

TVS Air Management Technology

San Diego, Nov 7, 2018

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Powering Business Worldwide

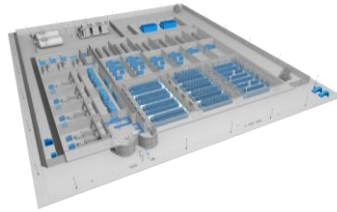
Eaton – a global \$20B+ manufacturer of safe, reliable and efficient power management solutions

Electrical Sector

Products



Systems and Services



2017 Sales: \$12.0B

Providing safe and efficient electrical solutions from generation through distribution and control



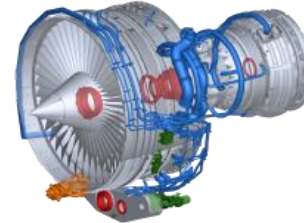
Industrial Sector

Hydraulics



Solutions for the world's most demanding power needs

Aerospace



2017 Sales: \$7.5B

Mission critical, safe, and reliable solutions

Vehicle



Leader in fuel economy and emissions reduction

Vehicle Group Products

Engine Air Management

Light Vehicle

Valves 	Valve Actuation 	Cylinder Deactivation 	Variable Valve Lift 	Valvetrain Carriers 	Direct injection pump actuation 	Supercharging
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Heavy Duty Diesel

HD Valve and Hydraulic Lash Adjustment 	Decompression engine braking 	HD Diesel Variable Valve Actuation 	Advanced Combustion 	Cylinder Deactivation
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Powertrain

Transmissions	Clutches	Torque Control
Heavy Duty (Endurant) 		Detroit Truetrac®
Medium Duty (Precision) 		IntelliTrac™
Medium Duty & Light Duty 		ELocker® ELocker4™

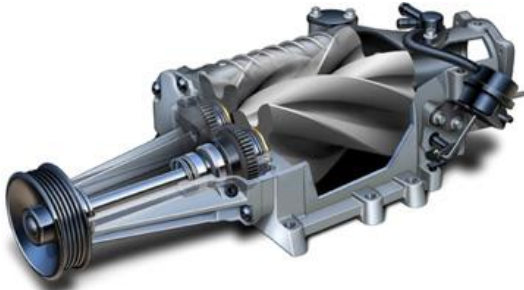
eMobility



Conversion	Distribution / protection	Hybrid systems
DC/DC converter 	EV fuse 	Power export
Inverters 	EV chargers 	Parallel HEV
Ultra Capacitors 	High voltage distribution 	48V mild HEV
		2-sp EV drive

From Supercharge to TVS® Air Management

Driven by simultaneous low NOx and low CO2



- Fresh air
- Ambient air intake pressure
- Pressure ratio: 1:2 – 1:3
- Peak efficiency at pressure ratio ~2
- Engine crank-driven
- Typical speed: 8,000 – 20,000 rpm

Boost

Fuel Cell Air

HCCI/GCI

EGR pump

Scavenging

- Up to 100% EGR
- Exhaust manifold intake pressure
- Pressure ratio: 1:1 – 1:1.5
- Peak efficiency at pressure ratio ~1
- Electrical motor for precise flow control
- Typical speed: 3,000 – 9,000 rpm
- Low inertia



Powering Business Worldwide

TVS® EGR pump

Roots-based positive displacement... but not a supercharger

48v Motor
& controller

Engine oil inlet

EGR outlet

Coolant
connections

Communications

48v power

EGR inlet

Oil drains

EATON

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