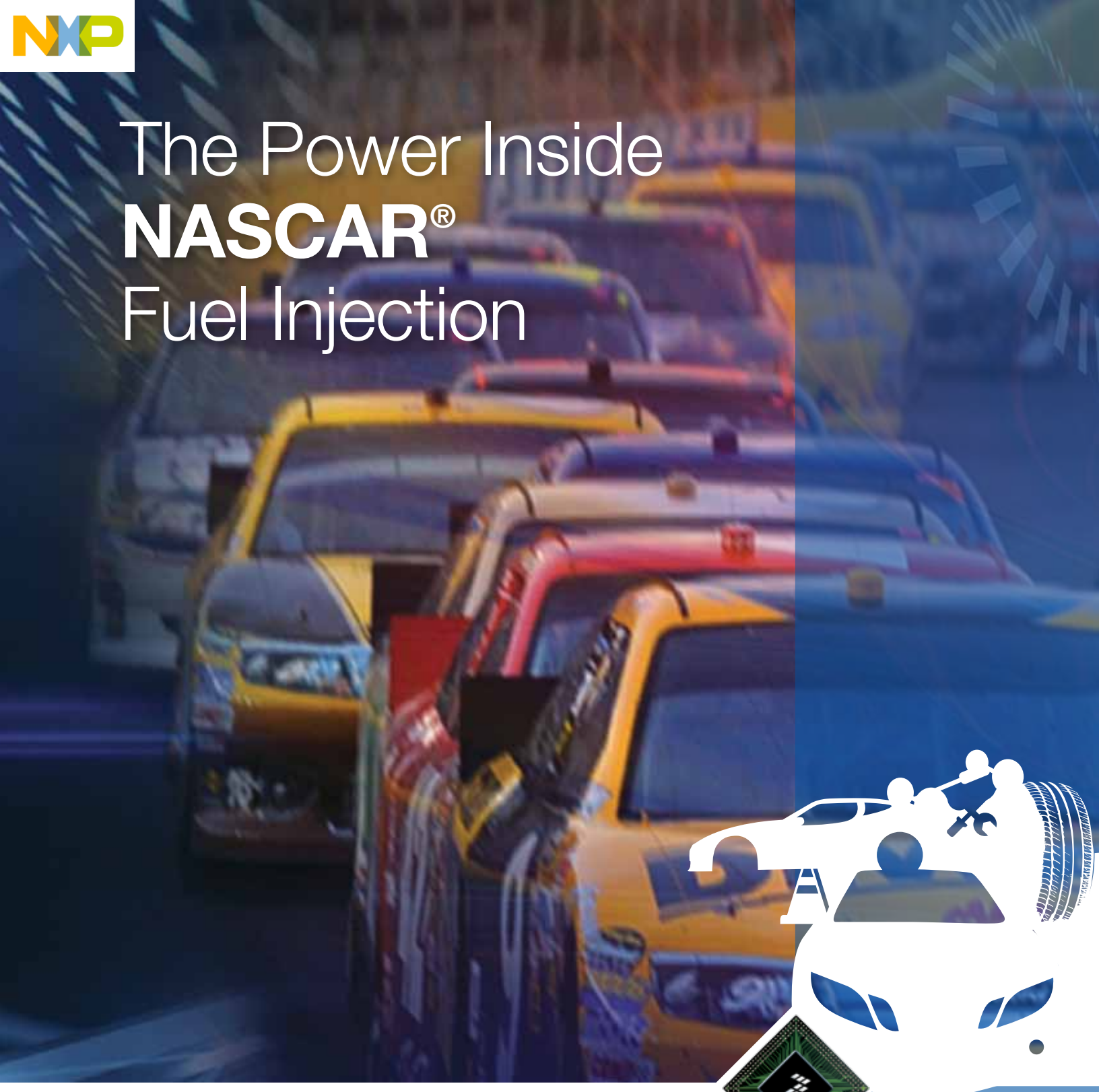
The Power Inside NASCAR® Fuel Injection



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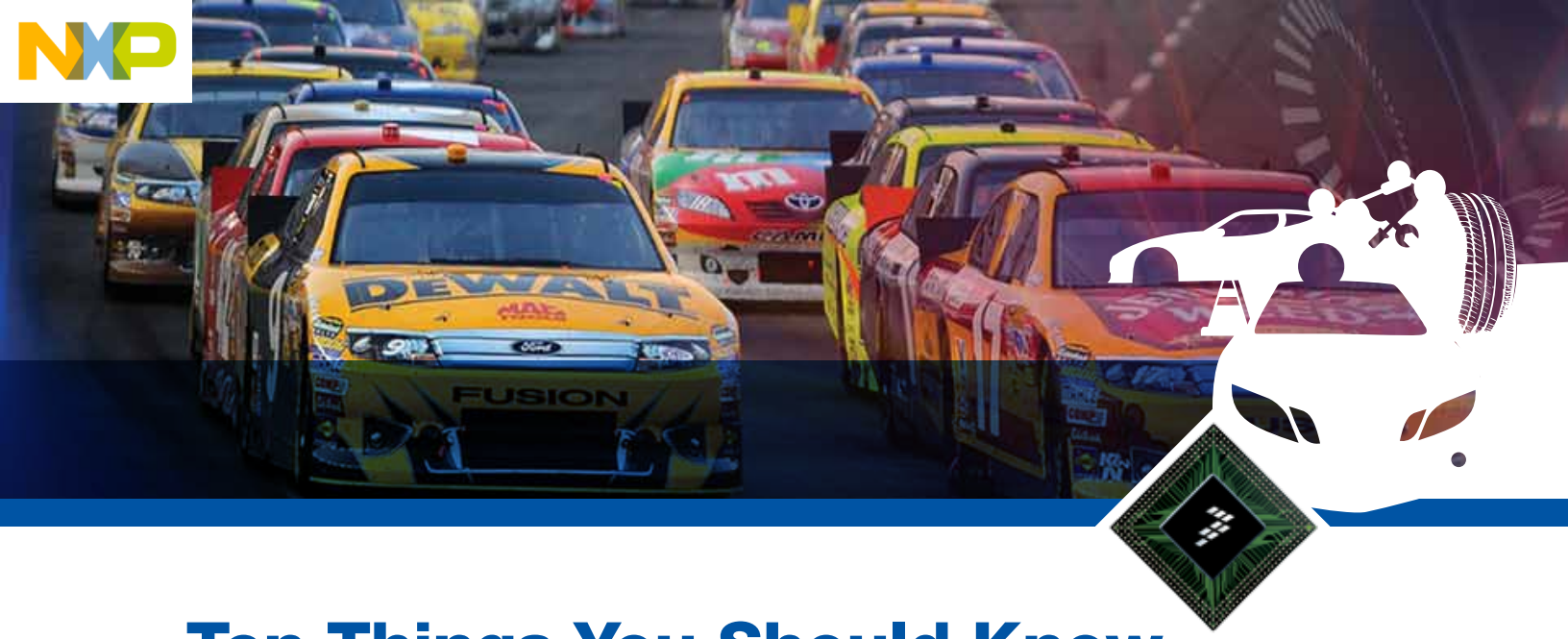

Ten Things You Should Know about NASCAR Fuel Injection

1. **Freescale is a global technology company with a long history in automotive electronics**—the first fuel injection system (1980 Cadillac Eldorado) was built with Freescale technology
2. **McLaren's engine control unit (ECU) is a proven product**, based on the system that has run the Indy Racing League since 2007
3. Fuel injection increases fuel efficiency and **reduces harmful emissions** while maintaining performance
4. In general, we may see the **largest improvements in fuel mileage** at tracks where there are abrupt transitions between full throttle and full braking
5. **The ECU is designed to be completely secure** and any modification is traceable and detectable
6. Restrictor plates operate the same way in fuel-injected engines as they do with carburetors—they **reduce the airflow which reduces fuel into the engine**
7. **NASCAR® will continue to use restrictor plates** for races held at superspeedways in Talladega and Daytona
8. In general, a fuel-injected system is **easier to manage and maintain** than a carbureted system
9. The electronics that go into the ECU are the same as those running most passenger cars—**the technology that brings you to the track gets NASCAR drivers around the track**
10. EFI is a key step in putting the **"stock" back in the stock car**

