

Lifting with 5.000t capacity ringer crane at Hinkley Point Nuclear Project, at Somerset - UK.

Dimitri Laurent ^a, José María Martínez Gutiérrez ^b

^a MSc International Management & Business Administration. SARENS Sales Manager HUB2 – Southern Europe / Africa

^b MSc Civil Engineer. SARENS Technical Solutions Spain Manager.

ABSTRACT

In November '18, SARENS unveiled the new SGC-250 crane for a high-profile project on behalf of JV clients BOUYGUES TRAVAUX PUBLICS of France and LAING O'ROURKE CONSTRUCTION of the UK. The nearly 4-year project involves the construction of a new nuclear power plant at Hinkley Point at Somerset. This crane has a maximum load moment of 250.000 metric tonnes and the ability to lift 5.000 tonnes. It's the strongest crane of its kind in the world. The crane's main boom can be from 118m to 160m and the jib can be extended up to 100m. This combination provides a height of about 250m, or a radius of 275m.

KEYWORDS: Nuclear Power Plant, Ringer Crane, SGC-250, self-relocation.

1. Introduction

Sarens launched on November 2018 the SGC-250 crane (Figure 1), the largest in its fleet and the biggest of its kind in the world in both size and capacity.

SGC-250 is the largest crane of the SGC (Sarens Giant Cranes) family own designed by SARENS. This SGC family is completed with SGC-140, SGC-120 and SGC-90.

The new crane was introduced to the world at a special launch event on November 9th, 2018, at the Port of Ghent in Belgium.

After its introduction, the crane was transported to the Hinkley Point C project where it will play a key role in supporting the construction of the nuclear power station currently the UK's largest and most complex civil engineering project.

The project will be supplying 7% of the country's low carbon electricity and also creating around 25.000 employment opportunities throughout the construction phase. The SGC-250 will help the Hinkley Point C team deliver increased efficiency by lifting and shifting the station's heaviest pre-fabricated components.

The crane is planned to lift more than 600 pieces of pre-fabrications, including the five major parts of each unit's steel containment liner and dome.

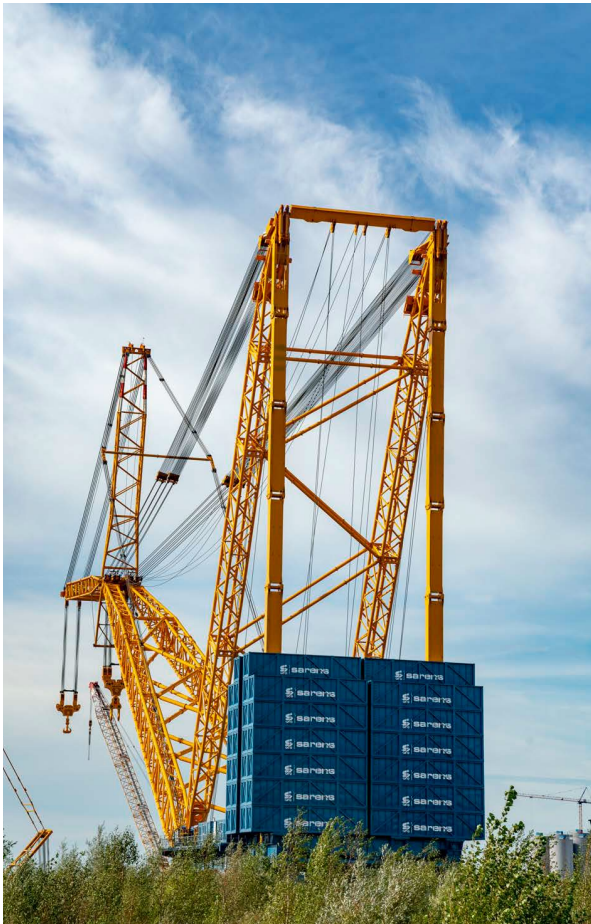


Figure 1: Picture of the SGC-250 in Ghent

2. Crane features

2.1 Lifting capacities

This crane has a maximum load moment of 250.000 metric tons and the ability to lift 5.000 tons at 40m radius. It's the strongest crane of its kind, with all the features and flexibility of a fully-mobile ring crane with winches and cables, hook blocks, and the ability to slew 360°.

