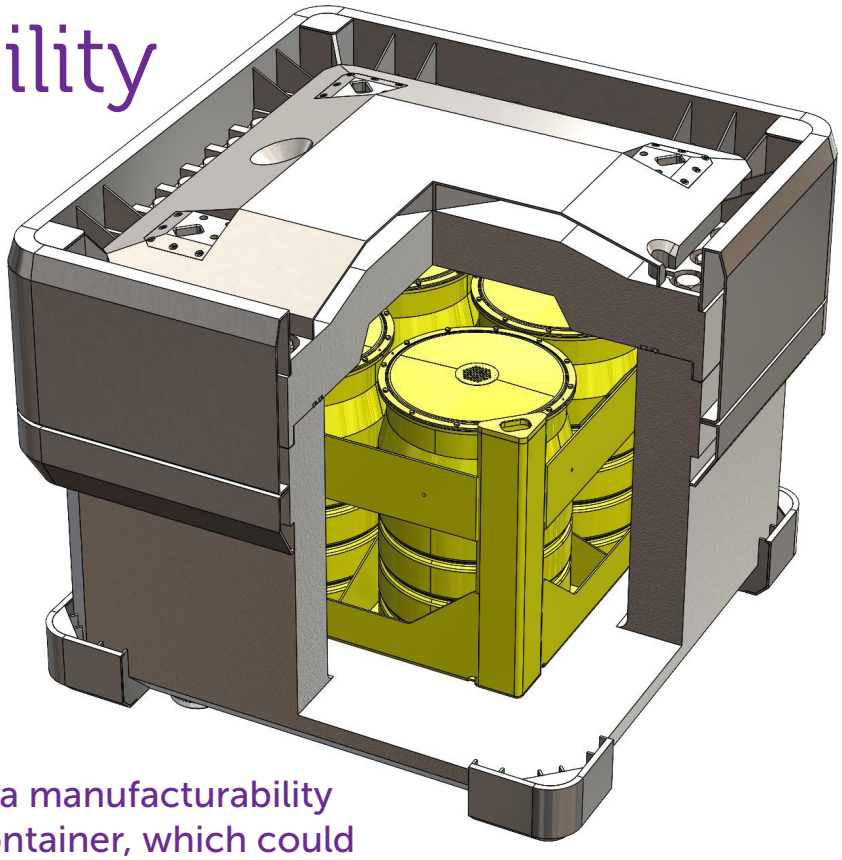
Case study

NUCLEAR AMRC
ADVANCED MANUFACTURING RESEARCH CENTRE

Manufacturability review saves costs and time for Nuclear Transport Solutions



The Nuclear AMRC has completed a manufacturability review of a new waste transport container, which could significantly reduce the costs of producing a fleet of containers for the UK decommissioning programme.

The review was commissioned by Nuclear Transport Solutions (NTS), part of the Nuclear Decommissioning Authority (NDA).

NTS is developing a new version of its standard waste transport container (SWTC), a large and complex box made of cast martensitic steel, to safely carry a variety of canisters of radioactive waste from storage sites to the UK's proposed Geological Disposal Facility. NTS plans to source a fleet of up to 150 such containers, to support the NDA's strategy for long-term disposal of radiological waste.

"There is sufficient resource within NTS and the wider supply chain to complete the detailed design of the package," says Sean Perry, lead design engineer in the NTS design and analysis team. "However, there will be significant challenges associated with the package substantiation, which involves a prototype manufacture followed by regulatory accident condition testing.

"Furthermore, there is only one UK company that has been identified as having the capability to complete the full package manufacture. This is a clear risk to the ability to deliver the package fleet, and will require strategic decisions to be made by the NDA to mitigate."

The Nuclear AMRC carried out a manufacturability study of NTS's initial design in 2016, which highlighted a number of areas where the design could be improved before it entered production.

After a comprehensive redesign and development review, NTS asked the centre for a full manufacturability review of the designs for its latest version, dubbed SWTC-255.

This kind of design for manufacturing study can significantly reduce the cost, time and difficulty of introducing new products, says David Anson, principal engineer at the Nuclear AMRC.

"It's ultimately much easier, much cheaper and much quicker to take the time out to have the design reviewed by some people who are independent but skilled in the required technical areas," he says.

"An end-to-end three-month study can save huge amounts of time in getting a new product approved, as we can catch things which would be very difficult or even impossible to manufacture, and suggest improvements which will still meet the design intent."

> "The results of the manufacturability assessment have been invaluable in progressing the SWTC-255 design."
> Sean Perry, Nuclear Transport Systems

The review investigated the full range of required manufacturing processes including casting, machining, fabrication, welding and metrology, with the team making a series of recommendations in each area.

NTS had previously reviewed the container design using finite element analysis (FEA) to ensure it met requirements, but the project team identified a number of manufacturing challenges and potential changes to improve manufacturability.

"The container met the design intent for crash survivability, but the drawings were not yet production-ready so we were able to suggest design changes to make it easier and cheaper to manufacture. The client can then go back to their team and make sure that the design intent is still met," Anson explains.

"For example, just changing some of the internal radii in the box made the machining less challenging. And while the initial FEA was used to design the shock absorbers which would protect the load in the event of a crash, we showed that they were nearly impossible to manufacture as a solely welded construction. We're now looking at casting each of the complex corners, and then joining those together by welding."

To ensure that all aspects of manufacturing were covered, Anson's team drew on specialist expertise from other research organisations based on South Yorkshire's Advanced Manufacturing Park. Design specialists from the University of Sheffield AMRC examined the container design for potential issues which could affect manufacturing or handling, while experts from Castings Technology International focused on the casting of the main container body and the main lid.

The Nuclear AMRC was also asked to estimate costs and lead times for a prototype container and bulk production, and to review the UK supply chain's capabilities for producing the container in the required numbers. The team drew on the centre's company database to identify potential UK suppliers with the capabilities to cast and machine the container body and lid.

After expert review of all the different aspects of the design, the Nuclear AMRC held an all-day workshop in November 2022 with NTS and the technology specialists to discuss the proposed changes.

"We all felt the benefit of having everyone, including the client, in the room to review the design," Anson says. "Having the technical experts bouncing ideas off each other is great for getting instant feedback from the client and sorting any issues."

"The results of the manufacturability assessment have been invaluable in progressing the SWTC-255 design," Perry says. "A number of specific activities will be completed in line with recommendations from the study, which should accelerate package development and reduce the number of iterations we need to assess. The cost and time estimates will also be used to inform strategic decision-making about engaging the supply chain for procurement of the packages once the design is complete."

"NTS used us at just the right time in their process for us to make a positive contribution and save them significant time and money," Anson concludes. "This project should have paid for itself just in producing the prototype, with many millions of pounds saved when producing the fleet of containers."

nucleartransportsolutions.com

May 2023

NUCLEAR **AMRC**

To find out how the Nuclear AMRC can help your business:

namrc.co.uk

enquiries@namrc.co.uk 0114 222 9900

Nuclear AMRC, University of Sheffield,
Advanced Manufacturing Park, Brunel Way, Rotherham, S60 5WG

CATAPULT High Value Manufacturing

University of Sheffield