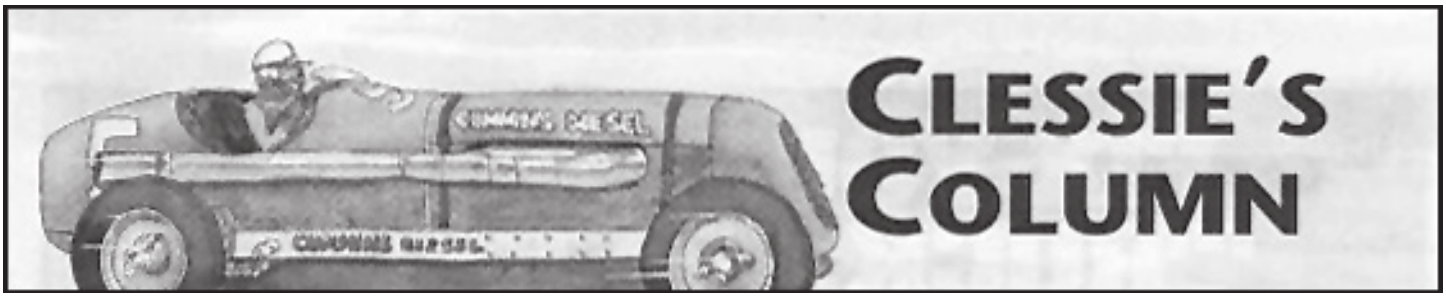

Cummins History

CUMMINS RACE CARS AT THE INDIANAPOLIS 500
(Parts Two and Three)

As we prepare for this year's TDR Rally (see pages 110-111), I have had the great fortune to meet a handful of Cummins employees that are volunteering their time to capture many of the engines and vehicles that were a part of Mr. Cummins' and the Cummins Engine Company's formative years.

In the previous issue of the magazine I used several passages from Mr. Clessie Cummins' book, "My Days with the Diesel" (published in 1967, used copies sell for about $100 on Amazon and eBay) to tell about Mr. Cummins' Barnum and Bailey days when he sought publicity and market acceptance for his diesel engine. The previous story Mr. Cummins told was about a Cummins diesel-powered race car driven in the 1931 Indianapolis 500 race.

The 1931 Cummins Race Car.

As a recap, Mr. Cummins completes the chapter in his book with a quote from the Indianapolis News: "The Cummins Diesel, with Dave Evans driving, covered itself with glory by slipping around the track without apparent effort and finishing 13th with the good average of 86.17 miles per hour. Indianapolis had the honor of having the first diesel in a race on any track in the world, and the Cummins Engine Company of Columbus, Indiana, not only got a lot of engineering data, but it demonstrated that it knew what it was talking about when Clessie Cummins decided he could turn what had been considered a stationary power plant and a marine power plant into an automotive racing engine."

Unlike today where the rule books for racing dictate that the cars are very similar in nature, back in the 1930s there was some flexibility. For the 1931 race, Clessie Cummins had asked his friend, Eddie Rickenbacker (general manager of the Speedway and head of the contest board), for leeway in allowing his diesel to race. Think of the diesel as it was, new and pioneering technology of the day.

Cummins at the Indy 500 – Part Two

As a part of developing his diesel engine for use in commerce, Mr. Cummins was convinced that the four-stroke engine cycle was a better design than the two-stroke. Nonetheless, intrigued by the simplicity of the two-stroke and challenged by others at the Cummins Engine Company, he needed a validation test. That test would be the 1934 Indianapolis 500.

From his book, let's go to Chapter 21, "Indianapolis Settles a Question" and I'll let Mr. Cummins tell the story:

"Between 1924 and 1928, our engineering department had turned out some twenty experimental designs of two-cycle engines. This two-cycle experimentation was brought on chiefly by the valve troubles developed in the four-cycle engines because of inferior valve materials. By 1928, however, suitable valve material had been developed. I was almost positive, by this time, that the four-cycle design would be our standard, now that the valve problem appeared licked.

"My spare moments (hard, indeed, to come by) continued to be occupied with research. By early spring of 1934, our engineering department had built up considerable pressure on me to give the two-cycle engine a try. I must admit, in defense of its proponents, that the two-cycle principle was intriguing because of its apparent simplicity. That word 'apparent' should be stressed, however.