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Fuel Injection Basics

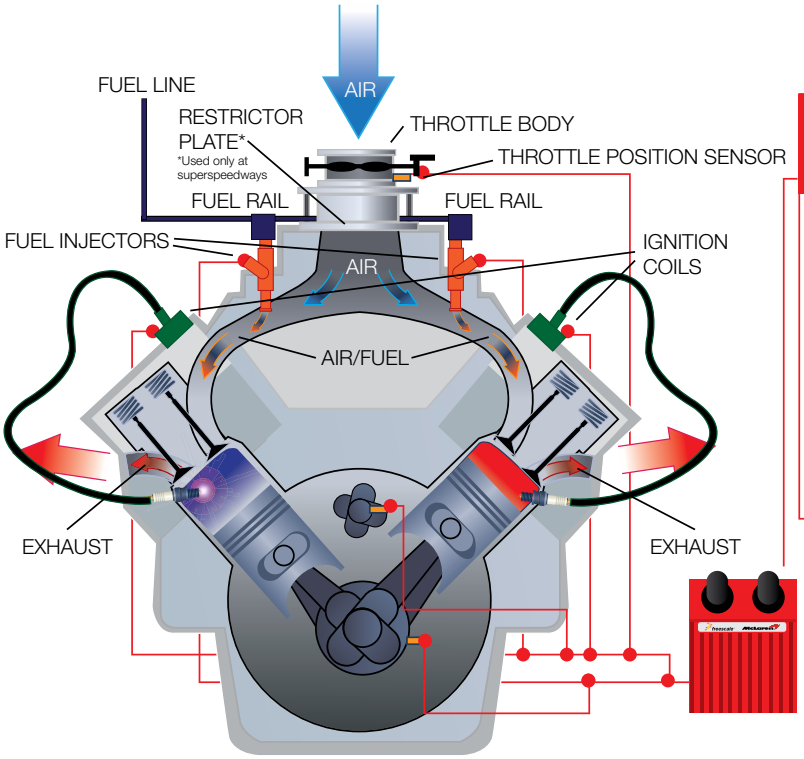
In an **internal combustion engine**, air flow is key. The amount of air pumped through the engine dictates how much fuel can be burned and, therefore, how much torque and power can be delivered.

The **carburetor** is a mechanical assembly that takes advantage of the suction created by the air flow to draw fuel into the manifold and combustion chambers. Different parts of the system help determine how much fuel enters the engine, such as the throttle plate, jets and other components.

These components are set up to provide the **optimum air-to-fuel ratio**—and by extension, the best combustion and fuel efficiency—in a very narrow part of the engine's power curve. Mechanical forces (as the car rounds the track), temperature, humidity and numerous other factors affect the delivery of fuel within a carbureted engine.

In a fuel-injected engine, the **ECU** is essentially an advanced computer that monitors precisely how much air is entering the engine through the throttle, the position of all the pistons and other factors that affect combustion.

Fuel-Injected Engine



NASCAR Sprint Cup Series™ Engine with Freescale/McLaren Engine Control Unit (ECU)

Receives information from crankshaft sensor, cam sensor, throttle position sensor, oxygen sensors, temperature sensors and pressure sensors. All determine how much fuel to inject into the engine and when to fire the spark plugs. This achieves the most horsepower with the least amount of fuel.