Table 1. SGC-250 Load Chart (tons)

Radius	MB 118m	MB 118m + Jib 52.3m	
	Main Hoist	Main Hoist	Jib Hoist
40	5.000	4.250	-
60	3.831	3.275	1.781
100	2.001	1.771	1.525
120	1.554	-	1.338
150	-	-	1.084
170	-	-	883

2.2 Safety Standards.

In regards to safety and continuity, the crane is rated with highest performance level (PL E) and full redundancy system on the hoisting and slewing system, achieved by intelligently connecting and steering all 12 engines with six power packs.

2.3 Counterweights

The SGC-250 has 5.200t of counterweight ballast. 52 reinforced 40' containers (Figure 2) filled with local available material are used maximizing overall mobilization costs.



Figure 2: Filling of counterweight

2.4 Low ground bearing pressures

Even at a greater radius, the SGC-250 never exceeds ground pressures of 30t/m², thanks to 128 wheel bogies on double ring beams and spreader mats (Figure 3).



Figure 3: 52.8m OD spreader mats

2.5 Hook blocks

Two hook blocks have been specially designed for the SGC. A main hook of 3.200t capacity weighing 104.6t and a jib hook of 1.600t capacity and a self-weight of 58t (Figure 4).



Figure 4: Main hook

2.6 Design criteria

As with all the SGCs in SARENS' fleet, the design of the massive SGC-250 crane was done completely in-house under following design criteria:

- Machinery directive 2006/42/EG
- EN13001-1: 2015: Cranes - General Design - Part 1: General principles and requirements
- EN13001-2: 2014: Crane safety – General Design – Part 2: Load actions

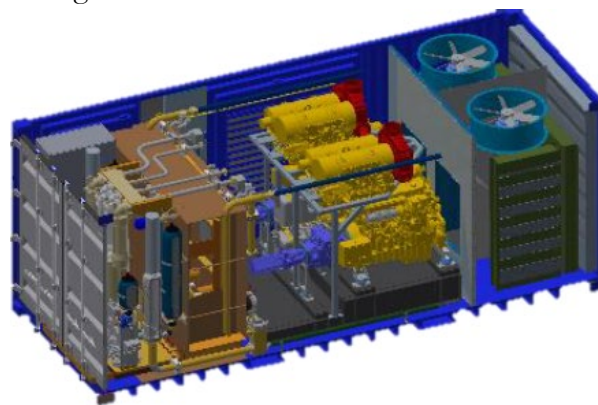
- ASME B30.5:2007: Mobile and locomotive cranes.

2.7 Others

The SGC-250 is equipped with 6 main hoist winches, 4 with 1.600m cable length and 2 with 2.000m cable length. The rope diameter is 50mm. Working speed is 20m/min on layer 1. 360° slewing at 6°/min.

Crane is powered with by 12 Caterpillars engines of 340 kW (Figure 5) each containerized in 6 power packs units. Emissions standards are according to Tier 4 final Stage 5.

Regarding wind speed limits, crane is designed to operate at 14 m/s in main boom configuration.



3. Crane Logistics & Assembly

3.1 Logistics

The SGC-250 has a containerized design in order to reduce overall mobilization costs and ease its transport to remote location. An equivalent of 280 trucks are necessary to transport the crane.

3.2 Assembly

The assembly of the SGC-250 requires two 600t crawler cranes, and several telescopic cranes from 100t up to 220t.

The overall process last 7 weeks in main boom configuration and 9 weeks with jib.

The assembly sequence is as follow:

