

CONSTRUCCIONES Y AUXILIAR DE FERROCARRILES

Case Study



Photo © CAF

Challenge

Spanish railway systems manufacturer Construcciones y Auxiliar de Ferrocarriles (CAF) builds state-of-the-art trains and delivers comprehensive turnkey projects to build efficient and cost-effective infrastructure and transport services. As CAF leads the way with the next generation of urban mobility solutions, it needed a powerful platform to unify its design and engineering processes, manage all product attributes within a single environment and speed up innovation.

Solution

The **3DEXPERIENCE** platform sits at the heart of CAF's digital transformation. The company uses the **3DEXPERIENCE Efficient Multi-Energy Platform** and **Global Modular Architecture** industry solutions to

optimize its design processes and boost collaboration between design and engineering to develop cutting-edge train designs and railway solutions. It can now easily convert 2D sketches into comprehensive 3D virtual models and validate a vehicle architecture across all disciplines

Benefits

With a single source of information and the ability to connect the dots across its product development processes, CAF is enhancing engineering and design productivity. Rich design capabilities and template libraries allow CAF to develop 3D models at speed to support effective decision-making while focusing on innovation and securing new bids ahead of the competition.



**"We're using the
3DEXPERIENCE platform to
develop competitive
offerings."**

– Joseba Amenabar, Technical Director,
Rolling Stock Operations, CAF

DRIVING THE SWITCH FROM DIESEL TO ELECTRIC TRAINS

When Verkehrsverbund Rhein-Ruhr (VRR) and Nahverkehr Westfalen-Lippe's (NWL) new fleet of battery-powered trains go into service, the share of rail passenger transport using diesel traction in the Rhein-Ruhr/Westphalia region will drop to less than 10%. The two German operators say that making the switch from diesel to electric trains will save around 24,000 metric tons of carbon emissions per year.

VRR and NWL have ordered more than 60 of the new-generation Civity BEMU trains. They hope to make a significant contribution to tackling the climate crisis while offering the region's 18 million residents an environmentally friendly incentive to switch from private cars to rail. The battery-powered trains can run on catenary-free tracks and will not only be quieter and more efficient, but also will not emit any fine dust or nitrogen oxides. Each train will have up to 160 seats, significantly increasing capacity on many lines of the Niederrhein-Münsterland network.

Charged with supplying and maintaining the battery-electric vehicles is Spanish railway systems manufacturer Construcciones y Auxiliar de Ferrocarriles (CAF). It was awarded the contract based on its ability to submit the most economical bid in terms of delivery, maintenance, and energy consumption over the fleet's lifecycle. It is one of the largest contracts in the world to date involving this type of technology.

For CAF, such an order is a striking example of how its business is quickly evolving to meet its customers' changing requirements. Its focus has become developing urban mobility solutions that reduce transport energy costs, uphold safety and reliability, and pave the way to a sustainable future.

"We are a multinational group with over 100 years of experience in the supply of comprehensive transit solutions, positioned at the forefront of technology for high value-added sustainable mobility," said Joseba Amenabar, technical director of CAF Rolling Stock Operations. "We offer one of the broader and most flexible arrays of products in railway related markets. By drawing from firmly established technological and human resources, we'll increase and diversify our transit portfolio and respond to social demands for sustainable mobility."

As CAF continues to expand its portfolio and secure large global orders for next-generation vehicles, it needs its own technology to support its business growth. A long-term user of Dassault Systèmes' solutions, including CATIA V5, the company sought a powerful platform that would allow it to stay at the forefront of innovation and ensure its operations

run as efficiently as possible. When CAF heard about the **3DEXPERIENCE**® platform, it was sure it had found the answer to its future business needs.

"Moving to the **3DEXPERIENCE** platform was a natural evolution for us," said Sergio Heras, PLM director at CAF. "We'd already begun refining a lot of our internal processes and it gave us an opportunity to upgrade our design and product lifecycle management capabilities. The **3DEXPERIENCE** platform had the rich capabilities we needed to support a new approach to configuration and change management with full versioning control and grow with us as we further develop our product portfolio."