"To settle the question permanently, we decided to take one more whirl at the two-cycle engine. Furthermore, I announced, we would test the two-cycle and four-cycle engines side-by-side under common operating conditions. The easiest method for accomplishing this, I decided, would be to enter two identical race cars in the 1934 Memorial Day Race at Indianapolis. The cars would be identical in every detail, with the exception that one would be powered by a four-cycle engine while the other would have a two-cycle engine.

To settle the question permanently, we decided to take one more whirl at the two-cycle engine.

"We again chose Duesenberg-designed chassis for our two entries in the 1934 race. Both cars were identical in every detail—frames, bodies, axles, gears, etc. The car with the two-cycle engine carried a Number 5, while the four-cycle engine went into car Number 6.

The #5 car was at the 2019 Amelia Island Concours event.

Cummins' Bruce Watson (his back to us in the photograph) tells Johnny Rutherford (three-time Indy 500 winner) that the car was one of four that actually drove onto the field for judging.

"From the very opening of the race, Number 5, two-stroke car, had a rough time. Evidently an unusual vibration frequency was set up by the two-cycle engine. Not many miles were run before Number 5 had to make a pit stop. The exhaust pipe, mounted on the same kind of brackets which had gone through the 1931 race with no difficulty, had shaken loose. We managed to make temporary repairs. Shortly after returning to the track, the car encountered more trouble. A hose connection broke at the radiator and most of the water was lost. The two-cycle engine sounded as if it would come apart at any moment.

"Meanwhile, the Number 6, the four-cycle car, was rolling smoothly. Passing the 270-mile mark, he pulled in for his first pit stop—to fill the fuel tank for the laps remaining. In leaving the pit and moving back onto the track the driver managed to strip the gears.

The #6 car now resides at Cummins' Historic Research Center.

"Our four-cycle car was out of the race through no fault of the engine.

"In spite of a bad clutch and an engine that sounded like a bucket of bolts, the Number 5 car finished the 500 miles in twelfth place. After steering the Number 5 car into the track garage area, the driver stopped the engine. It never turned over again. The parts had almost fused together.

"Back at the factory in Columbus, we tore down both engines, removed and weighed the carbon deposits, and carefully examined each part for wear. The four-cycle engine was barely 'broken in.' But the other engine was in pitiful shape. We all agreed to abandon two-cycle research. Thus ended the 'two-beat chant' in our plant.

"The move to concentrate on the four-cycle type had a fundamental basis and was the correct decision, I believe. I saw that it would be impossible to develop a good two-cycle design and simultaneously perfect our fuel injection system. Our limited facilities wouldn't permit it. So work halted on the two-cycle engine.

"Certainly one cannot ride behind a big locomotive powered by the two-cycle GM diesel engines and say 'the two-cycle won't work.' But how many engine manufacturers have General Motors Corporation's vast resources for research? With only an exception or two, therefore, two-cycle design has lagged behind the four."

Editor's note: GM's Detroit Diesel division was sold to Roger Penske in 1988. Subsequently, Penske sold the engine company Daimler Trucks North America in 2000. Regardless, the Detroit Diesel two-stroke design could not meet the emissions legislation implemented in 1999 (perhaps sooner, 1991?) and is no longer manufactured for on-highway use.

Cummins at the Indy 500 – Part Three

As I read Mr. Cummins' book I am fascinated by his stories. With the conclusion of his 1934 Indianapolis 500 story I realize that I'm getting close to the end of the book (page 164 out of 190). In the final 26 pages Mr. Cummins tells the audience, "Engine sales continued to rise steadily. In 1937, after 18 years in existence the Cummins Engine Company operated with black ink on the books."

From the timeline that I drew from reading Mr. Cummins' "My Days with the Diesel" and the book by his son Lyle, "The Diesel Odyssey of Clessie Cummins," the senior Cummins was 50 years of age in 1938. Manufacturing expansion at Cummins caused the need for additional capital, more than what could be supplied by Mr. Cummins' original banking partner, the Irwin Bank of Columbus, Indiana.

It was a difficult time for Mr. Cummins. The titles of the final two chapters in his book foreshadow his final departure as Honorary Chairman in 1957, "The Partnership Ends" and "I Cut the Cord."

How is that for suspense?

In the next issue of the magazine I'll try to wrap-up the final chapters of Mr. Cummins' story with the Cummins Engine Company.

For now, let's focus on two more Cummins-powered diesel race cars that competed in the 1950 and 1952 Indianapolis 500 events.

