D&C Engineers

Project: Hinkley Point C

"The focus and attention to constituents, batching start-up surveillances, continuous feedback and improvement, and overall batching consistency has delivered both the best operational batching plant in the UK but also production trends that really set the standard."

Peter Abel, Chief Materials Engineer, Bylor,
to Construction News (March 2018)

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""What we've provided in conjunction with D&C Engineers is a concrete production system that is one of the most accurate facilities of its type in the world, it is safe, efficient, effective, and requires minimal maintenance. It was extremely challenging to get right. Many different elements needed to be considered to produce concrete to the quality levels required, and the technology and equipment used to mix and batch it consistently, every time, had to be the best. We were convinced that we could provide all the equipment needed to create nuclear concrete from one source which, coupled with our experience and our innate understanding of the entire concrete production process, meant that we would be able to produce what is probably the finest-grade concrete the industry has ever seen."

Steve Peterson, ConSpare engineering director, to Construction News (March 2018)

Background

Hinkley Point C is the site for two nuclear reactors on the north Somerset coast in southwest England, due to be completed by 2025. The new power station will be a major contribution towards the UK's efforts to reduce carbon emissions, with the electricity generated saving nine million tons of carbon dioxide emissions in every year of the station's projected 60-year lifespan. The project is expected to employ 25,000 people over its build stage and, once operational, will create 900 jobs and provide seven per cent of the UK's low-carbon energy.

Challenges

In concrete terms, Hinkley Point C is one of the most complex and challenging projects the construction industry has ever seen, requiring approximately 1.8 million cubic metres of 'nuclear-grade concrete'. Where nuclear technology is involved, extreme precision is required to create materials to the highest specifications, and consistently. Working for Hanson Aggregates on behalf of contractor Bylor (a joint venture of Bouygues and Laing O'Rourke), we needed to build a plant capable of producing nuclear-qualified concrete with a standard deviation of two per cent or less, regulated by the Office for Nuclear Regulation. Achieving such a brief would be both time consuming and technically demanding.

D&C Engineers' role

When plans to build Hinkley Point C nuclear power station were first drawn up, D&C Engineers was contacted by contractors Hanson Aggregates and Bylor to help design mixing and batching equipment that would cope with the demands of the project.

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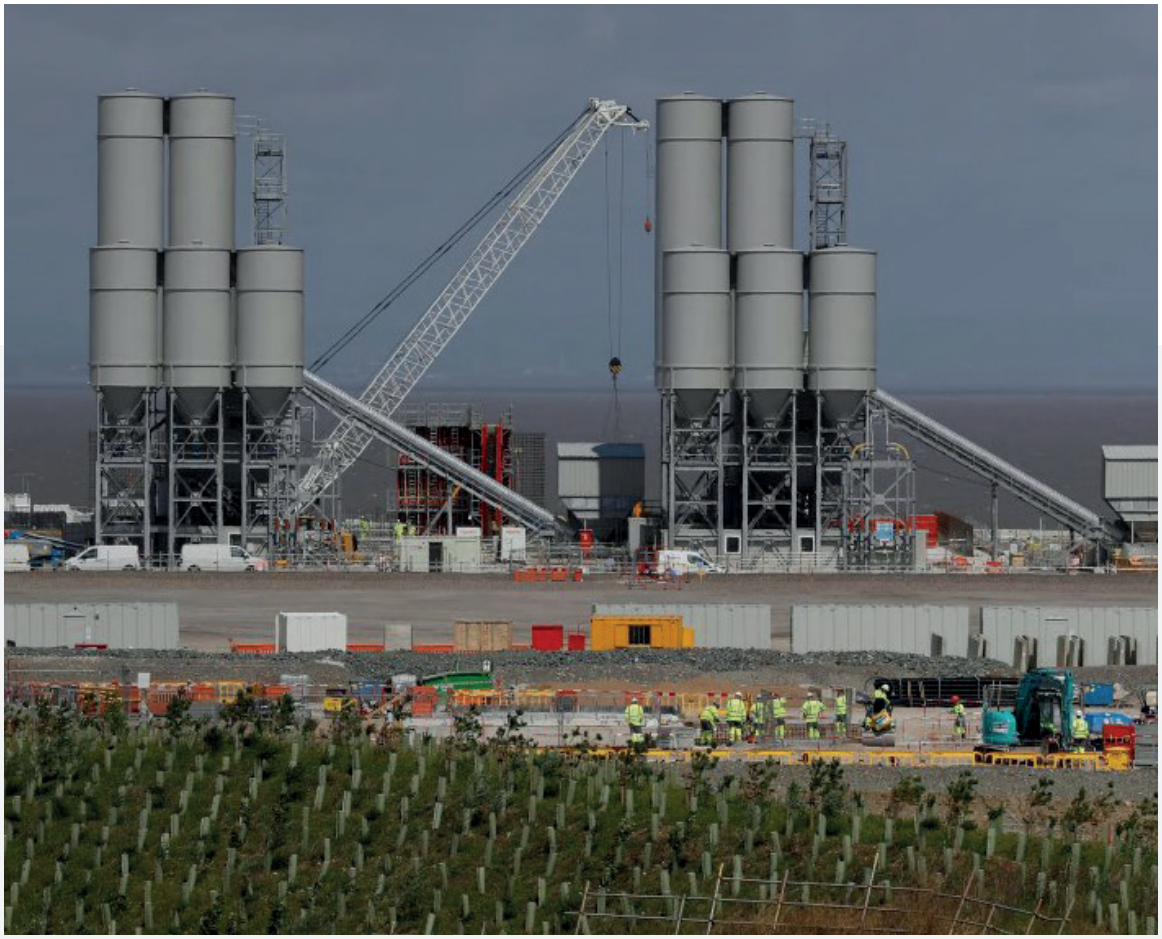
D&C Engineers has experience in every aspect of concrete production, which involves a series of interdependent processes. We pooled our expertise with that of international manufacturer TEKA via concrete production specialist Conspare.

