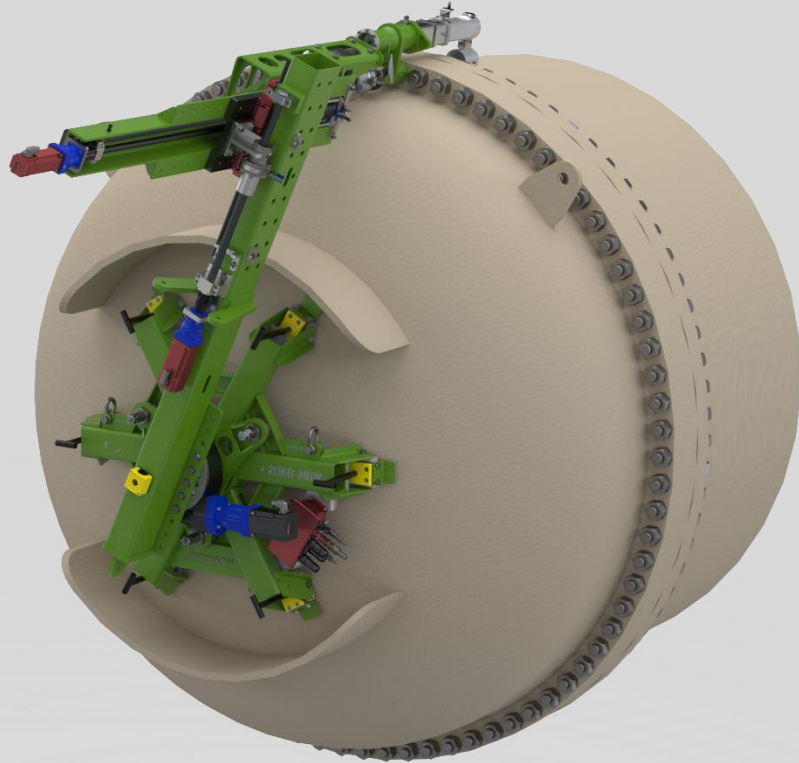
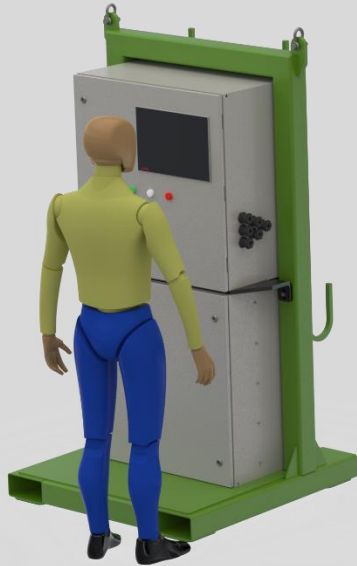




# Meet the Automated Bolting Robot "Boltron"

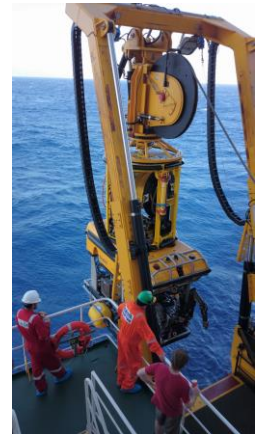


# TMT – Australian Technology Developer



TMT Delivers;

- Leading-edge harsh environment systems
- High reliability system engineering
- Advanced automation and remote-control systems
- Specialised user interfaces and diagnostic tools
- Bespoke subsea system design and customization
- Complete communications and data management
- In-house structural, mechanical, hydraulic, electrical, electronic and software design



# What's the issue with a Bolted Flange?

- They are difficult to manage in Maintenance and Shut downs.
- They are ubiquitous in: Mining, refining, energy and heavy industrial infrastructure with heat exchangers, piping, tanks, pressure vessels and process equipment,
- Bolted flanges between 500mm and 4000mm in diameter with either single sided or double sided bolts/nuts,
- Harsh conditions including high temperatures, acidic and caustic environments, precipitation, dust and fluids,
- High torque requirements, large diameter bolts, high volume of bolts/nuts
- Costly, risky and time-consuming bolting activities, often directly affecting rate of production,