The 1950 Cummins Race Car #61

In 1950 Cummins Engine Company had another entry in the 500-mile race, a Kurtis chassis with a Cummins supercharged model JS600 engine, a 6-cylinder with 6.6-liters of displacement.

The 1950 race was a big event at Indianapolis as the race was one of seven races in a "World Championship" format.

There were 31 cars that did not qualify, so making the cut as one of the top 33 was a feat in itself. The Cummins car started in position 32.

The #61 car completed 52 laps and finished 29th. The supercharger failed.

But, the folks at Cummins Engine Company had just started.

1950 Cummins race car #61.

The 1952 Cummins Race Car #28

The #28 Cummins indy car.

In my zeal to provide a coverage of Cummins' historic race car, #28, I spent hours at different websites, talking with Cummins historians, reviewing the Cummins DVD "Cummins Special #28" (bulletin 4971180) and reviewing Cummins history at Cummins' 100th Anniversary website "1919-2019 Challenge the Impossible," www.cummins.com/timeline.

Researching the history of the #28 car was a fun and entertaining endeavor.

Previously, I mentioned that Cummins Engine Company finally saw a profit in 1938, almost 20 years after it was incorporated. Now we are in the post-war 1950s and Cummins would reach another milestone in 1955—51% of the commercial diesel trucks operating on US highways were Cummins powered.

An advertisement from the day talks about a "White-Freightliner powered by a 175hp Cummins JT6 *Turbo* Diesel. The emphasis on turbo is intentional. Read on.

To understand, let's look back to the 1952 Indianapolis 500 and prototype testing of the turbocharger.

Wait, wait, turbochargers were nothing new. After all, TDR Issue 50, November 2005 (pages 58-60), had a three page write-up that discussed the 100 year anniversary of the patent for the first turbocharger developed in 1905 by Dr. Alfred Buechi, chief engineer at Sulzer Brothers Research and Development, Winterhur, Switzerland. Our own Kevin Cameron gave us a turbocharger (and gas turbine) history lesson back in our Issue 42 magazine. Therein, Cameron describes the metallurgical challenges of building turbocharger wheels to withstand high operating temperatures. Paraphrasing from Cameron: research to build the fighter planes of World War II paved the way for the turbochargers to be used in diesel applications. (Research to build fighter planes also led to the development of turbojet aircraft engines—by 1957 all Boeing 707 aircraft were jet-powered.)

At the end of his "Exhaust Note" column Cameron noted, "Almost as a footnote to all this, the resulting fall in the price of high performance refractory metals made reliable truck engine turbocharging common at last."

Now, back to the story: It is still 1952 and Cummins has yet to perfect the turbocharger concept. Researching "diesel turbocharger history" I learned that the European truck/diesel maker MAN introduced a turbocharged diesel engine in a truck in 1951, but it was not put into production. Finally, in 1954 turbocharged diesel-engine trucks were introduced in Europe by MAN and Volvo.

Interestingly, in my research I noted that turbocharged diesel-engine development took two paths: Caterpillar was experimenting with turbos and turned to J.C. "Cliff" Garrett in Los Angeles to help them develop their turbo diesel engines. (Garrett Automotive is now a division of Honeywell.) Cummins turned to Elliott and Schwitzer (Schwitzer of nearby Indianapolis, Indiana) to help them perfect the technology. The first commercial Cummins engines outfitted with the Schwitzer turbochargers were the 1954 products offered by Cummins in their VT12, NT, NTR and JT diesel engines.

(Now, here is another business link for you: the Holset/Cummins Turbo Technologies website tells us "in the late 60s a close licensee agreement between Holset and Schwitzer was formed, Holset would design and manufacture turbochargers for the European market where Schwitzer did not have manufacturing facilities." Today, Schwitzer is a division of Borg Warner, Holset is a division of Cummins Inc.)

So, in 1952 there was quite a bit of turbocharger engineering and testing going on with the Cummins #28 race car.

So, in 1952 there was quite a bit of turbocharger engineering and testing going on with the Cummins #28 race car.

As I think about the history and significance of this diesel engine at the Indianapolis 500, I recall another time at Indianapolis where a unique technology was allowed to compete: the turbine-powered cars of the late 1960's. Who can forget those years of creativity and excitement at the Speedway?

