

Shaft Cutting Station

Client: UKAEA



Remote Handling

Aims and objectives

The project brief was to design, manufacture, test, install and commission remotely operated size reduction equipment in the Active Cells of the European Spallation Source (ESS) in Sweden. The objective of the ESS Active Cells is to size reduce, store and enable subsequent shipping of radioactive material that will be produced as a by-product of the ESS research operations.

Cyclife EDF Group - Subsidiaries



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The client

The ESS is one of the world's largest scientific and technology infrastructure projects. It is funded by a European Research Infrastructure Consortium (ERIC), to fulfil an international requirement for a high-energy neutron source for scientific and engineering research.

The United Kingdom Atomic Energy Authority carries out fusion research in the UK on behalf of the UK Government and manages various projects, including the JET fusion project on behalf of the European Union.

The UKAEA has been engaged by the UK's Science and Technology Funding Council to supply significant parts of the ESS Active Cells, as part of the UK's in-kind contribution to the ESS ERIC. The Remote Applications and Challenging Environments (RACE) team at UKAEA are leading the delivery of the ESS Active Cells.

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Project overview

The ESS Active Cells will size reduce (predominantly by cutting), store and enable subsequent shipping of radioactive material that will be produced as a by-product of ESS research operations. Human access to the Active Cells is highly restricted; all operations and maintenance must be undertaken remotely using robotic handling systems.

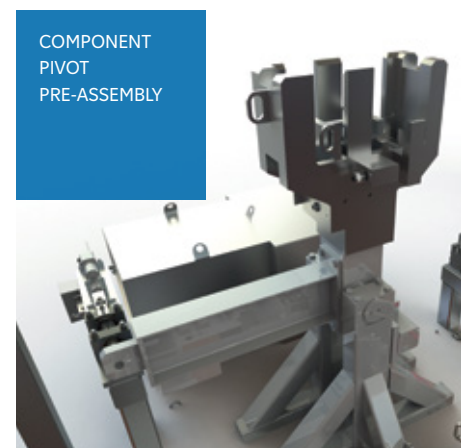
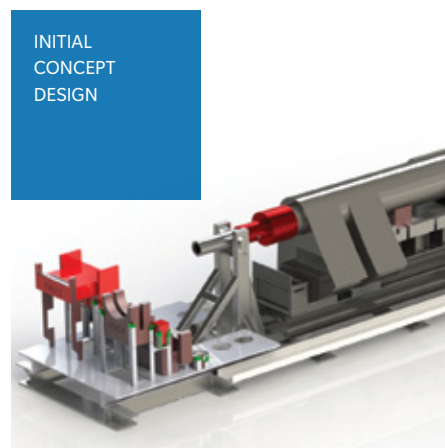
In order to size reduce by-product, a cutting station was required that can receive, support and size reduce all variations of by-product created.

Cyclife Aquila's Shaft Cutting Station resides in the ESS Active Cells and receives a range of activated components associated with the Target Station monolith. The system allows these components to be received and orientated for cutting and size reduction operations. The equipment allows the components to be safely supported and cut in a series of predefined locations. The sized reduced sections are placed in a waste transfer container and removed remotely for disposal using the 115 Tonne capacity rail-mounted Waster Transfer System.

Scope and Project Solution

The project scope included the detail, manufacture, works testing, installation and commissioning of the Shaft Cutting Station in Lund, Sweden.

Aquila's solution was developed to fulfil various equipment requirements, including operating environment, radiation hardness, size reduction, safety, reliability, availability and maintainability.



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Equipment Description

The Shaft Cutting Station comprises:

- Diamond Wire Cutting Assembly
- Static Receipt Bed
- Component Pivot Assembly
- Storage Rack

Diamond Wire Cutting Assembly

In collaboration with its supply chain, Aquila employed proven Diamond Wire technology to fulfil size reducing requirements, whilst allowing the equipment to be fully remotely operated. The Diamond Wire cuts each component by inducing downward pressure as the component is held on a Static Receipt Bed.