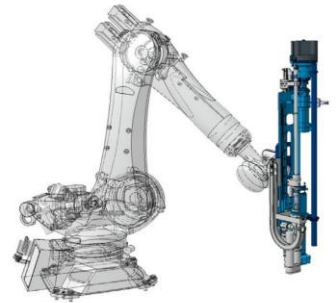
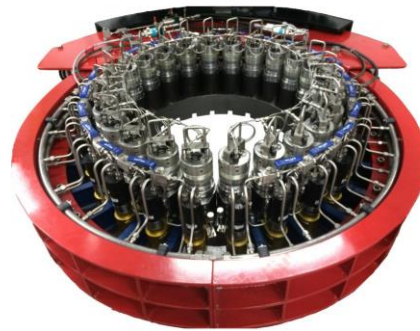
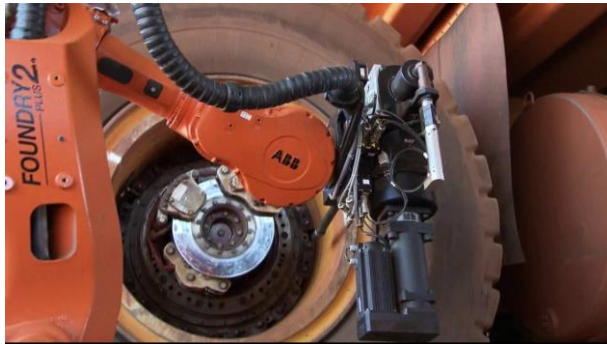
# Why do we need Bolting Automation?

- Manual bolting operations are time consuming and costly,
- Manual operations typically require expensive and time-consuming scaffolding,
- Operator safety incidents are frequent, expensive and can be difficult to prevent,
- Quality of bolting activities can vary significantly with equipment, processes and operators,
- Operator environment is often harsh with high temperatures, high noise, chemicals and working at heights,
- Suitable operators to handle and operate heavy bolting equipment are not always available,
- Regulatory restrictions to operator types that must be able to undertake the work are becoming problematic.



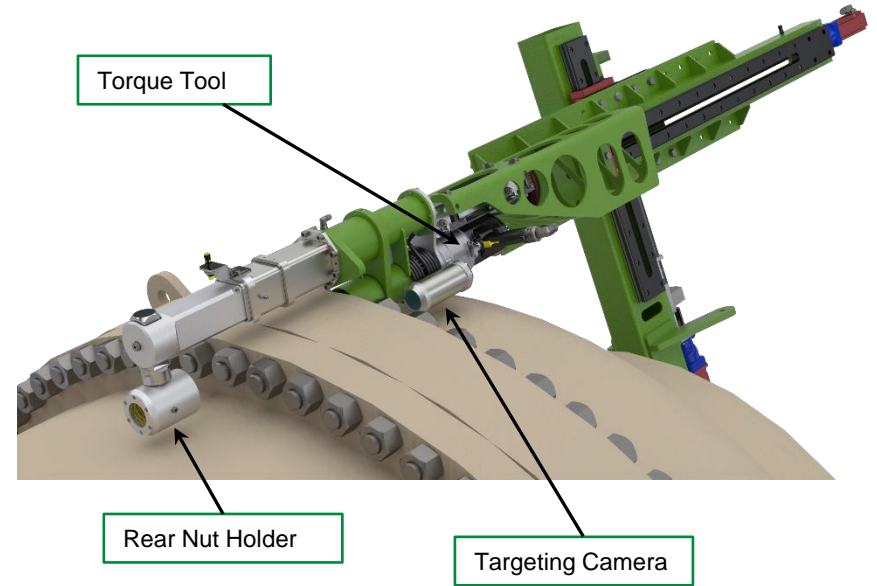
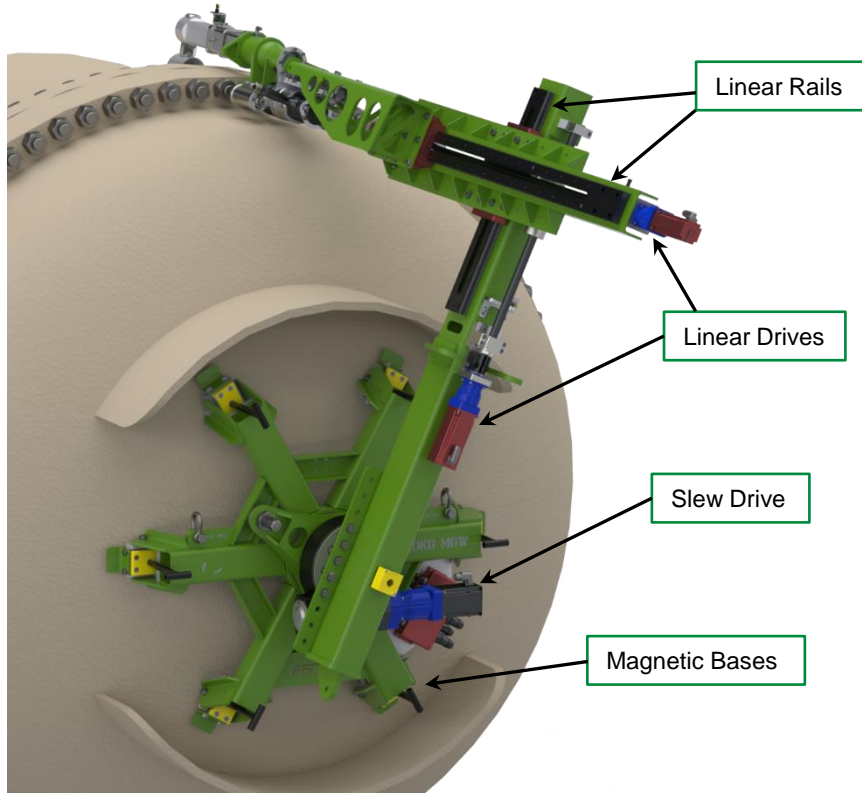
# What's in the Market already?

