

# Ethanol

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## QUALITY



## INDY'S SUPER FUEL

Since 2006, Indy Racing League competitors have been using ethanol to fuel their hopes for a checkered flag. Making sure that quality is never sacrificed in the process is the job of PerkinElmer Inc. EPM goes to the Milwaukee Mile to experience the power of Indy racing and to see firsthand what goes into testing the fuel for this high-octane environment.

Story and Photos By Craig A. Johnson

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Screeching around the track at more than 160 miles per hour, an Indy racing car skims a razor's edge between success and chaos. For the 50,000 fans in the grandstands, ear protection is not an option, but a necessity. At the Milwaukee Mile, a "small oval" by Indy standards, 27 race teams converged recently to risk their reputations for a chance at victory.

The last Saturday in May is qualifying day and crowds swarm pit road eager to catch a glimpse of their favorite driver. Some of the biggest names in racing are here. Favorites such as Marco Andretti and A.J. Foyt converse with newer stars like Danica Patrick, Tony Kanaan and Helio Castroneves, who appeared on ABC television's "Dancing with the Stars" and won.

Fans are understandably excited by the approachability of these icons. And the cars are no less famous. They are as sleek and muscular as jungle cats. Nothing on these vehicles is overlooked as every ounce of material supports the dual emphases of safety and speed.

Tolerances in Indy racing are incredibly thin, a function of the environment they inhabit. In the five closest Indy Racing League races, the combined margin of victory was .0275 seconds. That's about one-fifth of the time it takes to blink once. Each piston travels more than a mile up and down in its cylinder each minute. The wind force put on the car at top speed would allow the cars to race upside down. It is to this dance that ethanol was invited.

### A Brief History of Racing Fuel

In 2005, the IRL used 100 percent methanol in their tanks. The fuel worked well and was more efficient than straight gasoline, but IRL officials believed there was room for improvement. In 2006, they moved to a 10



An Indy Racing League official fills a tank with racing-grade ethanol.

percent blend of ethanol and methanol, which was then changed to 100 percent ethanol for the 2007 season.

The desire to use only ethanol aside, 100 percent ethanol is nearly impossible to obtain, and is illegal to keep without paying hefty taxes that date back to prohibition. The actual fuel used by the IRL is a blend of about 98 percent ethanol and 2 percent denaturant. The exact composition includes a small amount of high-octane racing fuel. The fuel for today's Indy cars has an octane rating of 113, compared

with methanol's 107. This means a significant reduction in pre-ignition, or knocking and pinging.

In addition, many of the people who handle the fuel, say it smells like tequila. This quality may seem insignificant, but smell is actually one of ethanol's benefits when compared with methanol. Pit crews noticed the switch to ethanol immediately, reporting fewer coughing fits and less eye irritation before any other modifications were made to accommodate it.

According to Dennis Vervynck, manager

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Ryan Hunter-Reay's crew rolls the ethanol car in to be tested.

of hospitality services and an IRL official, in 2006, the first year the IRL began using ethanol, teams saw a reduction in efficiency of about 10 percent. "That's because we put straight ethanol into the tanks," he says. "The teams initially didn't make any—or very many—adjustments to their engines. After a few months, they kept tweaking and by the end of the season they were back up to 100 percent efficiency."

Vervynckt points out that there was a minor loss of power. "When they first started using ethanol, teams saw a slight drop in horsepower," he says. "As the teams got used to the fuel, they were able to get more horsepower from ethanol once they again reached maximum efficiency."

The switch to ethanol also allowed the racers to carry less fuel and make fewer pit stops, thereby increasing efficiency even more. "When the cars ran on methanol tanks had to hold 30 gallons to accommodate the fuel

requirements of the cars," Vervynckt says. "After getting the engines to perform at their full potential, there was a significant gain in mileage. Indy cars now have 22-gallon tanks. When a driver pulls in to change out his tires, he can fill up. Teams were able to match their tire and fuel stops exactly, instead of stopping for tires only, or fuel only."

That efficiency translates into much less fuel being used by the sport. Lifeline Foods LLC, which supplies fuel for the IRL, will produce 120,000 gallons of ethanol for the 2008 season. And though this may seem like a lot, it's 20,000 gallons less than was used the previous seasons.