REMAINING COMPETITIVE

CAF's rolling stock business comes from railways operators, mass transit authorities and other public and private administrations. These organizations typically issue public request for quotations (RFQs) and CAF competes against other suppliers to secure contracts.

"These RFQs have usually very strict scoring rules where product quality, performance, price and delivery time are evaluated," Amenabar said. "We're using the **3DEXPERIENCE** platform to develop competitive offerings that meet these specific requirements and excel in all aspects, including maintenance throughout the product lifecycle."

CAF recognized that the key to future success was the ability to develop viable and compelling designs for new proposals as quickly and efficiently as possible.

"In the past, our way of working was based on creating new designs for each project," Amenabar said. "To remain competitive and find innovative solutions for new projects, we decided to begin reusing previous designs and templates. The **3DEXPERIENCE** platform serves as a central repository for storing and retrieving designs, and we want this to become an effective way of developing future products. Our most developed product line is trams and, using this approach, we've already been able to design faster and seen an overall reduction in the time it takes to develop products."



**"The goal is to achieve digital
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– Sergio Heras, PLM Director, CAF

With the ability to capture all data created in the product development process and refer to previous designs and analyses with ENOVIA on the **3DEXPERIENCE** platform, CAF's engineers can now find the optimal solution to each new design challenge.

"We're using the platform to modernize our product line structure and support product development and reuse," Heras said. "It will interconnect with all other software where product information is developed, including requirements, functionality,

verification and validation, manufacturing, operation and maintenance support.”

DEVELOPING NEW TRAINS ON THE PLATFORM

CAF is already successfully designing and developing new vehicles on the **3DEXPERIENCE** platform.

“We have been using Dassault Systèmes solutions for more than 30 years and we still use our previous ENOVIA and CATIA apps in the projects started before the **3DEXPERIENCE** implementation,” Heras said. “Our strategy has been to develop our new projects straight away on **3DEXPERIENCE**.”

Some of the latest projects that have already benefited from the **3DEXPERIENCE** platform include the design and supply of 246 modern diesel-electric train cars for Mitsubishi, which will run on the Yangon-Mandalay line in the Republic of the Union of Myanmar; 15 trams for Portuguese bus and tram operator Carris; and a 150 million euros contract to supply 51 light rail vehicles for Essen and Mülheim transport operator Ruhrbahn in Germany.

“We’re beginning to full take advantage of the solution change and roll out new processes,” said Vicente Salvador, from the Information and Communications Technology department. “We have now migrated and redefined almost 95% of design processes from our ENOVIA/CATIA legacy to the **3DEXPERIENCE** platform in production, from sheet metal design to tubing and kinematics.”

With the platform, CAF can take advantage of increasingly sophisticated design functionality to meet its customers’ requirements as pressure intensifies to reduce weight, cost, and material usage.

“We use CATIA app on **3DEXPERIENCE** to manage the product’s weight and material definition,” Amenabar said. “More of our customers are asking us to link the weight of the material definition and the material characteristics in pursuit of developing more sustainable products and it’s something we’re exploring on the platform.”

For projects like the Civity BEMU trains for VRR and NWL, the **3DEXPERIENCE** platform opens up opportunities for CAF to share information internally and with its customers in new ways.

“For example, virtual reality is something that is helping us to avoid the production of real mockups,” Salvador said. “The platform gives us the possibility to visualize the complete train at different stages of the development phase, and to share it internally with the engineering, quality and production divisions much earlier than the physical prototype. Our customers are pleased as they’re able to experience the product and ask for changes that can be implemented quickly. It’s really helping us to fulfill their needs.”

CAF uses SIMULIA on the platform to simulate designs and test their feasibility ahead of production. This helps to reduce the number of physical prototypes it needs to build.

“It’s a crucial app for validating our product designs before releasing them to manufacturing,” Heras said. “It allows us to test and develop a large number of different design variables in a way that would not be possible with physical prototyping alone, both in terms of time and cost.”

