

Audi F1 + PTC Windchill+: Ready to Run



Formula One: An Audacious Goal

When the Volkswagen Group's premium automaker AUDI AG made the decision to enter the sport of Formula One (F1) racing for the first time, announced at the 2022 Belgian Grand Prix and targeting the 2026 season, it immediately faced immense time pressure. The race to design, engineer, and build an engine able to compete on the world's most elite racing stage in under three years represented an aggressive – even audacious – goal.

Starting from scratch, Audi teamed up with PTC to implement Windchill+, PTC's SaaS PLM solution, successfully standing up the necessary engineering environment and onboarding new employees in just a few months from the project's inception. Working together with PTC's Digital Thread Advisory Services (DTAS) team, Audi met critical deadlines in time to meet staffing requirements and leverage critical new regulations for the defined F1 reporting period.

Progress through Technology

Audi will develop and manufacture the so-called Power Unit at the newly formed entity Audi Formula Racing GmbH (AFR). F1, a dazzling spectacle of mechanical and human performance, is enjoying one of the fastest-growing audiences in professional sports.

Since its emergence from the European Motor Racing Championships in 1950, Formula 1 with its high performance, and in particular, speed has become the pinnacle of motor racing. And for Audi to stand up its first F1 program in time to compete in 2026 required unprecedented speed of innovation, development, and systems integration.

An Evolving Formula

The "Formula" in Formula One refers to the common set of rules every team is required to follow. F1 governs almost every aspect of car and component design, as well as spending parameters intended to create a level playing field. On the financial front, F1 has initiated a new "cost cap" regulation, defining spending limits intended to ensure the long-term sustainability and stability of the sport.

New Powertrain Regulations

Even more compelling for Audi were the new F1 powertrain regulations taking effect in 2026. As a well-established leader in sustainable electric and hybrid auto technologies, Audi can leverage significant achievement. For example, Audi Sport

GmbH has been developing high voltage powertrain competencies for many years with the LMP1, Formel E and the Audi RS Q e-tron in 2021, powering the company's first entry into the legendary Dakar Rally.

AFR will now produce engines that conform to key new 2026 requirements including new fuel types, increased proportion of electric power required, and the elimination of a costly motor component from F1 designs:

- **New Fuel Type:** The final, blended fuel must achieve a greenhouse gas (GHG) emissions savings, relative to fossil-derived gasoline, of at least that defined for the transport sector in the EU Renewable Energy Directive RED (1), which was current on January 1st in the year prior to the relevant Formula One Championship.
- **Increased Electric Power:** The Motor Generator Unit-Kinetic (MGU-K) will be three times more powerful than currently. Audi will transition from 120 kW to a motor generator with 350 kW, bringing even more electric power into the overall powertrain.
- **MGU-H Banned:** F1 cars currently use the Motor Generator Unit-Heat (MGU-H) in addition to the MGU-K, as a means of recovering lost energy with the battery and electric motors. In order to reduce complexity and costs, Formula 1 has eliminated the MGU-H.



Race to the Starting Line

Having declared its intentions in Belgium, Audi faced significant technology and engineering management challenges in winning the race to the 2026 starting line. First, the full AFR IT and manufacturing environment would need to be completed within a timeline counted in months, not years. Second, staff for the new entity would need to be on-boarded and at work by January 1, 2023. Both essential milestones were driven by the need to take full advantage of F1's 2023 cost cap requirements.

Driving Factor: Core Systems

AFR chose PTC as a technology partner and PTC's Windchill+ as the software platform to support integration of its core ERP and PLM requirements. Realizing seamless, end-to-end financial control of the design and production environment was critical, especially given the tight timeframe the team faced to stand up their core systems:

ERP: To "hit the track rolling," AFR required the foundation of an out-of-the-box financial system, and selected SAP 4HANA. In addition to being

out-of-the-box, the ability to leverage SAP in the cloud would contribute to overall speed in the medium-to-long term, even though customization of the system would require significant upfront work in the short term.

PLM: Benedikt Brunniger, Windchill project leader for Audi Sport until his transfer to AFR at the beginning of the F1 initiative, recalls that "we knew from the past (that) Windchill out of the box is a strong system, and had experience with Windchill and PDM at Audi Sport." That success pointed to Windchill+ as the logical solution for an extended PLM system connected to SAP.

System Independence

PTC Windchill+ provided AFR the ability to start the project directly; independent of Audi's larger network and therefore free of the need to engineer integrations with those larger systems – and potentially time-consuming delays.

Paving the Fast Track to Success

Starting from zero and with only three years before their first F1 race required bold vision, but precise

planning and flawless execution. Now, having met the critical 2023 deadlines, AFR credits several factors for the initial success.

- *Experienced Team.* PTC's Digital Thread Advisory Services (DTAS) team executing process re-engineering and migration was led by experienced PLM experts and a trusted industry consultant with prior PTC experience in other motorsports projects, such as at KTM.
- *Pre-project Testing.* The DTAS-led implementation team supported Windchill+ testing prior to the project's official start.
- *Tailored Implementation.* Rather than "force-fit" AFR's project into Windchill's existing capabilities, the team scoped and configured the project to AFR's specific requirements, including project management, business configuration, and more.
- *Efficiency and Automation.* Windchill's power and versatility allowed fast and accurate process re-engineering.
- *Best Practices.* The project was configured to allow AFR to efficiently "translate" best practices from previous projects, such as those with Audi Sport, for the needs of AFR.

Ready to Race: The Windchill+ Advantage

Efficiency is the primary benefit, and "the biggest goal of the whole company," as described by Bruninger. This is mainly due to the need to work within F1 cost cap guidelines, and is exacerbated by F1s international range of teams, some of whom enjoy significant cost advantages over others due to exchange and interest rate differences.

But maximizing efficiency is only part of the story. Other Windchill+ benefits accrue to nearly every aspect of the AFR program.

- *Faster implementation and time to value* enables AFR to adopt new capabilities seamlessly.
- *2-3X increase in speed of access* and response time for employees working from home, compared to previous method using VPN access into Audi.
- *Assured IP security*, given that PTC's full stack, best-in-class security reduces the risks of cyber-attacks.
- *Collaboration with design and manufacturing partners* is facilitated, given the criticality of all involved parties working within the same environment.



Accelerating Time to Value

The rapid development achieved by the AFR/PTC team is the single highest-impact metric of the project's success. In September of 2022, the team had been tasked by management with completing a base version of the environment in three months. By December, the system was already running on four environments: development, test, quality assurance, and production. Within one year the system was fully configured and ready for Go-Live.

50,000 files from external systems had been migrated, with multiple business processes fully

up and running, including document management, multi-CAD data management and visualization (Creo and Catia V5), change and configuration management (including component mgmt., BOM management, and MBOM transformation), material compliance, SAP integration and more.

"From the very first second," notes Bruninger in recalling that day, "everyone was able to run." Today and moving forward, as it works toward the 2026 F1 season, AFR's success will continue to be fueled by the wide array of powerful functions and enhanced capabilities powered by PTC Windchill+.