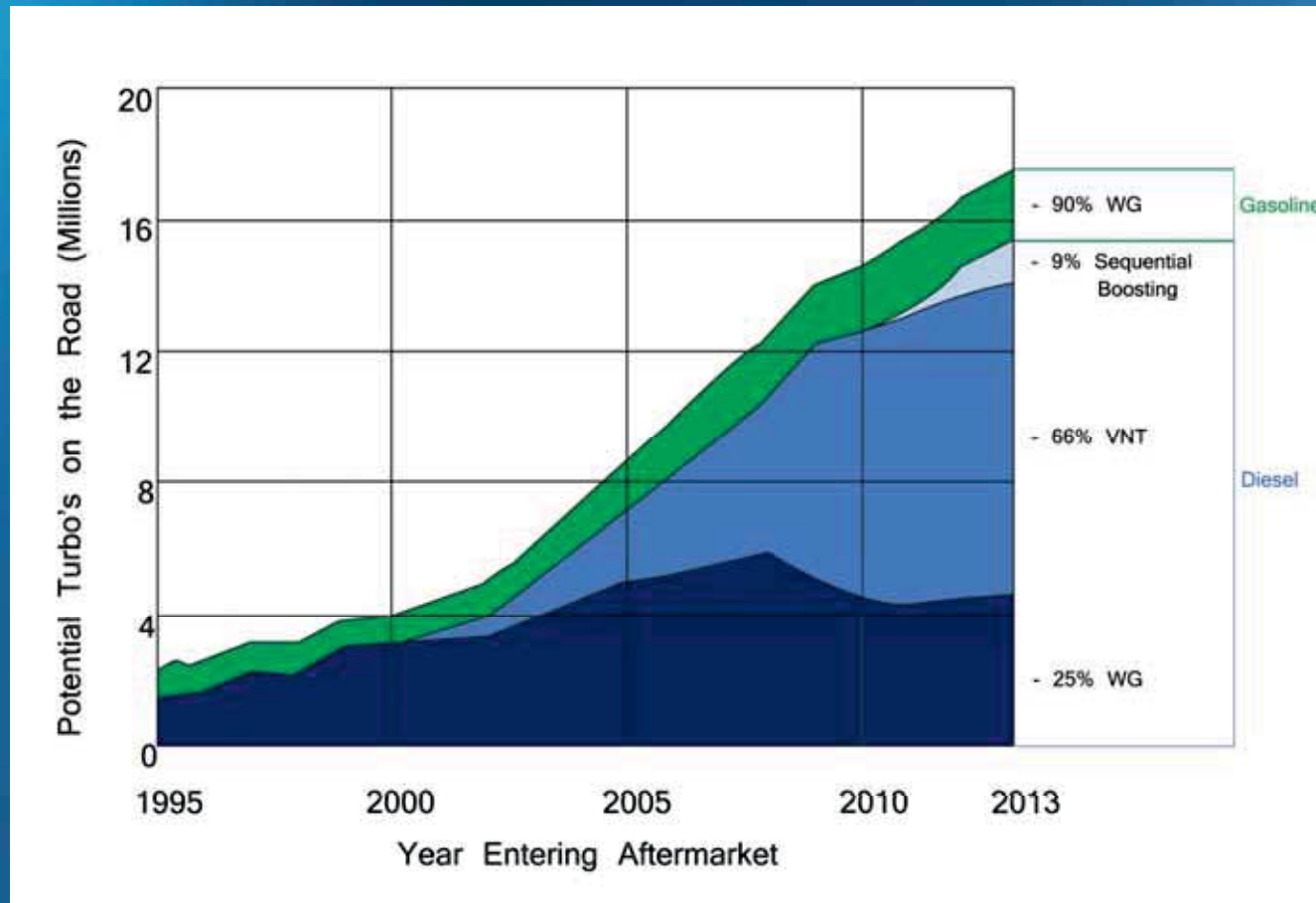
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History and Growth of Turbocharger Aftermarket



Turbocharger Aftermarket/ Repair Requirements

- Hardest Worked Engine Component
- Sensitive to poor maintenance (oil problems/ vibrations etc.)
 - More from BU
- Limited life on most applications - multiple repairs necessary during vehicle life.