The switch from methanol-based fuel to ethanol has amazed almost everyone in the league. Drivers, the direct users of the fuel, voice their approval in glowing terms. "[Ethanol] is an American fuel that is good for the country and the environment," says Ryan Hunter-Reay, of Rahal Letterman Racing and

driver of the ethanol car. Standing beside his crew as they make last-minute adjustments to the car, he is more than happy to discuss the benefits of the IRL's switch to ethanol. "It's been great for Indy racing—the fuel economy, emissions—there's nothing we don't like. We love it."

### PerkinElmer's Testing Procedure

During Saturday's qualifying round cars must make a date with IRL race official Kevin "Rocket" Blanch. All day teams roll their cars from their setup areas in the infield to the testing center for inspection.

The cars come in order—no exceptions. As teams push them toward the testing area, Blanch makes sure they know who's in charge. "Go! Go! Go!" he yells to a team that's taking a little too long to get their front wing set before rolling underneath the white awning that's popping in the strong wind off Lake Michigan.

Outside the tent, two men in red shirts dash from car to car taking small samples of fuel. Gerry Kennedy, a senior customer support engineer for PerkinElmer Inc., handles a syringe with a long tube. After taking a bit of fuel, he turns to PerkinElmer field service engineer Saleh Abdeljalil, who stands ready with a small sample jar. Abdeljalil makes a note of the sample number and then places it, in order, in a piece of wood that holds the sample jars. As Abdeljalil finishes, Kennedy is already headed for the next car.

Fuel testing takes place before and after qualifying. "We test the fuel from the main tanker truck and then from all the cars," Kennedy says. "After the qualifying round, the top five teams will have to come back and we'll do a follow-up test."

Of course, stiff penalties await any team that might attempt to cheat, but the idea might

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Blanch, center, keeps the testing area running smoothly.

be more apocryphal than realistic. “There’s not much they can put in the tank that would give them an advantage,” Abdeljalil says. Still, the fuel needs to be checked, and if a sample deviates too much from the mean, further testing will be done.

PerkinElmer partnered with the IRL in 1996 to begin testing fuel for the league using gas chromatography. Before then IRL fuel was tested using ultraviolet-visible spectroscopy (UV-VIS). Analyzing the absorption of light passing through the sample, UV-VIS is a fairly easy test to perform. The test is accurate to a point, but gas chromatography is preferred for its ability to identify the actual composition of the elements and particles present in the sample. A UV-VIS test can tell if fuel has impurities in it, but it can’t necessarily tell what all of those impurities are. Conversely, a gas chromatograph can tell exactly what impurities are

in the fuel based on their chemical signature.

After the cars are through the checkpoint and given the green light to qualify, they are rolled to pit road for any last-minute preparations before the drivers arrive. The samples taken by Kennedy and Abdeljalil are brought inside the IRL station and tested using PerkinElmer’s gas chromatograph (GC). As the qualifying round commences, most Indy officials begin to turn their attention to the television screens. Everyone is a race fan whether they are directly involved with the IRL or the racers, or not.

In the meantime, PerkinElmer’s scientists still have a job to do making sure each of the 27 samples is accounted for and will be checked accurately. Abdeljalil and Kennedy are oblivious to the cars still audible zooming around the track.

“Samples go into the GC unit and are

heated,” Kennedy says. “They start at about 45 degrees Celsius (113 degrees Fahrenheit), increasing by 20 degrees each minute up to about 160 degrees C (320 degrees F). Each sample takes five to seven minutes, so once we start the samples will take a few hours to process.”

The next day, when all the samples have been processed, and assuming all comes out well for the teams, Kennedy and Abdeljalil will only need to test the top five finishers. “The only problem is that sometimes they forget to bring their car by so we can test it,” Kennedy says. “That means we may have to track them down quick and get the sample.” Because the fuel is pumped out of the cars before they travel, the sense of urgency is real. “There have been a few times I’ve had to stick my arm way down in the tank just to feel for any moisture whatsoever,” Kennedy says. “Luckily we don’t need much for the GC.”

## Ethanol in Indy’s Future

PerkinElmer is one of many players who make the IRL the powerhouse it is in American racing. From the technologically advanced tires that Firestone produces for the league, to the engines—all identical from the factory and leased by Honda—Indy racing brings a powerful image to anyone affiliated with the sport.

The fact that the IRL switched to ethanol should signal to observers that league officials spent a lot of time and energy making sure they were getting the best fuel available. Their ringing endorsement is an indication that they plan to continue the relationship for a long time to come. **EP**

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