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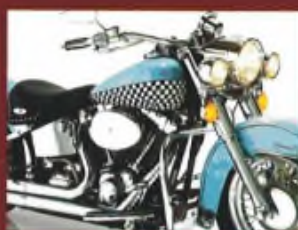


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Titanium Dreams

The exotic metal and the Poggipolini craftsmen who work with it are the secrets behind some of today's most successful racers.

By Marc Cook

Scuderia Ferrari's success in Formula 1 racing is the stuff of legend: In 686 races since the beginning of modern F/1 in 1950, the Italian company has won 167 times and earned 13 Drivers and Constructors championships. Ferrari's achievements can be ascribed to a single-minded focus on attracting the best drivers and engineers and cultivating an unmatched will to win. In many ways, NCR Ducati is the Ferrari of motorcycle racing. The venerable Italian team has

reached the pinnacle of World Superbike performance, particularly with the help of American Doug Polen in the late 1980s and early '90s. Ferrari's recent dominance of F/1 (and its storied racing history) and NCR Ducati's sustained competitiveness share a common denominator: Stefano Poggipolini.

Poggipolini's story begins near the historic city of Bologna in northern Italy, in the industrial complex in San Lazzaro di Savena, home of Poggipolini Titanium. Here, the Poggipolini family members have established themselves in metal fabrication and become some of the world's finest crafters of titanium. Founded 50 years ago by 24-year-old entrepreneur Calisto Poggipolini, the Poggipolini Group (as it is now known) soon included a

motorsports arm inspired by the founder's sons, Stefano and Marco, both of whom were avid motocross racers. Signore Poggipolini fitted his boys' dirt bikes with custom-fabricated aluminum components—anything to gain an advantage. Today the company is Stefano's playground, and he has built Poggipolini Titanium into a force among manufacturers of exotic materials.

Titanium, a metal that is stronger than steel and lighter than aluminum, is among the cycling industry's hottest commodities. When used in an alloy (a combination of raw materials designed for a specific purpose, say, exhaust systems or motorcycle frames) it boasts other desirable properties such as excellent corrosion resistance and superior heat conduction. Titanium is also an incredibly

durable material when processed correctly. Known by its periodic symbol, Ti, the element is also used extensively in jet aircraft engines.

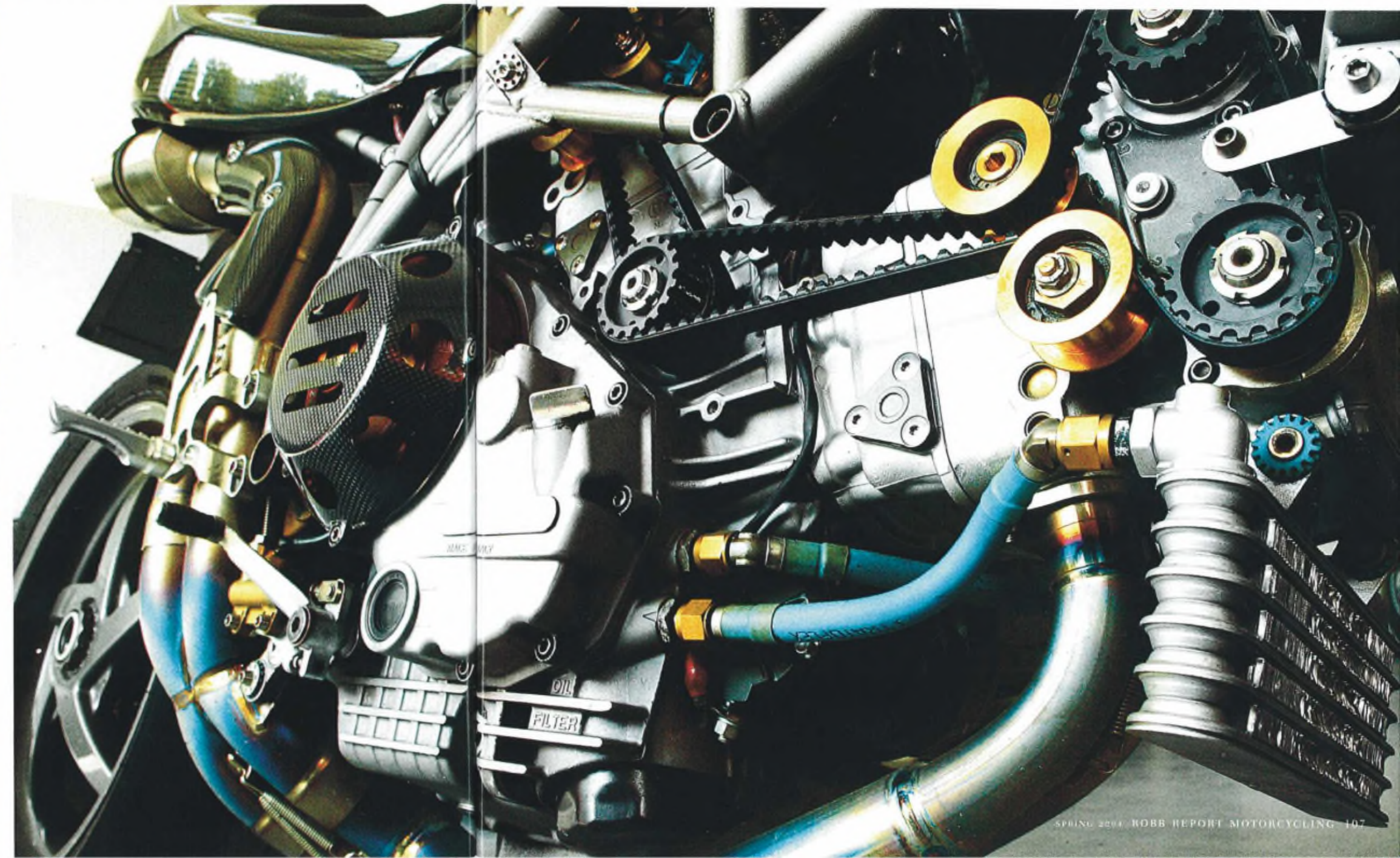
While it is true that the Poggipolini chain is driven by commercial titanium technology—the company is involved in automotive, aircraft, nautical, and medical manufacturing—motorsports is at its heart. Stefano Poggipolini owns the rights to the NCR Ducati brand and supports the superbike squad with custom Ti designs—everything from titanium nuts and bolts to rearsets, clip-ons, clutch covers, and exotic connecting rods. (Some of these products are even available for retail purchase.) Poggipolini also supplies critical parts to Ferrari for its F/1 effort and is involved in a rapid prototyping process that