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Requirements for Remanufacture

- Not an easy product to repair
- 3 Levels of repair
 - CHRA replacement.
 - Reconditioning of full CHRA with repair kit, parts and balancing.
 - Remanufacturing – as reconditioning but reclaiming parts through oversizing bearing housing / grinding shaft etc.
- Equipment – cleaning / measuring / specialist balancing equipment (rotor & CHRA)
- Expertise of repairers – experience with high precision tolerance (microns)
- Warranty issues / associated consequential losses



Availability of Repair Parts

- Market availability of parts and OEM aftermarket policies.
 - Parts not available e.g. Toyota
 - Limited OEM support for many passenger car applications.
 - Good support but stock availability issues.
 - Replacement parts available for most models but of varying quality.



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Part Details



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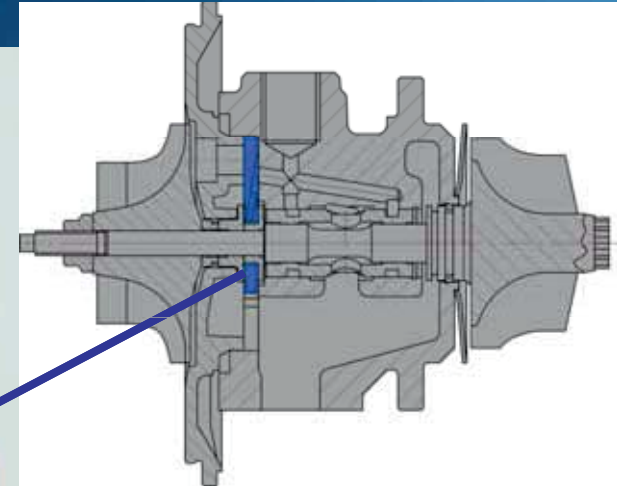
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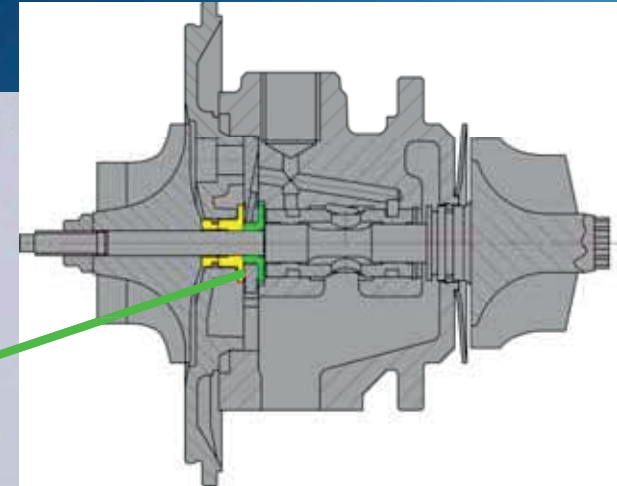
Thrust Bearing



- Specialist design oil ramping
- Aerospace materials
- Tight geometric tolerances