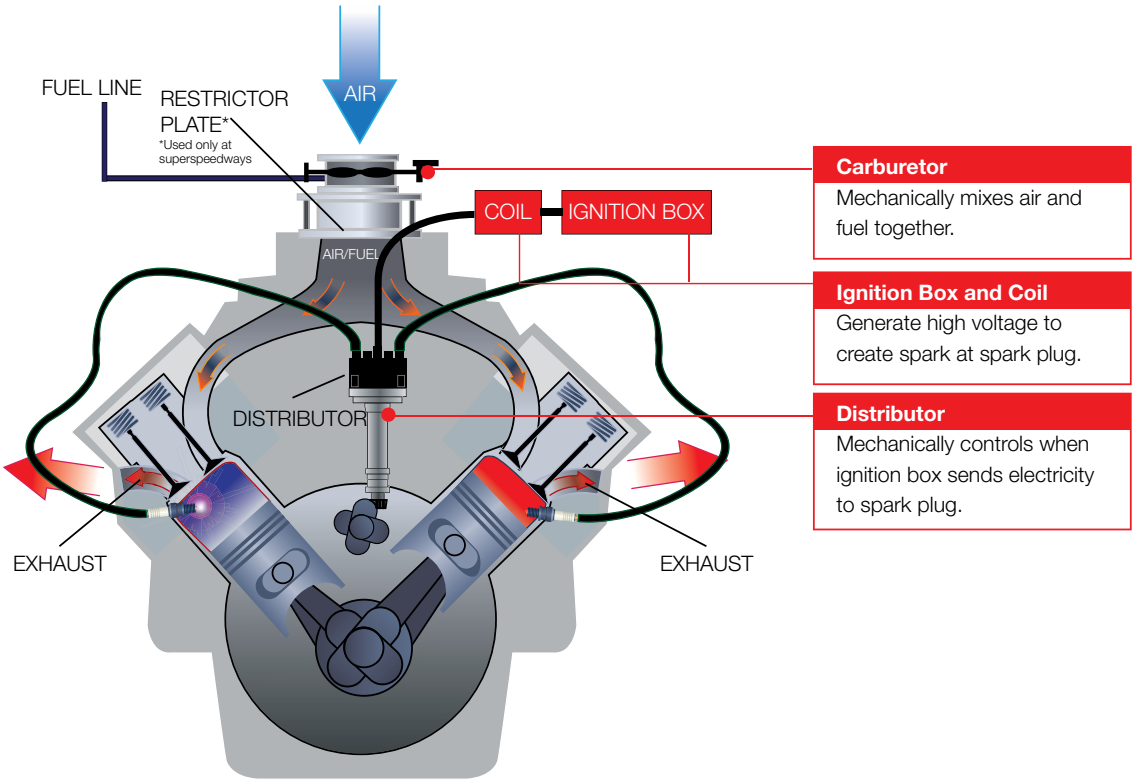
The ECU calculates how much fuel to deliver to the engine under all operating conditions.

Fuel injectors, located in the manifold above each cylinder, are valves in the pressurized fuel system that open to squirt a precise amount of fuel into the manifold. The fuel injection system allows the engine to automatically adapt to varying conditions, providing far more efficient fuel delivery and optimal power and torque.

At the heart of the NASCAR Sprint Cup Series™ race car ECU is a **Freescale microprocessor**. One thousand times a second, the processor gathers data from the sensors on the engine and calculates exactly how much fuel is needed, when it should be injected into the manifold and when the air/fuel mixture needs to be ignited. This important Freescale technology delivers a critical balance of speed, power and reliability.

All in all, a fuel-injected engine leads to **improved fuel consumption, reduced emissions and better driveability**. It also decreases the amount of time spent refueling during a race and provides for a smoother and more consistent running of the engine.

Carbureted Engine



About Freescale Semiconductor

Freescale Semiconductor is a global leader in embedded processing solutions for the automotive, consumer, industrial and networking markets.

Formerly part of Motorola, **our innovation and product leadership span more than 50 years**. We employ more than 19,000 people in more than 20 countries around the world. Freescale's 2010 revenues were $4.46 billion USD.

Freescale develops embedded processing solutions that enable:

- Automotive safety
- Hybrid and all-electric vehicles
- Next-generation wireless infrastructure
- Smart energy (lowest cost, lowest environmental impact)
- Portable medical devices
- Home appliances
- Smart mobile devices

Freescale has shipped **more than 18 billion** embedded devices.

If you've driven a car, used the Internet, talked on a cell phone, read an eBook or used a home washing machine, chances are good that you've used Freescale technology to do it.

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Leaders in Automotive

Freescale is a leading supplier of embedded processors for the global automotive industry and is a leader in the development of technologies and standards critical to making cars safer, more fuel-efficient and environmentally friendly.

In today's high-end vehicles, there are more than 80 MPUs and MCUs used to enable:

- Engine management
- Body electronics
- Chassis control
- Driver safety
- Driver information and entertainment systems

Estimates place Freescale technology in 50 million new vehicles in 2010.*

Freescale shipped more than 300 million auto MCUs in 2010 and has shipped a total of 4 billion since 1996.

Driven by the need to comply with vehicle safety regulations, automotive electronics represent a significant percentage of automotive market innovation.

Freescale's automotive focus is driven by a "Mission Zero" philosophy: **zero defects, zero emissions, zero fatalities.**

The Official Automotive Semiconductor of NASCAR

Freescale is providing the embedded processing technology behind the NASCAR Sprint Cup Series switch to fuel injection in 2012.

In February 2011, Freescale was named The Official Automotive Semiconductor of NASCAR.

Freescale is an Official Technology Partner to McLaren Electronics.