Before the installation of the concrete plant at Hinkley Point C, we subjected ten unique concrete designs to rigorous testing. We were looking for the best performance in retention, hydration and durability. And then we pressure- tested the concrete continuously for three years.

ConSpare, D&C Engineers and Bylor determined that four concrete batching plants were needed to achieve the levels of concrete production needed to complete the Hinkley Point C development. D&C Engineers has worked carefully to ensure the plants are designed, manufactured and installed to the highest standards of health & safety. We have studied access to all areas, providing stairs and platforms around the plant to eliminate the need for vertical ladders on any level.

The large silo pictured below is for storing 5,000 tons of GGBS (ground granulated blast-furnace slag – a glassy, granular powder that can be added to concrete to enhance its lifespan, durability and strength). Behind the plant is a mass storage system for aggregate, which will be delivered by boat.



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TEKA TPZ 4500 Planetary Mixers were specified for each plant, based on their successful performance in similar-sized projects globally. TEKA's model incorporates a unique counter-rotational mixing action that meets the rigorous demands being placed on the equipment.

Having worked hard to ensure the right mixing action was deployed, our next step was to ensure that performance and consistency would be maintained in each batch over the long term.

We know worn mixing tools have a detrimental effect on mixing efficiency, so we upgraded heavy-wear parts to maintain mixing performance throughout the intense production stages.

Another challenge for projects of Hinkley Point C's complexity and scale is ensuring that mixers are kept clean. The nature of the mixing process means concrete residue accumulates in the mixer during every production shift. The build-up must be removed, otherwise mixing efficiency quickly diminishes.

We fitted the Walter wash system to each TEKA mixer. An automatic 12-minute cleaning cycle would use high-pressure water jets to effectively remove concrete residue from all mixing tools after every shift, allowing the mixers to maintain optimal mixing performance.

Yet another challenge is dust containment during the mixing process. We specified CDX dust extraction systems to filter displaced air and retain cement dust. This created a safer working environment on each mixer platform. It also helped to prevent waste and reduce environmental impact, as all cement would be returned directly to the mixer.

Recognising the high levels of logistical support required on site during busy construction phases, D&C Engineers' technical team worked closely with site staff to implement highly efficient maintenance support systems. We ensured the right parts were available from Conspare on site, where and when they were needed.

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Another challenge was to ensure the concrete formulation mix was correct. Bylor's attention to detail in identifying the right raw materials was exceptional, reflecting a determination to achieve the highest quality standards that echoes our own.

The cement is shipped in from France and each load is quality-tested. All the limestone is crushed to a specific grade, then washed and stored onsite in 57,000-ton aggregate bays.

All sand is stored in huge weather-protected aggregate storage bays.

The strictest of quality controls were put in place to monitor moisture levels in the raw materials to an accuracy within 0.2 per cent.

Hydronix microwave moisture probes have been used in every sand bin to continuously monitor moisture and enable batching control systems to compensate for any variation. Additional moisture control probes in each mixer manage the mixing process to ensure accurate homogeneity and monitor the concrete mix.

This essential equipment plays a key role in keeping the mix quality at nuclear standard.

All of the above steps have contributed to the successful installation of three batching plants at Hinkley Point C, and we have an order for a fourth now underway.

Testimonial

"To do nuclear quality concrete, everything has to pull together. Everything must work.

How do we deliver it? It's a one-team approach.

The ethos of Team Concrete has set and maintained a high standard of work. There's a real sense of pride on the plants. The teams really look forward to us coming to site, so they can tell us how their plant is performing, both technically and operationally.

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- Peter Abel, Chief Materials Engineer, Bylor.

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