

Driving forward steel-fibre concrete

A 165,000m² steel-fibre-reinforced concrete (SFRC) jointless floor slab was specified as part of the construction of a new Renault Logan production facility in Tangier, Morocco.

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Renault's new automotive plant is due to start production in early 2012 with one production line and an annual output capacity of 170,000 vehicles. Ultimately, capacity will be increased to 400,000 vehicles per year and the plant will emit zero carbon and zero industrial liquid discharges.

The Moroccan National Electricity Office is committed to developing renewable energy forms and this site is powered entirely by wind and hydro-electricity. The plant will cut its water consumption for manufacturing processes by 70% in comparison with a plant with equivalent output capacity. These improvements will avoid taking the equivalent of 175 Olympic swimming pools (437,500m³) of water from the ecosystem every year.

Renault's decision to partner with an SFRC jointless flooring specialist meant Twintec, through its regional subsidiary Twinplan-T. Med, was involved early at the design stage of the scheme, enabling a value engineered solution to be presented based on the design-build-insure philosophy. This concept enables customers to benefit from a single point of responsibility and in this case used the UK Concrete Society TR34⁽¹⁾ guidance rather than the French DTU Standard generally used in Morocco.

Technical solution

A detailed review of the client's needs enabled in-house engineers to produce an optimum slab design, which proposed that construction should be based on design guidance contained within TR34 guidance. This was accepted by the project engineers, main contractor and client as being the best way to proceed. The floor slab needed to cater for various load conditions, with uniformly distributed loads (UDL) between 20kN/m² and 80kN/m². Working within TR34 guidelines allowed a precise engineered slab thickness (between 140 and 350mm throughout the various buildings), selected reinforcement type/dosage and the ability to specify the concrete strength.

The Twintec Freeplan (ground-bearing SFRC jointless floor slab) was put forward as the most appropriate for this project. Two of the main advantages of the product which were key to Renault's contracting decision were:

- jointless – eliminating the need for saw-cut contraction joints, leading to dra-



Above: Renault's new automotive plant in Tangier, Morocco.

matically reduced year-on-year maintenance costs and higher MHE efficiency.

- programme – fast construction programme as reinforcement added directly into the concrete and large-area pours per day, made possible by specialist equipment and excellent concrete supply.

The specific design solution along with the Freeplan floor made an attractive package price that takes into account short-, medium- and long-term costs for Renault. They will also benefit from provision of a ten-year warranty on the slab, compared to the DTU Standards that make the client responsible for any potential defects after the project has been handed over.

Production critical success factors

A fast-track programme was demanded by Renault to meet the factory-production opening target and this was achieved with a project management team consisting of a project director, site manager, two site supervisors and a team of 20 operatives.

Twintec took responsibility for the final regulating layer preparation using laser-controlled equipment to deliver high output and very accurate tolerances, providing the platform for the floor slab casting process. The specialist team placed approximately 23,000m³ of concrete, incorporating 1000 tonnes of steel fibres to deliver an average production output of 2000m³/day and with a maximum daily output of 4250m³/day.

To guarantee quality and consistency of concrete, Twintec worked with Lafarge from two on-site dedicated batching plants. C25/30 and C30/37 concretes were used, reinforced with 35–40kg/m³ of AFT 1/50 steel fibres.

Large-area pours and in particular the production of a high-quality 'jointless' SFRC

floor slab is reliant upon many factors including a well-organised programme of works, experienced site management and a highly trained workforce as well as a detailed and implemented quality assurance plan (QAP). QAP control procedures for all aspects of the production operation should include the following:

- Pre-pouring:
 - concrete composition, grading, fibre dispersion analysis and trials
 - CBR testing and final regulating layer level checks
 - joints and formwork
 - weatherproof/environment
 - plant and equipment testing
 - column isolation and perimeter wall detailing.
- During slab pour:
 - fibre integration
 - concrete testing (slumps, cubes, temperature, etc)
 - joints and concrete level checking
 - polythene.
- Post slab pour:
 - slab inspections
 - surveys (flatness, abrasion resistance).

The total offer concept incorporating an optimised technical slab design, high-quality product, delivered by dedicated on and off-site personnel has resulted in Renault placing an order with Twintec for Phase II of the project (110,000m³) commencing in January 2012. ■

Reference

1. CONCRETE SOCIETY. *Concrete industrial ground floors – A guide to design and construction*. Technical Report 34, Third Edition, The Concrete Society, Camberley, 2003, 138pp.