JUNE 2019

COMPANY OVERVIEW

Garrett
ADVANCING MOTION

WHO WE ARE

Strong mission

Garrett
ADVANCING MOTION

Garrett is a cutting-edge technology provider that enables vehicles to become safer, more connected, efficient and environmentally friendly

We lead the development of innovative and differentiated solutions which empower the transportation industry to redefine and further advance motion

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Pioneering technology solutions provider

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Turbo Technology

- Reduce fuel usage
- Reduce exhaust emissions
- Enhance engine performance

Electric & Hybrid

- Optimize fuel economy
- Step towards a zero emissions future
- More responsive driving

Connected Vehicles

- Protect vehicles against cyber attacks
- Diagnose and predict anomalies
- Avoid breakdown and liabilities

Serving automotive customers with differentiated technologies

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Garrett at a glance

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$3.4B
2018 Revenue

~7,500
Employees

~1,200
Engineers

40
Vehicle manufacturers served globally

5
R&D Centers

12
"Close-to-Customer" engineering centers

100+
New applications annually

1,400+
Patents issued or pending

13
state-of-the-art manufacturing facilities

50,000+
Turbos / day

100M+
Garrett turbos in use globally

GTX
LISTED
NYSE

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Broad product portfolio, serving all markets

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FROM 0.8L TATA ENGINE — TO 100L CATERPILLAR MINING TRUCK ENGINE

LIGHT VEHICLE: GASOLINE | LIGHT VEHICLE: DIESEL | ELECTRIC BOOSTING | SOFTWARE SOLUTIONS | ON-HIGHWAY VEHICLES | OFF-HIGHWAY VEHICLES

2018 Revenue

$3.4B

All vehicles, all segments, all regions

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Global footprint, local player

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Corporate Headquarters | R&D center | "Close-to-Customer" engineering center | Software development center | Manufacturing Plant

Sales, R&D and Engineering close-to-customers | Global manufacturing presence

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Differentiated integrated supply chain strategy

Differentiated internal manufacturing technologies

- Home-grown “Industry firsts” (high-speed electron-beam, laser welding...)
- Proprietary super high speed balancing
- 100+ manufacturing patents and trade secrets

Standardized manufacturing processes

- Global engine programs sourced from multiple plants
- Maximized flexibility and assets utilization
- Resilience to industrial risks

13
state-of-the-art manufacturing facilities

50,000+
Turbos / day

100+
New applications annually

Driving best-in-class productivity and performance

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Long-term customer relationships with 40+ manufacturers

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	PRE-DEVELOPMENT 4 YEARS →	PRODUCT DEVELOPMENT 2 YEARS →	VEHICLE PRODUCTION 3-5 YEARS →	AFTERMARKET 10-15 YEARS
KEY ACTIVITIES	INNOVATION	CUSTOMIZATION	MANUFACTURING	REPLACEMENT

SINGLE SUPPLIER PER ENGINE

20+ YEARS CYCLE

CAT	Volkswagen	Mercedes-Benz	RENAULT	BMW	CITROËN	Ford	HYUNDAI	WEICHAI 潍柴 Weifang Diesel
63 YEARS	40 YEARS	40 YEARS	38 YEARS	35 YEARS	33 YEARS	32 YEARS	30 YEARS	25 YEARS

Early engagement leads to long-term global business relationships

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TECHNOLOGY DIFFERENTIATION

History rich in innovation

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Milestones

1950's – 60's	1990's	2000's	TODAY		
			2017:Cybersecurity	**2017:** Integrated Health Vehicle Management	SOFTWARE
		2008: 1st turbo used on gas-hybrids	**2016:** 1st fuel cell E-Compressor	**2018:** E-Turbo passenger car	ELECTRIFICATION
	1998: Launched Gen 2 VNT for VW/Audi diesel	**2008:** Gen 1 WG turbo	**2017:** Gen 3 WG turbo	**2018:** Gen 4 WG turbo	GASOLINE
	1998: 1st electric actuator for VNT	**2009:** Gen 4 VNT for VW diesel	**2014:** Gen 2 WG turbo	**2016:** Gen 1 Gas VNT	
1962: 1st turbo for passenger car (Oldsmobile Jetfire)	**1995:** Gen 1 VNT for VW/Audi	**2006:** 1st Two Stage System for PSA	**2015:** 1st VNT/VNT Two Stage	**2017:** Gen 6 VNT	DIESEL
1967: Deere goes turbo, followed by the whole industry	**2000:** Double axle VNT introduced at DDC	**2004:** Gen 3 VNT for BMW diesel	**2011:** World-first ball bearing turbo for Daimler	**2013:** Gen 5 VNT for EU6 cars	
1955: 1st turbo for Caterpillar tractor	**1997:** 1st ball bearing turbo at Nissan Diesel	**2010:** DualBoost turbo with Two Stage compressor, Ford	**2011:** Gen2 Double Axle VNT at John Deere		COMMERCIAL