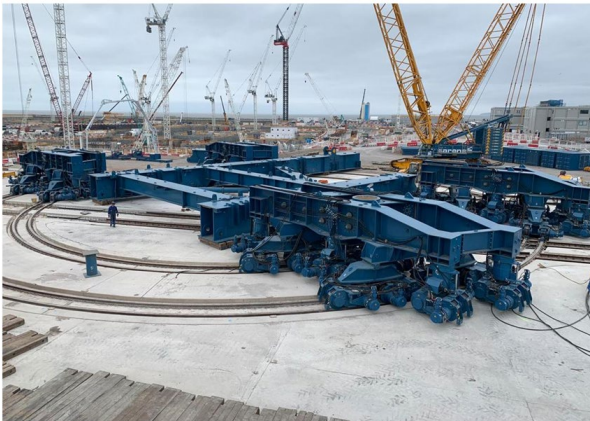


Figure 6: SGC-250 main base frame and bogies assembly

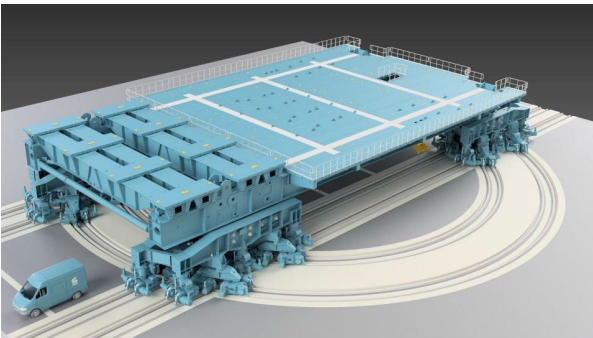


Figure 7: SGC-250 main deck lift and bogies installed

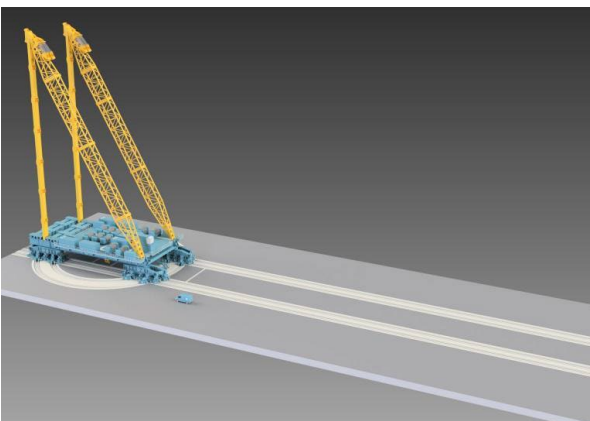


Figure 8: SGC-250 back mast, hoist and PPU are installed

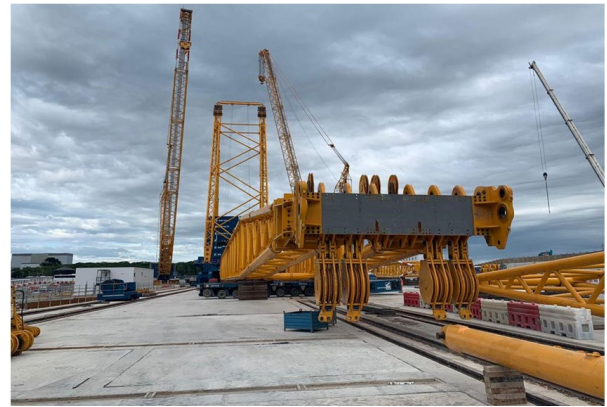


Figure 9: SGC-250 counterweights installed and boom assembled



Figure 10: SGC-250 boom up ready to lift

4. Innovation

One of the most unique feature of the SGC-250 is its ability to relocate the fully-rigged crane on site from one lifting position to another. This is not only unique to SARENS, but to the entire global crane industry. The crane has two sets of wheels: one for slewing 360° composed by 128 wheels and one for travelling composed by 96 wheels. The second set is hydraulically retractable and is pushed out whenever the crane needs to travel. (Figure 11)

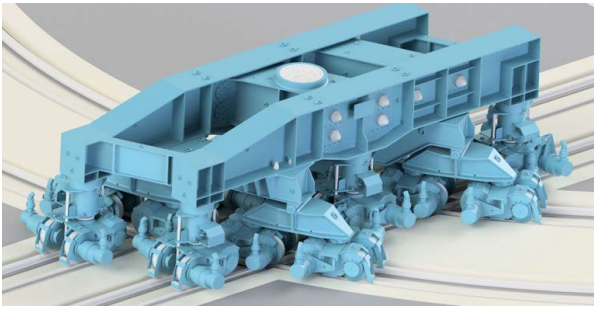


Figure 11: SGC-250 General bogies arrangement

The theoretical travelling speed is 180 meters per hour. During travelling operation, no slewing or lifting operation can be performed.

This innovation was key for the Hinkley point project. With several critical lifts to be executed in several locations, the relocation of the SGC 250 enables the client to maximise its construction schedule.

There are 3 different lifting location (Figure 12, 13 and 14) and a total of 6km of rails have been installed on site. The relocation operation, ring to ring, from lifting position A to lifting position B is lasting a total of 10 hours compared to several weeks in case the crane would have to be partially disassembled.



