



# Historic Bridge in Northern France Modernized with SMARTUP™ UHPC

*The Pont de Thouaré-sur-Loire bridge in northwestern France was built between 1879 and 1882. In order to keep up with modern traffic flows and correct years of corrosion, the aging, quarter-mile long bridge underwent a complete renovation in 2017. Today, the original brick vaulted structure now features Ultra High-Performance Fiber reinforced concrete slabs resting on new metal bridge components.*

**A**ccording to Serge Jaffrelo, Project Manager of the Loire-Atlantique’s Civil Engineering Department, most of the weight on the original span consisted of brick arches which tipped the scales at some 3,000 tons.

“Once all the exterior brick arches were removed, the weight of the bridge was reduced to 750 tons of metal structure,” says Jaffrelo. “We planned to add a walkway for pedestrians and cyclists which would add weight to the structure, so we sought an innovative solution to the problem by using high performance, fiber-reinforced concrete to build a new deck which would be very lightweight.”

Jaffrelo says the agency decided to use 3.5” thick precast slabs of SMARTUP high performance fiber concrete. The use of these slabs required additional installation of perpendicular cross pieces designed to span the width of the original bridge structure. The slabs and their support pieces together added an approximate total weight of 750 tons. Thus the total weight of

the structure was reduced by half due to the use of this new fiber concrete technology.

***At the same time, we were able to reduce construction time. The renovation project, which was initially scheduled to take 12 months, only took 6 months because of the use of lightweight bridge parts,” says Jaffrelo.***

## Prefabricated Slabs

The Jousselin Préfabrication Company, a firm that specializes in precast concrete, supplied the concrete slabs for the deck of the Thouare Bridge. These components were made with SMARTUP, a high-performance, fiber-reinforced concrete that delivers high mechanical performance, high skid resistance as well as resistance to compression. SMARTUP offers exceptionally high durability in all climates, providing better mechanical resilience and protection against aging.

*The job required the manufacture of 218 slabs of specially designed fiber-reinforced concrete.*



Christophe Barriere, Jouselin's Operations Director, says the Thouare Bridge project was the first of its kind in France. "Due to the daily volume of concrete required to be poured for this type of application, we had to deploy extensive resources to pour about 5 cubic yard per day."

Barriere notes that SMARTUP offered several desirable characteristics - namely its consistency and adaptability to actual workshop conditions. "Because we were manufacturing the slabs in a manufacturing plant rather than a lab, we developed a valuable partnership with VICAT's representatives during the different phases of the project including the design, testing, and concrete mix design stages."

Barriere says during production, careful monitoring of the casting process was required. "The concrete formulation step is a very important stage in this type of project because of the necessity of verification that the precise calculations made at the construction site for the size of the slabs are strictly adhered to in the manufacturing plant."

### **Custom Assistance**

Through its technical advisors and test laboratory, the SMARTUP team was also able to provide support for concrete used in the field cast connections of the precast slabs on the project. Emmanuel Cottereau, Job Site Supervisor for Bouygues Public Works, says since this was the first time his crews used UHPC, having the SMARTUP team on-site was very helpful.

"Because this product is not a standard type of material, its manufacture and installation require a specific methodology that is very important to follow," says Cottereau. "SMARTUP's team was very helpful and worked closely with our crews in the operation of connecting the slabs to teach them the proper use of the product, and we are very satisfied with the performance

of this new material."

### **End Result**

Guillaume Roux, Vicat's UHPC activity manager, says the use of SMARTUP enabled designers of the rehabilitation project to overcome numerous difficulties. "They were able to reduce the weight of the structure and complete the project on a very tight schedule," says Roux. "Additionally, the creation of overhanging structures improved the daily life of cyclists and pedestrians using the bridge. Above all, the use of UHPC drastically decreased the dead weight of the structure and restored the serviceability and safety of the bridge."