Note: WG – Wastegate turbine (fixed geometry); VNT – Variable Nozzle Turbine; EVR – Exhaust gas recirculation; IVHM – Integrated Vehicle Health Management

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Regulatory changes driving need for new technologies

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+ 15M
New cars by 2025

+ 21M
Turbocharged cars by 2025

+ 30M
Hybrid cars by 2025

+ 5M
Battery Electric cars by 2025

More environmentally friendly cars by 2025

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Digital disruption driving need for new technologies

Increased vehicle complexity requiring sophisticated software solutions

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Garrett's differentiated technology offering

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	TURBOCHARGERS	ELECTRIC PRODUCTS	AUTOMOTIVE SOFTWARE
INNOVATIVE SOLUTIONS	• Wastegate • Two Stage • Variable Geometry Turbine	• Mild Hybrid • Plug-in Hybrid • Fuel Cell Electric	• Cybersecurity • Integrated Vehicle Health Management • Powertrain Controls & Virtual Sensing
BENEFITS	• Fuel economy & fleet CO2 compliance • Compliance with emissions standards • Reliability and asset up time	• Best CO2 for hybrid powertrains • Enhanced driving pleasure • Full portfolio of E-Boosting solutions	• Safety & security • Reliability / assured functionality • Vehicle up-time

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Turbocharging – technology at the cutting edge

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Journal bearing clearance

0.0004 inches of oil film

7 times thinner than human hair

Average compressor flow

20 cubic meters per minute

The capacity of a utility van

Wheels tip speed

1,300 miles per hour

supersonic, more than 1.7 times the speed of sound

Being shaken

at 25g vibration level

fighter jets can withstand ~14g

From 50,000 RPM to 200,000 RPM

in less than 2 seconds

3 seconds for F-16 engine to spool up to maximum thrust

Rotor group rotating speed

Can reach 350,000 revolutions per minute

B787 engines reach only 14,000 RPM

Turbine inlet temperature

Over 1,900 degrees Fahrenheit

window glass melts at 1,800 degrees Fahrenheit

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Garrett light & commercial vehicle turbo portfolio

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Turbos

FREE-FLOAT	WASTEGATE	VARIABLE NOZZLE TURBINE (VNT™)

DOUBLE AXLE VNT	TWO STAGE	TURBO-COMPOUNDING	ELECTRIC BOOSTING

Benefits

- Broadest portfolio with dedicated engineering support
- Fuel efficiency through state of art aerodynamics, bearing systems and control
- Higher performance, better fuel economy and emissions control enabled by innovative variable nozzle turbine designs
- Optimized for transient behavior to improved drivability and fun to drive

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Turbocharging electrified powertrains

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	MILD-HYBRID (48V)	HIGH VOLTAGE HYBRID	FUEL CELL ELECTRIC
	Audi SQ7	Mitsubishi Outlander	Honda Clarity
CORE TURBOCHARGERS	Base turbo	Base turbo	
ELECTRIC BOOSTING	Electric Turbo / E-Compressor	Electric Turbo / E-Compressor	FC E-Compressor
CO_2	10 - 20%	60 - 70%	**Zero** Not accounting for H_2 production

- 76% hybrid powertrains and 100% hydrogen fuel cell powertrains turbocharged by 2025
- Full CO_2 potential unlocked with electric boosting
- Hydrogen fuel cell electric vehicles require high performance E-Compressor

Towards zero emissions with hybrids and hydrogen fuel cell powertrains

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Garrett electric boosting portfolio