Figure 12: SGC-250 lifting locations at Hinkley site

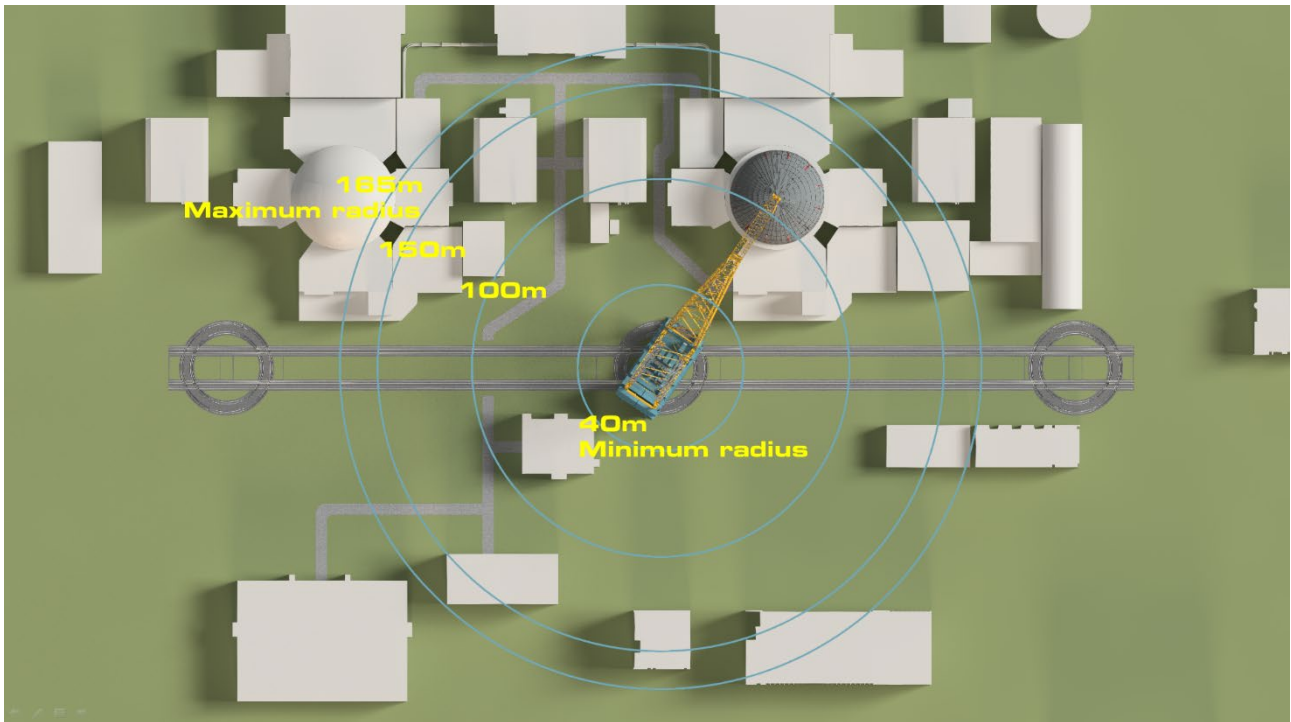


Figure 13: SGC 250 position and radius at Hinkley



Figure 14: SGC250 at Hinkley site



Figure 15: SGC-250 sizes comparison

The SGC-250 mission on Hinkley point is the installation of prefab concrete elements, steels structures and reactors equipment weighing from 50t to 1.150t and up to 165m radius on 3 different reactors. The SGC-250 is the unique piece available which combine the flexibility for relocation and the lifting capacity to execute those operations on the schedule imposed by the client.

Gratitude

We want to state that SGC-250 won the Innovation award at the Heavy Lift awards 2019 organized in Antwerp. As the judges declared “The SGC-250 was inspired by the increasing trend towards modularization and the move away from stick-built construction. It’s ability to relocate the fully-rigged crane on site from one lifting position to another is not only unique to Sarens, but to the entire global crane industry.”

This operation is under realization on behalf of JV of clients BOUYGUES TRAVAUX PUBLICS of France and LAING O'ROURKE CONSTRUCTION of the UK. SARENS wants to thank the trust and confidence showed by these companies for

awarding this job to us and pushing us for innovation.