Thrust Collar



- Tight Geometric Tolerance (5 micron)
- Tight bore tolerance

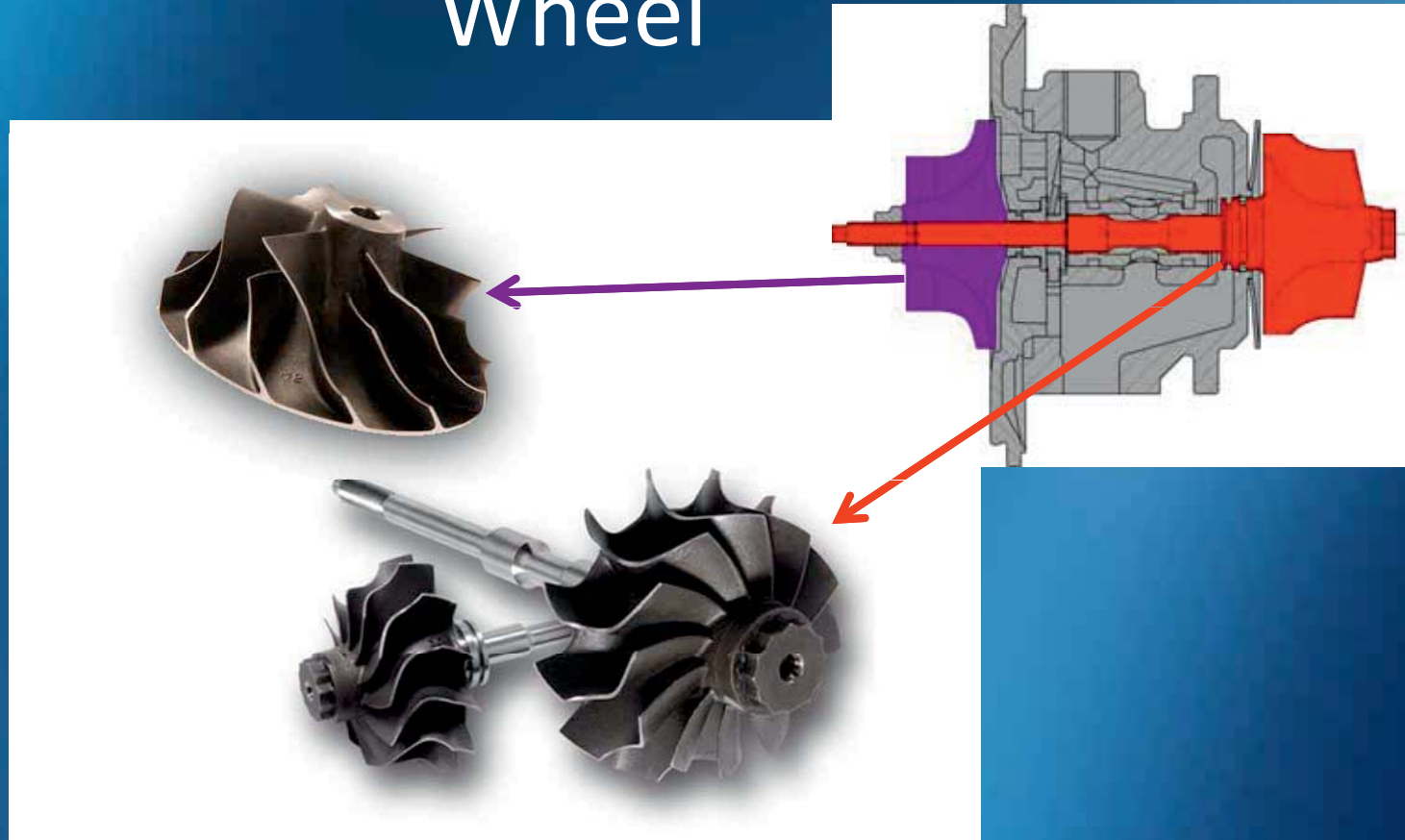


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Shaft and Compressor Wheel



- Aerospace material for high temperature
- Tight tolerance on critical dimensions
- Precision balanced



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Seal Plate Screws



- Special design of screw head to bite into seal plate creating additional oil seal.



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Aftermarket Flexibility



- Experience of failure modes allows improvements to be made in the aftermarket.
- Improved specification on new models can fit and upgrade old models.



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The future of turbo
remanufacture depends on
total quality repair by all



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Thank you for your time



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