NUCLEAR NEW BUILD · MARINE WORKS

Taking waste out of one of Europe's largest construction projects

A UK nuclear new build that will supply around 7% of the country's electricity. We provided continuous improvement as a service to its marine works, the tunnels that carry cooling water to and from the power station far beneath the seabed, working alongside site teams, subcontractors and the client to remove waste from work on the critical path.

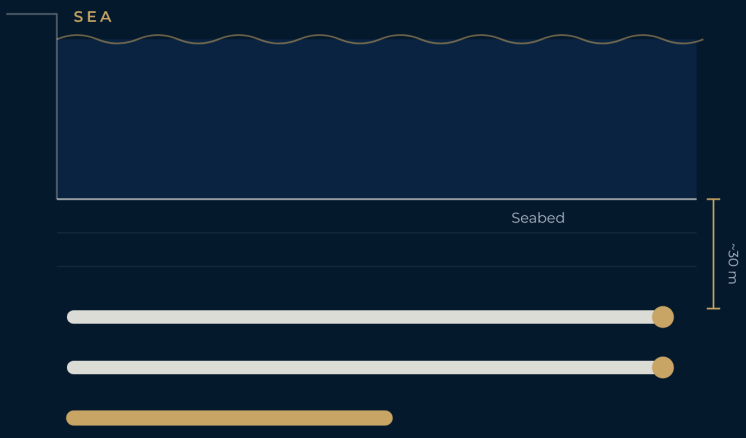
3.2 GW
capacity, about 7% of UK electricity

6m
homes powered, roughly

12,000+
people on site at peak

38,000
concrete segments lining the tunnels

~9 km
of cooling-water tunnels, up to 30 m beneath the seabed



Two intake tunnels, about 3.4 km each
Outfall tunnel, about 1.8 km

DIAGRAM NOT TO SCALE

CLIENT
Tier 1 contractor, marine works, UK nuclear new build

SECTOR
Nuclear and energy infrastructure

SERVICES
Continuous improvement as a service, efficiency reviews, lessons learned

ENGAGEMENT
2022 to 2025

OUR ROLE

Continuous improvement, embedded in the operation

Rather than a one-off review, we worked as an embedded improvement team. Effort went where the critical path and the potential savings were greatest, agreed with the operations team as priorities changed.

After the first improvement meeting with the client, we put a deployment plan in place, with templates to capture every improvement and lesson learned along the way.

How we worked

01	**See the work**	Observe processes at the workface and classify every step as value-adding, value-enabling or waste.
02	**Challenge the specification**	Question steps that add nothing for the client, with designers and the quality and materials teams.
03	**Trial before rolling out**	Prove changes through controlled trials, then update methods and train the teams.
04	**Plan the flow**	Pull planning, short-interval control and T-minus sessions to remove waste between activities.
05	**Learn and share**	Capture lessons learned and report progress to the client through a regular improvement report.

159 days of extra processing removed in 2023 alone. Work that added nothing the client valued was the single biggest source of waste we found.

In this pack

02	**Bolt pocket infilling.** Five times the output on a critical-path task	3
03	**Tunnel segment preparation.** 92% faster segment preparation, with 2.5 million litres of water saved	5
04	**Lifting efficiency review.** Getting more from a 104-person lifting operation, safely	7
05	**Tunnel handover.** Learning from one tunnel to de-risk the next	9

CASE STUDY 02 · BOLT POCKET INFILLING

Five times the output on a critical-path task

Every concrete segment lining the cooling-water tunnels is bolted in place, and every bolt pocket then has to be filled by hand. At the original rate the work would have run for months on the critical path. By removing waiting and extra processing, the team went from around 6,000 pockets a month to 30,000.

