Planning

4846/AMRC/ATR/JS/25 – Autonomous Tool Room Cell (Phase 1)

UNIVERSITY OF SHEFFIELD

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Scope

Reference

4846/AMRC/ATR/JS/25

Description

4846/AMRC/ATR/JS/25 - Autonomous Tool Room Cell (Phase 1)

Scope of Requirement

The AMRC has launched an innovation challenge to develop a digital framework to explore autonomy in subtractive manufacturing process planning. This focuses on industrial software interoperability and the improvement of modelling predictions through real-time data. The innovation challenge to develop a reconfigurable tended subtractive manufacturing cell initially centres around a three-axis mill CNC.

A phased investment approach is applied to the innovation challenge, within Phase One, an automation cell (herein referred to as the 'Autonomous Tool Room (ATR) Cell' and/or

"Cell") will be purchased. This will include a seven-axis robot with a range of part tending routes, tool management options, representing current affordable and accessible physical automation solutions. Within Phase One, the 'Cell' will be installed on Factory of the Future (FoF) shopfloor requiring the rerouting of services, both physical such as air and power and also data connectivity, including sustainability focused monitoring solutions.

In the coming years further investment will be made around the 'Cell' to build capability in the autonomy space. This will provide an AMRC sandpit to physically demonstrate technologies for autonomy in tool room/job shop activities which represents a significant part of the UK supply chain. This work will focus on key strategic priority areas around workforce development, supply chains and SME support.

To this end the 'Cell' should be designed with a fundamentally modular architecture which allows for future adaptation and expansion (see section G4).

The Vision

To create a secure, traceable, and interoperable end-to-end digitally connected manufacturing system. This system will integrate human knowledge, real-time process data, and advanced virtual models to optimise subtractive process planning, remove the mundane and time wasteful processes, improve machining performance, automate decision making and support certification of parts by analysis in order to reduce time-to-market and address the skills shortage in the workforce of the future.

This is a cross AMRC proposal including The Machining Group (TMG), Integrated Manufacturing Group (IMG), AMRC North West, and AMRC Metrology.

This is a multi-phased, multi-year project which may be procured over the coming years.

General Specification

Key Objectives of the 'Autonomous Tool Room (ATR) Cell'

• Implement an end-to-end digitally connected manufacturing system from CAD to final part inspection.

• Implement a cyber-secure digital infrastructure to protect sensitive manufacturing data during real-time operations and in cloud environments.

• Implement cloud and high-performance computing (HPC) infrastructure to manage and analyse large datasets, with 5G technology ensuring fast, seamless communication between systems.

• Develop an integrated and automated CAD/CAM environment which is digitally

connected to the shop floor.

• Utilise the latest Generative AI and Digital Twin systems for real-time process improvement, model validation and to eliminate trial-and-error on both the shop floor and in the CAM office.

• Deploy multi-model machine tool connectivity to integrate supply chain data and monitor machine and process performance.

• Close the loop between metrology and the machining process by integrating metrology equipment within the 'Cell'. For the avoidance of doubt, integration of metrology equipment is outside the scope of this tender (see G4: a).

This tender is for the supply, installation, commissioning, integration, and support over the product lifetime of an autonomous cell playing a key part of the Autonomous Tool Room (ATR) vision. ATR is a key initiative within the AMRC and forms one of their Subtractive Manufacturing Innovation Challenges to develop the interconnected shop floor of the future. This tender specifically addresses Phase One of the ATR vision, the machining cell (the "Cell") which focuses on enabling physical automation and autonomy. The 'Cell', destined for the AMRC Factory of the Future shopfloor in Sheffield, will ultimately integrate multiple machine tools (note that within Phase One, the scope of this tender, only one machine tool is considered*), a multi-axis robot and rail for diverse functionalities such as part/vice/pallet and tool loading, AMRC owned hardware integration (Alternative vices, Dynamometers, etc.), autonomous guided vehicle (AGV) / autonomous mobile robot (AMR) integration (example system Iconsys IAM-R), safety cell, and a metrology zone, all overseen by a central controller station.

*For the avoidance of doubt it is envisaged that the machine tool will be a new 'DNM6700' (https://www.millscnc.co.uk/product/dnm-6700/) and should be on site at the AMRC's Factory of the Future by the end of April 2026. This will be confirmed for certain as soon as possible.

Phase One will consider the integration of a single machine tool (Machine Tool 1) to be accessed from the right-hand side by the robotic arm alongside part/vice/pallet and tool loading.

The ATR Cell

In summary the ATR Cell will be comprised of various pieces of Equipment, and Cell Controller Software and Cell Controller Station (HMI) as detailed below:-

Equipment

The proposed 'Cell' must have the capability to move part/vice/pallet and tooling between

key 'Cell' elements which include:-

• Machine Tool 1 (DNM6700) - sourced separately from this tender

• Multi-Axis Robot on a Rail

• Part Storage

• Tool Storage

• Pallet Storage

• Pallet In/Out

• Vice Storage

• Gripper Storage; and

• Safety Cell (including industrial safety fence, sensors, light curtains etc.)

ATR Cell Controller Software and Cell Controller Station (HMI) will also be required.

The ITT will be issued on 4th November 2025 with a closing date of Monday 1 December 2025 @ 12:00 (UK time).

The available budget for this procurement exercise is £140,000 to £260,000 (exclusive of VAT). This includes supply, delivery, installation/commissioning/acceptance testing (SAT), integration, training and documentation.

Tender Process and Documentation:

This procurement will be an open procedure conducted in accordance with the Procurement Act 2023

Total value (estimated)

- £260,000 excluding VAT
- £312,000 including VAT

Contract dates (estimated)

- 19 January 2026 to 18 January 2029
- 3 years

Main procurement category

Goods

CPV classifications

- 42997300 - Industrial robots
- 48921000 - Automation system
- 42600000 - Machine tools

Contract locations

- UKE3 - South Yorkshire

Engagement

Engagement deadline

20 October 2025

The engagement was carried out before this notice was published.

Engagement process description

The University of Sheffield will shortly be issuing an Invitation to Tender (ITT) relating to the supply, delivery, installation, integration, commissioning and training of an 'Autonomous Tool Room Cell' which will include a robot arm, rail, industrial safety cell amongst other pieces of equipment and software. A CNC machine is being supplied by one of the AMRC's members (Mills CNC) as part of its membership contribution. Mills CNC has also been involved in the conceptual design of the 'Autonomous Tool Room Cell' and this information will be included in the ITT.

Submission

Publication date of tender notice (estimated)

4 November 2025

Contracting authority

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