

INDUSTRY LIVE BRIEF

Thank you for supporting our undergraduate students with a Live Brief. This form will help us capture the key information for your proposed challenge and ensure a rewarding experience for the students involved.

1. Organisation / Contact Details

- **Organisation name** : Supercritical Solutions LTD
- **Your name** : Antoine Zaarour
- **Job Title / Role** : Principal Mechanical Design Engineer
- **Email Address** : antoine.zaarour@supercritical.solutions
- **LinkedIn Profile (optional)** : https://www.linkedin.com/in/antoine-zaarour-ceng-mimeche-a070a485?utm_source=share&utm_campaign=share_via&utm_content=profile&utm_medium=android_app

2. Title of the Challenge

A short, clear title (e.g. “Redesigning a Modular Bike for Urban Use”)

Designing an assembly and maintenance frame for Supercritical’s large scale electrolyser vessel

3. Summary of the Brief

A short description (250 – 300 words) of the real-world engineering problem you would like the students to work on.

This project focuses on developing a conceptual assembly and maintenance frame for a large-scale electrolyser module. The outer vessel houses several internal sub-units (“black boxes”), designed for efficient replacement, inspection, and servicing. At a high level, the process involves securing the vessel, lifting and positioning the internal units, and enabling disassembly without compromising safety, alignment, or component integrity.

A conceptual frame will be proposed to support this process. The frame design prioritises ergonomics, ensuring operators can safely access and manipulate heavy components, while reducing manual strain. Safety features, such as interlocks and shielding, will mitigate risks during lifting and positioning. Automation elements—like guided lifting systems or robotic assistance—will improve repeatability, reduce error, and shorten turnaround time during both assembly and maintenance cycles.

The project plan will include mapping of assembly/disassembly workflows, conceptual frame design, and an evaluation of tooling requirements. Risks to address include component misalignment, equipment handling hazards, and delays from non-standardised interfaces. Quality considerations will centre on ensuring precision fits, traceability of maintenance activities, and robustness of the rig to repeated use.

The outer vessel measures 870 mm internal diameter × 3000 mm internal height (1100 mm OD × 3500 mm total height) and weighs 13 tons. Housed within the vessel are internal sub-units, collectively forming a “black box” assembly measuring 550 × 550 × 2000 mm in height, with a combined weight of 3 tons. These sub-units are attached to the vessel lid, and must be safely lifted, positioned, and removed during assembly and maintenance cycles.

4. Background or Motivation

What is the industry context or reason behind this challenge?

Delivering such a frame would bring significant value to Supercritical. It would enable safe, reliable, and scalable module assembly, while also reducing downtime during servicing. By embedding ergonomics, safety, and automation into the design at an early stage, the project supports long-term cost savings, workforce safety, and operational efficiency. Furthermore, it contributes to positioning Supercritical as an industry leader in designing electrolyzers that are not only high-performing but also maintainable and service-friendly at scale.

5. Constraints/Special Considerations

Any key requirements such as sustainability, manufacturing, cost, regulations, or customer needs?

Consider vertical vs horizontal assembly/maintenance option. Vertical assembly relies on enough clearance and ceiling heights, reflect on standard workshop ceiling heights. A horizontal assembly option would focus on assembling the internals on a cradle/skid, using restraints to get the parts safely into the vessel, and provide stability during the rotation operation to reach vertical final assembly.

6. Presentation and Acknowledgement

Do you consent for the student work on this brief to be presented at our Future Skills Day (December 2025) or shared internally within the University (with appropriate credit to you/your organisation)?

☐ Yes

☒ Yes, but internal use only

☐ No

7. Are you planning to attend the Future Skills Day on the 10th of December between 10am – 2pm at the Townhouse, Penrhyn Road Campus, Kingston University London?

☐ Yes

☒ Maybe

☐ No