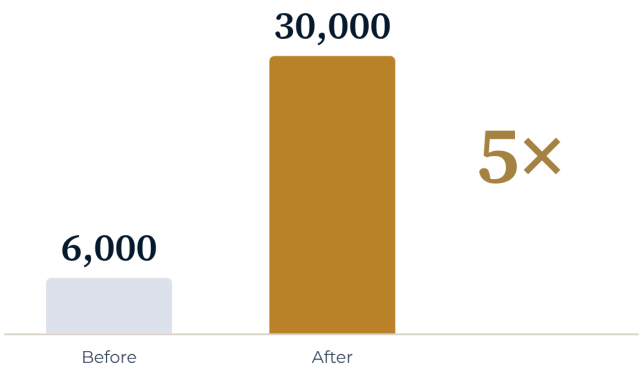
5×
monthly output, from about 6,000 pockets to 30,000

17 weeks
taken off the programme

£2.1m
in benefits captured

Bolt pockets filled per month

Before and after the Lean intervention



IMPROVEMENT 1 · WAITING

Pre-wetting moved to the previous shift

112 working hours a week recovered and 4 weeks off programme

IMPROVEMENT 2 · EXTRA PROCESSING

Spray-on curing compound replaced covers

51.8 days of labour saved, with 24 miles of tape and 2,430 m² of plastic sheet no longer needed

The challenge

Bolt pocket infilling is repetitive, manual work: remove the temporary bolt, prepare and wet the pocket, fill it with mortar and let it cure. With more than 127,000 pockets still to fill, it sat squarely on the critical path.

The team was averaging about 1,500 pockets a week. At that rate, finishing would have taken months longer than the programme allowed.

How we tackled it

We mapped the process step by step, classifying each step as value-adding, value-enabling or non-value-adding. Two sources of waste stood out.

Waiting: pre-wetting moved to the previous shift

Each pocket must be wetted for two hours before filling to meet the manufacturer's specification. Only two to four people were needed for this, so the rest of the finishers waited. Now the previous shift removes bolts, cleans and pre-wets the pockets, so the next shift starts filling straight away. That recovered 112 working hours a week for an eight-person team and filled 1,120 more pockets a week.

Extra processing: a spray-on curing compound

Every filled pocket was covered with plastic sheet and taped down to help it cure, then uncovered later. A curing compound does the same job with nothing to fit or remove. Across the remaining 127,000 pockets that saves 51.8 days of labour and gains 120 value-adding hours a week.

THE RESULTS

- Monthly output rose from about 6,000 pockets to 30,000, a 400% gain in efficiency.
- The bolt pocket programme came down by 17 weeks.
- £2.1m in benefits captured, including a forecast £1.4m from the shorter programme.
- 24 miles of masking tape and 2,430 m² of plastic sheet no longer bought, fitted or thrown away.

CASE STUDY 03 · TUNNEL SEGMENT PREPARATION

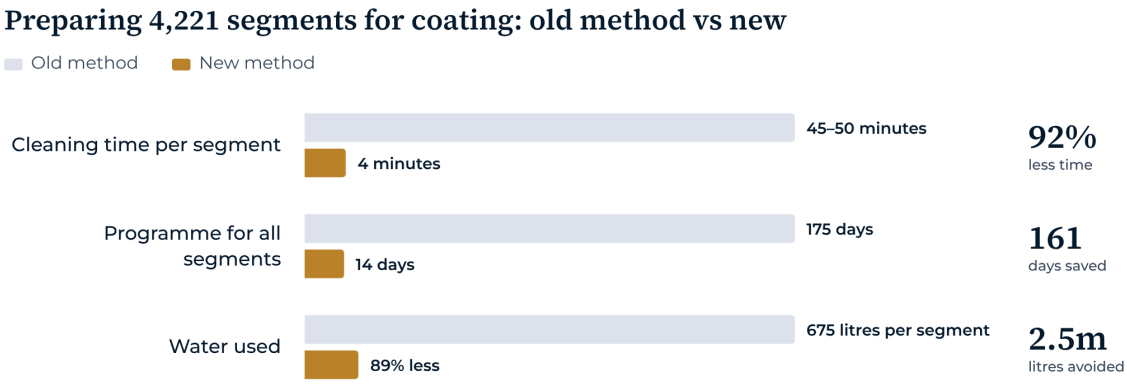
92% faster segment preparation, with 2.5 million litres of water saved

Before 4,221 tunnel segments could be coated, each one had to be high-pressure cleaned and, by design, taped. We questioned both. A new cleaning method achieved the same finish in a fraction of the time and water, and the taping step was removed altogether.