- Adapted industrial robots have a limited power to weight capacity compared to size.
- Typical Robot construction materials are not resistant to industrial process chemicals
- Area geometry limitations drives the need for small footprint solutions.
- Current systems are not mobile friendly and not dynamically adaptable to size and collision constraints.
- The graphical user interfaces can be challenging to navigate.



Bolting system x-gun with robot

# Solution: Boltron the Automated Bolting Robot



# Key System Features

TMT's Flange Bolting Robot Includes the following features;

- Automated operation
- Adjustable frame for different flange PCD's,
- Multi-speed pneumatic torque gun
- Guidance camera technology
- Programmable staged torquing and bolting patterns
- Robust, dust and chemical resistant system design

## OPTION

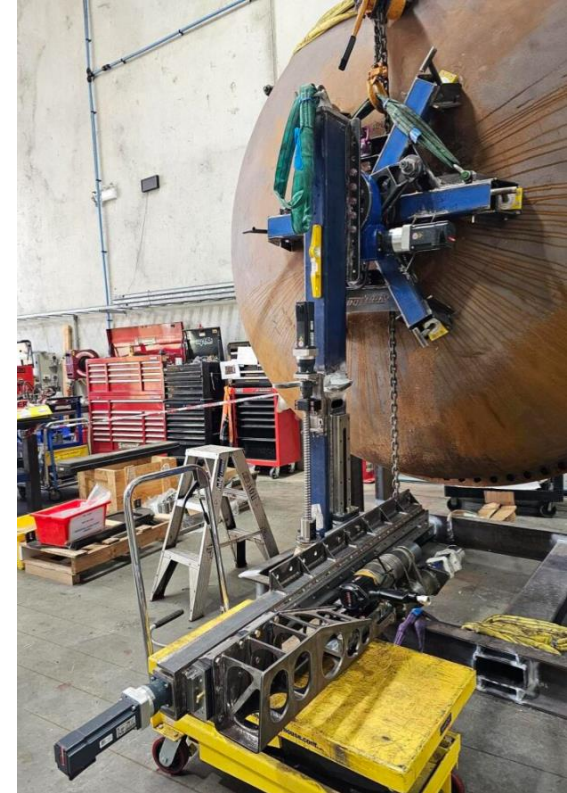
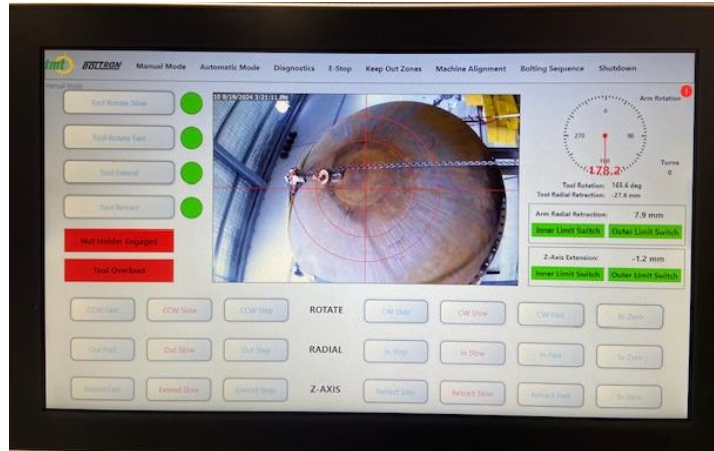
- Machine vision guidance – Auto setup, obstruction detection, flange calibration, collision avoidance





