



## An application of the FRP girder bridge technology to cope with logistic difficulties

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### Summary

In the year 2013, Acciona Infraestructuras, a Spanish contractor, designed and manufactured a Fibre Reinforced Plastic (FRP) road bridge which is expected to be installed in Gabon in 2014. The bridge girders, originally designed in steel reinforced concrete, were redesigned employing FRPs to take advantage of the lightweight of these materials and the high prefabrication inherent with their use. In fact, concrete, which must be mixed in situ due to the unavailability of concrete plants at a reasonable distance from the worksite, results to be expensive, since the transportation of the aggregates to the worksite is made difficult by the lack of proper roads and bridges. This lack of infrastructure also hampers the use of prefabricated reinforced concrete beams, since it makes extremely difficult moving heavy goods and machineries. The design and the manufacturing process of these two girders are presented in this paper.

**Keywords:** fibre reinforced polymers, girder, bridge, infusion

### 1. Introduction

The village of Iboundji, located in the interior part of Gabon, West Africa, is poorly connected to the two most important ports of the country: Libreville and Port-Gentile. In the surrounding of this village, the construction of a mini hydro power plant has started in 2013. In the context of this project, it was detected the necessity to build a bridge to cross the crick that is going to move the turbines of the future power plant.

Due to the poor transport network of the Country, the cost of the concrete in Iboundji is very high, and it is almost impossible to get a concrete with a characteristic strength higher than 25 MPa. Moreover, it is not possible to count on cranes with sufficient capacity to install a prefabricated reinforced concrete bridge. For this reason, to install the girders on the bridge abutments, it has been planned to lift them using the arm of an excavator as crane. Due to this plan, the weight of a single girder was limited to 80 kN.

Fibre reinforced polymers (FRPs) offer a solution for manufacturing prefabricated elements to be used in the erection of civil engineering structures, such as bridges, located at sites like Iboundji. The weight of FRPs, normally between 15 and 20 kN/m<sup>3</sup>, allows manufacturing bridge girders that weigh much less than the equivalent girders built using reinforced concrete or steel. Moreover, FRPs do not suffer from galvanic corrosion, performing in the long term better than steel and reinforced concrete in the tropical region where Iboundji is located.

This paper describes the design and manufacturing processes of the two identical FRP girders that will be used to erect the bridge at the site of the Iboundji mini hydro power plant.