92%
less time to prepare each segment

2.5m litres
of water avoided, 89% less

£2.5m+
expected savings across both changes



The challenge

Ahead of thick coating, every segment in the cooling system had to be cleaned at 340 bar to remove dust, oil, grease and surface laitance. Each took 45 to 50 minutes and around 675 litres of water, and the wastewater then had to be removed from the tunnels.

The design also called for scrim tape on segments in the tunnel invert: a manual step that added time and created a risk of non-conformance.

CASE STUDY 03 · OUR APPROACH

How we tackled it

We observed both processes during off-site trials, then worked with the designers, subcontractors and materials team to challenge them.

Challenge the specification

We could not see what value the scrim tape added for the client, and it raised the risk of non-conformance and rework after coating. We made that case to the designers, and the step was removed from 1,477 segments.

Trial a better method

Through controlled trials with the subcontractor and materials team, we changed the cleaning method and equipment. The new approach reaches the same surface standard in about four minutes per segment.

THE RESULTS

- Preparation time cut by 92%, from 175 days to 14 across all 4,221 segments.
- Water use cut by 89%, avoiding around 2.5 million litres (enough to fill an Olympic swimming pool), with 89% less wastewater to remove from the tunnels.
- At least 10 weeks off the programme, reaching the value-adding coating step sooner.
- Removing the scrim tape saved 525 hours (65 working days) of programme and a non-conformance risk.
- Expected savings of around £2m from the new cleaning method and more than £550K from removing the tape.

CASE STUDY 04 · LIFTING EFFICIENCY REVIEW

Getting more from a 104-person lifting operation, safely

Subcontract costs were running 10% above plan, and the lifting operation was one of the largest teams on the job. We were asked to find where it could work more efficiently without affecting safety, quality or delivery. Working strictly within the client's lifting standard, we identified up to £4.6m a year of efficiency opportunity.

104
people in the lifting operation

3
efficiency improvements, all within the lifting standard

£4.6m
a year of efficiency opportunity identified

Three ways to make lifting more efficient

All within the client's lifting standard, with no change to safety

SUPERVISION
Organised around clear sight lines
£1.1m
a year

TRAFFIC CONTROL
Remote barriers with one marshal per area
£0.5m
a year, plus a physical barrier around lifting areas

LIFTING WINDOWS
Lifting capacity follows the critical path
£3m
a year

£4.6m a year of efficiency opportunity identified. A first improvement was made straight away, worth around £257K a year.

The challenge

The lifting operation was around 104 people, organised into three gangs at each tunnel location across a shift pattern. Every role was set by the client's lifting standard, which governs supervision and limits the dual roles that are normal on other sites.

Gang sizes were fixed regardless of how busy each location was. In quieter areas, skilled people spent time waiting for lifts while the critical path set the pace elsewhere.

CASE STUDY 04 · OUR APPROACH

How we tackled it

We reviewed the lifting standard line by line, observed live operations at two tunnel locations and worked through each role with section managers. The aim was to match lifting resource to the work, and every proposal had to stay within the standard.

Supervision

The standard requires a second lift supervisor only when one cannot practicably see both the slinging and the landing. From a raised viewing point, one supervisor could see both, so supervision could be organised around clear sight lines rather than a fixed pair at every lift.

Traffic control

Marshals were already covering for each other during breaks without losing control of traffic. Remote-operated barriers, controlled by one marshal per area, would add a physical barrier around lifting areas and free marshals for other duties.

Lifting windows

One gang would follow the critical path while a second worked planned lifting windows across the quieter locations, so lifting capacity goes where the work is instead of waiting where it isn't.

THE RESULTS

- Up to £4.6m a year of efficiency opportunity identified, with no departure from the client's lifting standard.
- Around £1.1m a year from supervision, £0.5m from traffic control and £3m from planned lifting windows.
- A first improvement was made straight away, worth around £257K a year.
- Physical barriers proposed to strengthen traffic protection around lifting areas.
- A clear, evidence-based plan the lifting team could adopt in full or in part.