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	ELECTRIC COMPRESSOR Mild Hybrid Plug-in Hybrid	ELECTRIC TURBO Mild Hybrid Plug-in Hybrid	TWO STAGE ELECTRIC COMPRESSOR FOR FUEL CELLS Fuel Cell Electric
CUSTOMER BENEFITS	• Full speed within 0,25s • 2-3% better fuel economy • 20% NOx reduction (Diesel) • Enables Lambda 1 (Gasoline)	• 4x faster than a conventional Turbo • 2-4% better fuel economy (regen) • 20% NOx reduction (Diesel) • Enables Lambda 1 (Gasoline)	• Enables 40% downsizing of fuel cell stack • Reducing volume, weight and cost • Optimal power consumption due to architecture & high efficiency design
GARRETT EXPERIENCE	• Specific aerodynamics • High speed electric machines • System integration	• System packaging • High speed electric machines • Boost and Energy Management	• Innovative high efficiency Aerodynamics • High speed electric machines • Air bearing
ARCHITECTURE	• Aerodynamics and motor matched for optimal speed • Sealed for life bearings	• Integrated Turbo & high speed Motor/Generator • Stand alone or Integrated Power Electronics	• Two Stage series compressors • 100% Oil-free foil bearing technology to avoid pollution of fuel cell stack with oil and provide the lowest noise & vibration possible

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Safeguarding connected and autonomous vehicle integrity

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*Integrated Vehicle Health Management

Piloting proprietary solutions with customers around the globe

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Garrett connected vehicle portfolio

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	CYBERSECURITY	OEM SMART DIAGNOSTICS AND PREDICTIVE MAINTENANCE	EARLY WARNING SYSTEM
CUSTOMER OFFERINGS AND BENEFITS	• On-board network **Intrusion Detection and Prevention System (IDPS)** that identifies and protects the vehicle network • Off-board **Security Operations Center (SOC)** that reports and analyze attacks on fleet of vehicles • **Scalable and agnostic** to any vehicle hardware and infrastructure	• **Smart diagnostic** tools ensuring OEMs fast and accurate repairs • On-board **Health Monitoring** and off-board **Predictive Maintenance** that provides early warning before a problem occurs • **Knowledge-management capture** that improves the performance of diagnostic and prognostic tools	• **Aftermarket Predictive Maintenance** system saving costs for engine repairs and unplanned downtimes • **Optimizing maintenance planning** and inventory scheduling reducing missed customer deliveries due to fleet breakdowns

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AFTERMARKET

Strong aftermarket platform with brand equity

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Broad aftermarket product portfolio

ORIGINAL EQUIPMENT / INDEPENDENT AFTERMARKET

- Original supply ensuring emission compliance
- Distributors network

REMANUFACTURE

- Remanufacturing of OE design
- Economic alternative with no trade-off on quality / durability

RED BOOST

- Economic turbo for high growth regions, with good reliability
- Alternative to other Turbo original lines

PERFORMANCE & MOTORSPORTS

- Higher power, with reliability
- 50 years of racing support

#1 in global brand awareness

5,300+ Product References

~100M Garrett Installed Base

5 Global Aftermarket Technical Support Centers

~100 New Product Introduction Launches Planned in 2019

83/100 Garrett IAM Net Promoter Score

160+ Third-Party Distributors Globally

Note: IAM – Independent aftermarket

Broad aftermarket portfolio serving a large installed base globally

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Garrett aftermarket channels

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VEHICLE MANUFACTURERS

Original Turbo

INDEPENDENT AFTERMARKET (IAM)

Complete Range adapted to Vehicle age and Markets

IAM PERFORMANCE & MOTORSPORT

VEHICLE AGE	0-3 years	4-6 years	7-10 years	11-15 years	16-20 years

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Garrett Motorsport technology

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Redefining the limits

CUSTOMISED TECHNICAL OFFERINGS

- **Electric turbos:** Efficiency-optimized turbos combined with hi-speed electric machines for max transient (performance) and energy recuperation (fuel efficiency).
- **DualBoost turbos**: 30% faster transient performance and smaller/lighter packaging with better steady-state performance.
- **High-Temperature VNT™ turbos**: Robust 1050°C VNT turbine for both Diesel and Gasoline engines

Also available:

Ball bearing
High-temperature (MarM-247) turbine wheel materials
High temperature thin-wall (HK30) turbine housing castings

Championship Wins

FORMULA1, LE MANS, WRC….

26	**FIA World Rally Car** 100% since 2002
19	**24 Hours of Le Mans** 100% since 2000
14	**Indianapolis 500**
11	**CART / Champ Car** 67% win rate
10	**American Le Mans Series**
8	**IMSA GTP / GTO**
7	**FIA World Touring Car** 100% since turbo engine rule
7	**Global Rallycross** 100% since series introduced
4	**Super Formula** Turbo engines starting 2014
4	**Super GT** Turbo engines starting 2014
4	**FIA World Rallycross** Inaugural season 2014

Rapid development of hi-tech boosting products

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