More about the solutions:

Efficient Multi-Energy Platform provides capabilities to help manufacturers manage the development and production of both electric and internal combustion engine vehicles concurrently as the transport and mobility evolves to ensure a greener future. The solution helps companies realize more efficient multi-energy vehicle platforms that satisfy their customers’ requirements while fulfilling regulations.

Global Modular Architecture is a disruptive approach that fits the new development challenges mobility manufacturers face today. It goes beyond traditional product data management with an enterprise systems engineering approach to drive early bill of materials, and a configured digital mock-up to support all minimize design engineering complexity.

Benefits

- Streamline interdisciplinary and supplier collaboration
- Provide passengers with exceptional mobility experiences
- Improve sourcing and standardization through design reuse
- Define and monitor verification and validation plans for all development phases.



CAF uses the **3DEXPERIENCE** platform to optimize its design processes and develop cutting-edge train and railway solutions.

Focus on CAF

CAF is a multinational group with over 100 years of experience in the supply of comprehensive transit solutions. The company is a leader in the railway industry and pursues sustainable mobility, offering one of the most comprehensive and flexible arrays of products in railway related markets, such as rolling stock, components, infrastructure, signaling and services, including maintenance, refurbishing and financial services. CAF's products can be tailored to suit the specific requirements of each customer, providing safety, comfort, and satisfaction to millions of users around the world.

For more information: www.caf.net

A RELIABLE ENGINEERING BACKBONE

ENOVIA on the **3DEXPERIENCE** platform has become the engineering data backbone for CAF to track, control and share all its products' technical data.

"It has improved and facilitated our access to the 3D model, product's attributes and specifications, all from a web browser," Heras said. "We're now all working with the same information and avoiding mistakes that arose because of inconsistent data."

Importantly, the platform allows CAF's engineers to access the information they need at the right moment.

"It's been key for putting information into the hands of our engineers," Heras said. "You can see everything you need in the 3D model."

A FRESH APPROACH TO CHANGE MANAGEMENT

One area where CAF is seeing a real benefit from the **3DEXPERIENCE** platform is in its ability to manage all product changes in a single configured product structure with ENOVIA.

"Until now, we faced a lot of issues with change and configuration management," Heras said. "The new platform is enabling us to move away from our manual processes, allowing us to handle configuration from requirements to design solutions and change requests all the way to the operation of the products. The platform is enabling the change of those processes in a more digital and controlled way."

"We manage the drawings and have the latest configuration of the product," Salvador added. "What we want to do next is to define some baselines and to control not only the drawings but also the 3D, mechanical data, electrical definition, hardware and software. We're sure that the platform can support us."

CAF is making an assessment of DELMIA on **3DEXPERIENCE** to optimize its manufacturing processes too.

"The goal is to achieve digital continuity with our data from engineering design to production," Heras said. "It will enable us to link the configuration of the production information with the engineering configuration and validate designs before manufacturing."

COMMITTING TO A BIG TRANSFORMATION

CAF's journey to the **3DEXPERIENCE** platform began in 2016. Working closely with Dassault Systèmes, the company has made some radical shifts in the time since then to take full advantage of the platform and redefine its way of working.

"During the course of the implementation, we have had to make significant changes across the company, especially in terms of our culture, redefining some of our critical processes and getting the IT acquainted with the new solution infrastructure," Heras said. "We took a modular approach to ensure the success of the rollout, starting with one business unit at a time. Over the past five years, while we were deploying the **3DEXPERIENCE** platform, the solution continued to evolve, and so did the data model. We have been able to manage these aspects in parallel."

CAF has benefited from Dassault Systèmes' expertise throughout, navigating the challenges that came with such a large implementation.

"This is a marathon, and it has been very important to have access to the experts across each of the different disciplines to have a successful adoption," Heras concluded. "We had to be prepared to put in the time to define a platform that will support our processes, now and going forward. We are sowing the seeds for our future."

Our **3DEXPERIENCE®** platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3DEXPERIENCE** platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 290,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit www.3ds.com.