CASE STUDY 05 · TUNNEL HANDOVER

Learning from one tunnel to de-risk the next

Each cooling-water tunnel has to be stripped of temporary services, repaired and handed over to the client section by section. The first handover took 90 days, and the larger tunnels risked taking twice as long, with contractual penalties at stake. We captured what the team had learned and turned it into a plan for the next tunnel.

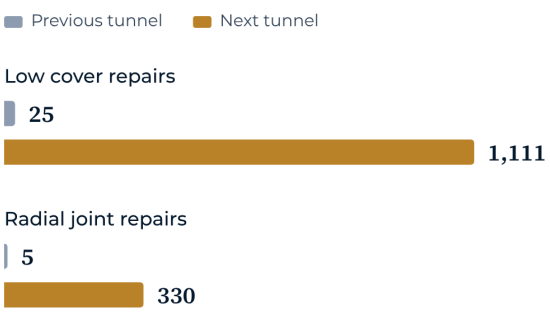
149 of 152
non-conformance reports shown to be closable

7–9 days
of engineering time freed

12 weeks
fixed window for the next handover

The next tunnel's repair profile

Repairs logged, previous tunnel vs next tunnel



149/152 non-conformance reports shown to be closable under the standard repair procedure

7–9 days of engineering time freed for defect logging and snagging

74 hrs saved with disposable templates for low cover repairs

The challenge

After tunnelling, each tunnel is stripped of the services that supported construction, then scanned and repaired before the client's surveillance and delivery teams sign it off. The first, shorter tunnel took 90 days to hand over, and the two larger tunnels risked taking up to 180.

The final tunnel had a fixed window of around 12 weeks and a very different repair profile, with low cover repairs up from 25 to 1,111 and radial joint repairs up from 5 to 330.

CASE STUDY 05 · OUR APPROACH

How we tackled it

We ran two lessons-learned workshops, one internal and one with the client's surveillance and delivery teams. We observed strip-out, repairs, snagging and handover over several days, and analysed scan and repair data for the next tunnel.

What worked

Strong collaboration with the client, early engagement with the surveillance team and lessons carried over from the previous tunnel had already improved section handovers.

What held the team back

Slow defect logging, resources split across areas with no logical sequence, little time to plan between tunnels, snagging that relied on repeat inspections and limited hands-on training.

Where the risk sat

About 75% of the next tunnel's repairs were in the invert and front-loaded. One platform zone had held 1,656 recorded issues, against 121 across the rest of the tunnel.

THE RESULTS

- 149 of 152 non-conformance reports, covering 2,108 defects, were shown to fall within the standard repair procedure and could be closed, freeing 7 to 9 days of engineering time.
- Disposable templates trialled for low cover repairs save about four minutes a segment: around 74 hours across the tunnel for about £1,500 of material.
- Pre-start works planned for the gap before handover, including moving services to reach the repairs behind them.
- Resource plans built around where the repairs actually are, with shorter sections for more frequent sign-off.
- A dedicated construction manager recommended to strengthen planning, team structure and programme control.

ALSO DELIVERED

More improvements from the programme

Concrete crack repairs

Observing an injection repair process showed only 22% of the time was value-adding. A curing trial proved both resin coats could go on the same day, so each repair could finish about 50% faster.

Single point inspection

A new inspection and test plan, developed with the quality team, released four site engineers from inspection duties, with expected savings of more than £200K.

Lessons-learned library

Every improvement was written up as a lesson learned, so other projects could find, remove and control the same wastes.

START A CONVERSATION

Work on the critical path that could flow better?

We help construction and manufacturing organisations find and remove the waste that slows delivery, at any scale. Let's talk about where yours is.

www.cropperadvisorygroup.com

CAG

About Cropper Advisory Group

Cropper Advisory Group helps construction and manufacturing organisations improve efficiency and effectiveness through operational excellence. It is led by Caio Cropper, an operational excellence leader with more than 15 years' experience across construction, manufacturing and complex infrastructure programmes.

Client and project details have been anonymised. Project scale figures are from public sources; results are drawn from the engagement's own reporting, and expected or potential savings are labelled as such.