The #20 was one of three STP-sponsored turbine cars that competed in the 1968 Indianapolis 500. This car was on display at the Indianapolis Motor Speedway Museum.

After success in the 1967 and 1968 races at Indianapolis, the rule book was changed and the turbine-powered cars disappeared. This photograph was taken at the 2019 Amelia Island Concours event.

Sorry, I digress.

Back to the Story – A Look at the 1952 Race

As I researched the Cummins #28, I discovered an article by David Kennedy, Diesel Power, that was exemplary in telling the story.

Here are several passages from Diesel Power, August 2008:

"To prove its point, Cummins set out to build a 6.6-liter turbocharged race engine with an aluminum block, head, and magnesium crankcase. Renowned chassis builder Frank Kurtis of Glendale, California, built the car. At Kurtis' recommendation, Fred Agabashian was hired to drive. That spring, the Modesto-born (California) driver and the Cummins team tested in a wind tunnel in Wichita, Kansas, and then at the Indianapolis Speedway. The car was powerful, and not just qualify-and-get-in-the-race powerful, either. Fred and Cummins knew that almost immediately. 'We've got a rocket ship here,' Fred was reported to have said. That was the good news. But at the same time, it was not the kind of news that would make many outside Cummins' hometown particularly happy. For weeks, only those closest to Fred knew what the car was really capable of. Cummins made sure of that."

"The rules for the race allowed for a diesel engine as large as 6.6 liters, compared with a 3-liter limit for supercharged gasoline engines. The Cummins JT-600 was heavy compared to the smaller gas engines, and that was thought to be a built-in handicap. On race day, the turbocharged JT-600 was turning 4,600rpm and cranking out 430hp.

The engine was an in-production truck engine modified somewhat for the race, but not drastically. As mentioned by Kennedy, some of the parts were milled from aluminum or magnesium rather than cast iron for weight reduction, and it was installed in the car lying just a few degrees from flat on its side. That necessitated modification to the normally wet-sump lubrication system. It also gave the car a considerable handling advantage. The horizontally mounted engine forced a much wider stance than usual and gave it a very low center of gravity. Here is another quote from his article:

"The engine used an early version of Cummins' innovative PT fuel system, with a low-pressure pump, common rail and high-pressure unit injectors. That technology was also employed in Cummins' truck engines of the day, and would provide a significant edge over the competition for years to come."

That technology (PT fuel system) was also employed in Cummins' truck engines of the day, and would provide a significant edge over the competition for years to come.

Diesel Power's Kennedy tells us about the #28 team with some historical research with the local The Columbus Republic newspaper staff. Here are a few more quotes from Kennedy's story:

"Nearly everyone who worked on the 1952 race team was a Cummins employee-Clessie's brother Don (who spearheaded the operation), Nev Reiners, Thane Houser, Bill Doup, Mike Fellows, Art Eckleman, and Joe Miller. The seven of them 'worked day and night on the car since it had arrived' at Cummins in early 1952.

"'It was a homegrown type of thing,' Harry McCawley, an associate editor at The Republic who writes about local history for the paper, told Diesel Power. 'Fred was really the only outsider in the group.' They were homegrown, and in the racing community at least, relatively unknown.

"'They underplayed themselves,' said Donald Davidson, the Indianapolis Motor Speedway's track historian. 'They said, "We don't know anything. We're a bunch of farmers from Columbus."'

"Farmers they weren't though. They were savvy, experienced engineers and mechanics who'd been building some of the world's most innovative engines for years. And they came from a community that loved cars and racing."

Next, Kennedy tells us about the diesel engine and about *turbochargers*:

"'They put what ended up being a turbocharger on the new diesel engine, except that it wasn't generally called [a turbocharger] in those days,' Donald said. 'They put one on and it was a huge advantage. Some people referred to it as a supercharger and it was also known as a turbo supercharger. It was, in fact, a turbocharger 14 years before turbochargers started to show up on the gasoline IndyCar engines.'"

Back in the day the Indianapolis 500 "event" could use up a good three weeks of time, practice, qualifying, more practice, a second round of qualifying and finally race day. Again, Kennedy tells the story:

"'Driver Fred Agabashian knew they were going to upset the competition if they went there and started running fast right off the bat,'' Donald Davidson said. 'He was accused of sandbagging through the first couple of weeks of practice in May.' It was an accusation Donald said didn't exactly lack merit.