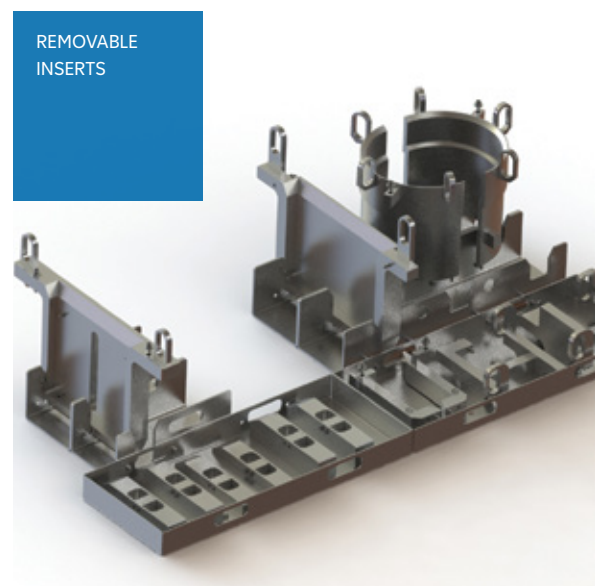
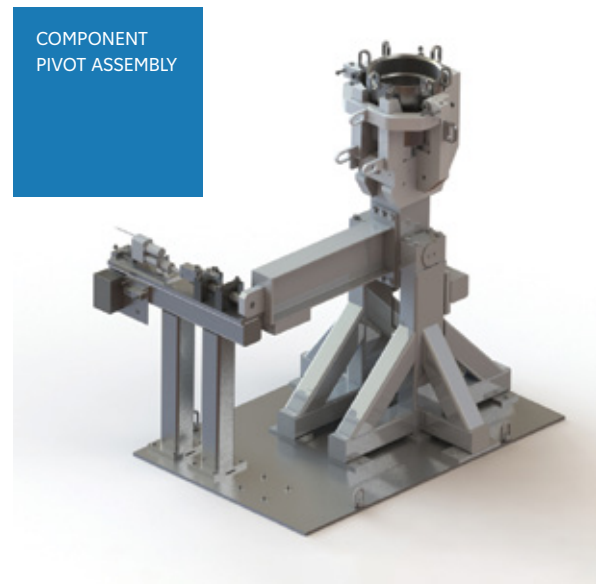
Owing to the operating environment and with human access prohibited, the Diamond Wire Cutting Assembly was designed to be a line replaceable unit (LRU), meaning sub-components could be easily replaced and maintained individually of each other. This avoided the need to replace the entire Assembly, which will have added to operating times in the ESS Active Cells.

We proposed the use of Diamond Wire to UKAEA because it de-risks various elements of the cutting process: it minimises and helps prevent the spread of airborne contamination. It also avoids the need for water-cooling during the cutting process, negating a need for water supplies to be held within the Active Cells.

Static Receipt Bed

A receipt assembly was required in order to hold components and position these under the selected cutting technology. Our design consisted of a Static Receipt Bed, avoiding the need for any moving parts. Instead, the Diamond Wire Assembly is relocated by the in-cell robotic handling system, along each component to undertake individual cuts.

The Static Receipt Bed is designed to accommodate removable inserts and stands, which help support individual components which vary in size and shape.



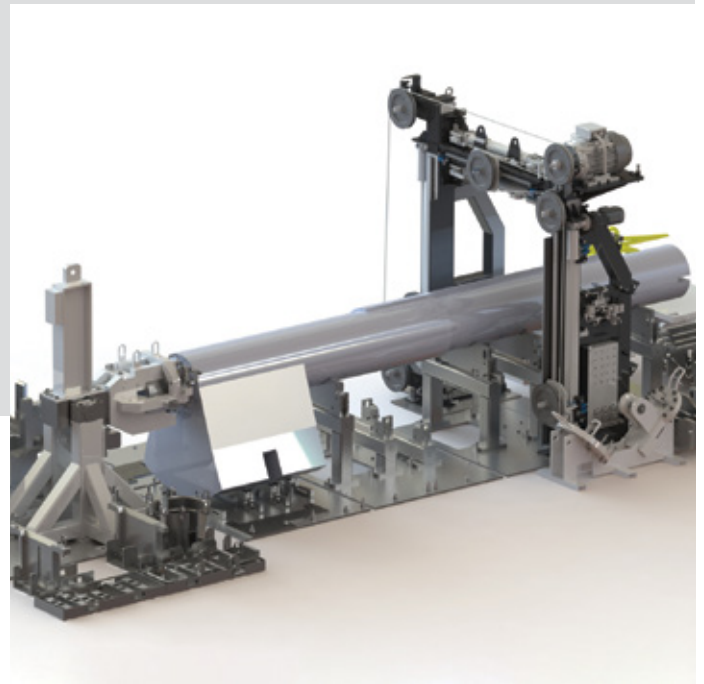
Component Pivot Assembly

The Component Pivot Assembly consists of a fabricated, welded and mechanically fastened, mild steel stand which is mounted directly to a base plate bolted directly to the Active Cell floor embedments. The Pivot is at a fixed height and position and consists of a pin upon which a pivot tool will rotate. The pivot tool can be locked in the vertical orientation. Locking the pivot tool in the vertical orientation will provide a fixed receptacle for the components and will assist during component loading.

Attached to the pivot tool are stainless-steel interchangeable component receivers. Each component for size reduction has a dedicated receiver which is used to accept and locate the component onto the pivot tool when presented in the vertical orientation.

Storage Rack

When not in use, the removable inserts used on the Static Receipt Bed and the interchangeable component receivers from the Component Pivot Assembly are stored in a Storage Rack located within the Shaft Cutting Station space envelope. All elements were designed with incorporated lifting features suitable for use with the in-cell remote handling equipment.



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Summary

Cyclife Aquila was engaged by UKAEA to deliver the full turnkey solution. Through collaboration and pragmatic working practices we developed a cost-effective solution for the ESS. This project is a good example of innovative working to employ proven industrial technology into a more challenging environment.



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