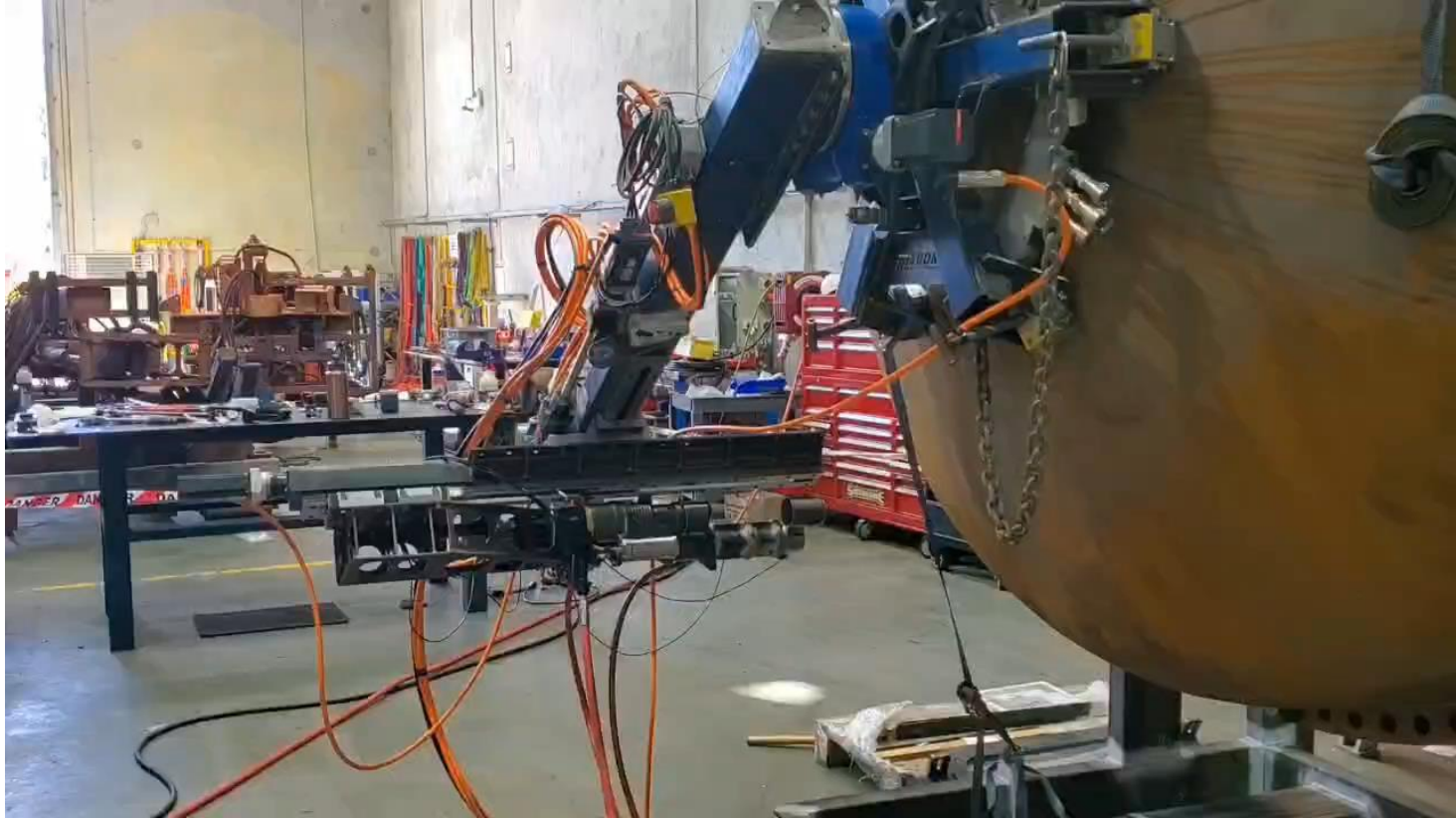
# System Innovations

- Automated bolting programs, star pattern, staged bolting and auto PCD mapping
- Heavy duty structural and mechanical systems design
- Collision avoidance mapping of the flange.
- Automated rear hex nut management.
- Harsh environment materials and design features
- Integrated guidance camera





# Prototype Testing



# What Challenges have you encountered?

"Experience is what you get when you don't get what you want".

The contract for the grant was formally signed in early May 2024 and we expect to be testing the prototype onsite in November 2024. The timeline for development is intentionally aggressive.

The project has presented a number key challenges including

- Incorporating wideband tolerance of the end effector mechanical design.
- Rapid positioning of the radius arm while managing the system inertia.
- PCD calculations from a 3 point map.
- Simplifying the user interface to an outcome driven programming model.
- Fault monitoring and virtual barrier controls.





# Questions & Thank You