helps keep teams such as Ferrari moving forward in the relentlessly cutting-edge sport of F/1 racing.

The interior of the Poggipolini factory—it is a factory, even if the hum of state-of-the-art machinery and the exacting care with which it is operated suggest a design studio or operating room—is lined with rows of the latest computer numerical control (CNC) equipment capable of cutting, welding, and shaping titanium in all its myriad forms: seamless rolled tubes, raw hunks of billet, refined extrusions, and cast pieces. CNC machinery is found in factories such as this throughout the world, but one of Poggipolini's secrets is an emerging technology called stereo lithography (S-L). In this process, forms for casting new parts can be made directly from computer drawings.



Titanium tour de force: Poggipolini components transform a Ducati into an exotic mechanical work of art.






Leading manufacturers use stereo lithography to produce prototype parts during the development phase, then they turn to traditional permanent tooling for the mass production process.

Poggipolini follows this path, but with innovative twists. The company is a pioneer in applying a new technology developed by California-based 3D Systems called laser sintering. In traditional S-L, a laser is guided over a vat of epoxy resin that hardens on contact with the laser beam. The computer controlling this process produces a new part by exciting (and thereby hardening) the epoxy in layers, which are then reassembled into the desired piece, called a cast form.

But during Poggipolini's laser sintering process, a very fine bed (20 microns, or 20 millionths of an inch) of powder, normally a glass nylon, is used in place of the epoxy resin. As with S-L, a laser tracks over the material, hardening it on contact. The computer commands the laser to pass over the material until the final shape is obtained, then the part is removed. The operator unearths the finished piece as though removing a gem from a sand castle, with the unreacted material falling away. As is true in conventional S-L, this part can then be used as a form for the investment casting of just about any kind of material, including titanium.

Laser sintering enables the forms to be much more detailed than with conventional S-L; thus, designers are freer to make the parts as light, as strong—and as beautiful as their knowledge and imagination allow. And at Poggipolini, there is never a shortage of either. Poggipolini's sintering machines can produce components in a variety of materials—nylon, glass-filled nylon, rubber, stainless steel,



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and A6 metals—including a proprietary material that blends alumina and nylon to form “aluminumylon.”

Because laser sintering creates forms that are much stronger than S-L materials yet still very light, new forms can be produced that are immediately ready to cast. To what end? There is no question that aerodynamic developments in F/1 come fast and furiously. Should Ferrari's aerodynamicists create a sexier, more efficient new shape, it becomes Poggipolini's job to render it for testing. Knowing time is of the essence, the company can respond almost instantly, receiving the CAD files over the Internet, porting them to its equipment, and offering a ready-to-try part by the time the morning shift arrives the next day.

The NCR 1000NE

Poggipolini's ability to craft exotic materials in-house helped it develop the NCR 1000NE, a state-of-the-art custom racebike. The outstanding technical specification is made possible by the liberal use of exotic materials—principally titanium and carbon fiber. The machine has been engineered to achieve the absolute lightest weight possible. Weighing in at just 112 kilograms, it comes very close to the Holy Grail of all race bikes: a 1:1 power-to-weight ratio.

The machine is powered by the new double ignition Ducati DS series engine (the same one that the MultiStrada uses) and breathes out through the lightweight Silimitor titanium two-



into-one exhaust. The engine itself has been reworked and refined by the Poggipolini NCR engineers to output just over 105 horsepower.

The rest of the technical specifications are impressive: Formula 1-style carbon silicon clutch plates help push the power to the back wheel; the complete frame—including the one-piece rear subframe that holds the seat in place, the rear spring, front fork springs, and triple clamps—is crafted entirely from titanium. Öhlins front forks, Brembo brakes with radial calipers, and wave-style brake rotors mounted to the Marchesini magnesium wheels help the handling and braking duties while the Dunlop tires help keep the whole motorcycle glued to the track.

After three wins in three races, the Aldo Drudi-designed NCR 1000NE has customers lining up to buy it. Only 30 race bikes, which will be customized exclusively for each rider, will be produced. —TOM CORAM

Stefano Poggipolini, the man behind the titanium artistry.



In Italy, racing is a demanding, expensive industry, but Stefano Poggipolini's love affair with motorcycles has never dimmed. In addition to its work with the NCR Ducati team, Poggipolini provides Ti parts for a variety of MotoGP teams, and it built its own titanium-framed, Ducati DS1000-powered 1000NE (designed by Aldo Drudi) that earned three victories in three races in the Italian version of the Battle of the Twins. The Poggipolini family's legacy of motorcycles, motorsports, and the utmost in high-technology manufacturing has never been stronger. If you still have any doubts, ask Michael Schumacher in his Ferrari or Garry McCoy on his Ducati the next time they take a checkered flag—if you can catch them, that is.