*Freescale Semiconductor estimate, Analyst Day, March 10, 2011

Freescale has delivered high-performance MCU solutions to McLaren Electronics and other manufacturers for more than 10 years.

McLaren Electronic Systems designs the ECU for Formula 1 and the NASCAR Sprint Cup Series using the processing power provided by Freescale technology.

Key Milestones

1955

A Motorola germanium transistor for car radios was the world's first commercial high-power transistor.

1961

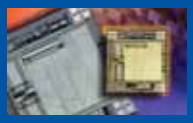
Motorola develops cost-effective techniques to produce the silicon rectifiers used in alternators.

1979

Motorola and its automotive customers developed the world's first MPU based engine control, the EEC III module.

1990

General Motors® chose Freescale's SMARTMOS technology to create the first automotive smart power IC with an integrated MOSFET for its motor-controlled anti-lock brake system.



1996

Addressing automotive safety issues, Motorola was one of few suppliers to deliver the first micro-electro mechanical systems (MEMS) inertial sensors for automotive airbags.

2003

The first pressure sensor to address the U.S. TREAD act requirement for tire pressure monitoring is released by Freescale.

2008

Freescale debuts one of the world's most powerful automotive MCUs for efficient engine design, the 32-bit MCU based on Power Architecture® technology.

2010

Freescale is a leading supplier of semiconductors for the global automotive industry, and 70 percent of all wireless phone calls pass through Freescale silicon.

Freescale Partners in Motorsports

About McLaren Electronics

McLaren Electronic Systems makes electronic control systems for motorsport. McLaren has been supplying control and data acquisition systems to the motorsport industry for over 20 years, selling to teams and engine makers in Formula One, World Rally Car, IRL, MotoGP, NASCAR, Le Mans and other professional motorsport categories.

The Official Engine Control Unit of NASCAR®

The heart of the NASCAR fuel injection system is the engine control unit (ECU), specifically the TAG400N, developed to control eight-cylinder race engines. A version of this same ECU has been in use by the Indy Racing League (IRL) since 2007.

The TAG-400N provides the following key functions:

- Control of a V8 normally aspirated engine—fueling and ignition over full engine operating range
- Absolute security against illegal software or tampering using "box-locking" methods developed and fine-tuned for over 15 years in Formula 1
- Secure NASCAR application inside the unit for enhanced analysis and performance monitoring
- On-board data logging of prescribed primary parameters for NASCAR
- Team data logging when permitted by NASCAR

The specific ECU used in NASCAR features LED tell-tales to confirm correct operation and to flag faults detected by the on-board diagnostics in the unit.

McLaren is the Official Engine Control Unit of NASCAR.

McLaren ELECTRONIC SYSTEMS

About Roush Yates

Roush Yates Engines designs, engineers and crafts high-performance racing engines with the power to perform and the horsepower and durability you'd expect from legendary NASCAR pioneers Jack Roush and Robert Yates.

Doug Yates, CEO of Roush Yates, leads a staff of nearly 200 engineers and specialty technicians who design, assemble, test and service racing engines at four separate state-of-the art facilities located in Mooresville, North Carolina. These facilities include Roush Yates Engines (for NASCAR racing), Roush Yates Performance Engine Group (for grassroots racing), Roush Yates Manufacturing Solutions and Roush Yates Performance Products—a new 50,000 square foot retail performance center.

ROUSHYATES

Fuel Injection and NASCAR

Since its inception in 1949, NASCAR has relied upon the simple mechanics of carburetors to ensure a competitive playing field for all NASCAR drivers and their teams. The change ushers in a new era of improved fuel efficiency and reduced emissions while narrowing the gap between stock car and mass-production street vehicle.

Glossary of Key Terms

Electronic Fuel Injection—Manages the flow of air and fuel into engine cylinders, significantly reducing burn of excess fuel.

Engine Control Unit (ECU)—A type of electronic control unit that determines the amount of fuel, ignition timing and other parameters an internal combustion engine needs to keep running.

Microcontroller (MCU)—Like a brain, similar to a personal computer but with some very specific dedicated real-time critical functions, most notably, tracking the position of all the pistons, valves and gears within the engine and gearbox to obtain maximum performance from both.

Microprocessor (MPU)—A device that accepts digital information and processes it into results that other components of a system can use to provide digital control of a myriad of objects, from appliances to automobiles to cellular phones and industrial process control.

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