"'The Cummins team decided, "Let's not draw attention to ourselves because we may have the troops up in arms,"' Donald said. 'Once the #28 car qualified, it would be too late, but they feared the officials may come along and change the rules.'

"As for Fred Agabashian, he wouldn't tell The Republic the maximum potential of the #28 Cummins Diesel Special, but word was getting around.

"The Republic reported, 'Fred plans to drive the diesel all the way, even on the turns, which may mean that his straightaway speed will run around the 155-mph mark. As yet, the engine speed has not attained its maximum speed at Indianapolis. The test engine used thus far was geared for lower speeds, but the new engine will provide Fred with "all the horsepower that will be needed," according to Nev Reiners, engineer on the car.'"

Time to Qualify for the Race

When qualifying day finally arrived, the first lap was an Indianapolis 500 record, 139.104mph. Yet, to qualify at Indy it is a four-lap average. Suspense builds, Kennedy completes the qualifying story:

"'We couldn't believe our watches,' Crew Chief Nev Reiners told The Republic. 'We clocked him at 139.014 mph with three watches on the first lap, but we just couldn't believe the car had gone that fast.' Neither could nearly anyone else, including Wilbur Shaw, the Indianapolis Speedway's president and a veteran driver. This was an experimental car. It was one that few knew anything about a month or even a week before. Now, it was on the pole in the world's most famous race with a four lap average speed of 138.010.

"'Cummins was actually looking at that as not just a car that went fast around the track and made a bunch of left turns, but it was looking at it as a business investment, and not just for promotional value,' Donald explained.

"Everywhere in downtown Columbus it was 'Diesel Fever.' 'Practically every store has at least one speed symbol on display,' the paper said. Nearly every clothing store sold checkered shoes, shirts, and sweaters.

"The Columbus Republic's Harry McCawley said, 'It was definitely a big thing. There was a great deal of excitement. That was true for the town as much as for the company.'

"Harry went on to say, 'Here in this town, and I guess every town, you have seminal moments. People say, "Remember the blizzard of 1978?" Here in Columbus, they still talk about the high school basketball team that went to the state finals in 1964. The 1952 #28 Cummins Diesel Special car was definitely along those lines.'"

And, on race day (after all of the pole position hype and heightened expectations) the #28 had to retire from the race on lap 70.

The restored 1952 Cummins Indy Car and several of the Cummins folks that worked on the restoration: (Left to right) Ben Shulte; Randy Watts; Dan Walters; Steve Wilson; Greg Hines; Tim Diehn; Steve Butler; Bruce Watson.

Here is the final bit of the story from Kennedy:

"Around lap 70 the car began to belch black smoke. According to an 2003 Car and Driver story on the 1952 Indy 500, the #28 car made a pit stop at the 175-mile mark. The engine was overheating. The experimental car was taken into the garage and withdrawn from the race, officially due to turbocharger failure.

"'The overheating was caused by the turbocharger,' Donald said. 'What Cummins did, not thinking because no one had ever run one before, was make the mistake of putting the turbocharger inlet down low behind the car's grille. It ended up sucking rubber particles into the inlet that eventually blocked it up. The team's engineers didn't think about it at the time. If they had to do it over again, they would have stuck the turbo up on top of the engine. That was the car's undoing: turbocharger failure. They were done after 70 laps.'"

Race Car #28 Today

Jim Park, from Heavy Duty Trucking, gives us an update on the #28 car:

"For many years after the record-setting qualifying run in the 1952 Indy 500, the #28 car was seen in parades and at various company functions. At some point, it wound up in a display case at Cummins headquarters in Columbus, Indiana. In 1999, now retired engineer Bruce Watson convinced his bosses to let him and his team begin restoring the car. In May of 2015, after rebuilding a few parts that had deteriorated over time, they started it for the first time in 17 years and it ran like a top.

"Cummins had the car on the tarmac during a truck introduction event, and it was then (2017) that I had the opportunity to shoot some video and do an interview with Bruce Watson."

You'll find Jim Park's #28 video at the TDR's website. You'll also find that you can watch the entire 43-minute "#28 Cummins Special" DVD at our website. (The footage and copyright to Cummins bulletin 4971180 are from 1952.)

The video's subject matter, film making, text and voice-over are approaching 70 years. This is a fascinating DVD to watch. Thanks, Cummins, for allowing us to share a small part of your history.

Robert Patton
TDR Staff