

MRI COIL SET



Magnetica operates at the cutting edge of magnetic resonance imaging (MRI) technology and is commercialising a coil system for a potentially disruptive solution, a deployable extremity/musculoskeletal (MSK) scanner. The project assists Magnetica in scaling production of this system.



How has the Growth Centre helped

The Advanced Manufacturing Growth Centre is co-investing \$269,825 in the project, accelerating entry to market and production scale-up.

What's changed

Digitising and automating key aspects of the production of radio frequency (RF) and gradient coils, the focus of this project, meets Magnetica's strategy of increasing digital intensity within its manufacturing value chain. This lifts the company's competitiveness and helps it meet rigorous medical device quality assurance standards. A number of new highly-skilled jobs are forecast to be created as production scale up occurs, with a key enabler being the project's successful completion.

Success story overview

University of Queensland spin-out business Magnetica was established in 2005 and remains in close collaboration with the university. It designs a range of MRI sub-systems products, including superconducting magnets, and then manufactures the RF coils, gradient coils and other MRI sub-systems in-house.

Founding inventor and CTO Professor Stuart Crozier is the university's Director of Biomedical Engineering and a pioneer in medical imaging technology. His inventions include a way of correcting magnetic field distortion to improve imaging, which has been licensed to the world's major healthcare manufacturers, and a method to drastically shrink superconducting magnets, leading to MRI machines with greatly improved deployability.

Magnetica is currently commercialising a 3 Tesla (T) extremity MRI system with its global MRI systems integration partner.

A 3T extremity MRI system is much smaller than a whole-body machine (approximately 1000 kilograms compared to 5,000) and able to perform about a quarter of the typical workload, freeing up the larger machine for other jobs. It is ideal for musculoskeletal scans of extremity body parts such as hands, wrists, knees and ankles. The smaller size and reduced weight means the system can be deployed in many more clinical settings than a whole-body system, as well as others such as sports sites and defence applications. There is currently no such machine on the market.

The coil set system, consisting of four RF coils and a gradient coil, together with the novel superconducting magnet is currently at Technology Readiness Level (TRL) 4.

This collaborative project between Magnetica, global MRI systems integration partner and The University of Queensland will move this project to TRL 9, allowing Magnetica to scale up production and meet predicted rises in demand for this disruptive solution.

“**Incorporating our proprietary magnet designs, together with our gradient and RF coils, within an extremity MRI system provides an enhanced patient experience in terms of comfort, the lack of claustrophobia concerns, and the reduced set-up and scanning times.**”
explains CEO Duncan Stovell.

The project focusses on developing an automated RF coil “testing, diagnostic and data processing station” and automating the labour-intensive gradient coil potting process.

Verification and test stations will digitise and automate these operations, producing test data and aiding in regulatory compliance and Quality Management System certification. It will also support a goal of increasing the digital intensity of Magnetica’s manufacturing value chain, meeting its Industry 4.0 strategy.

Automation of the Gradient coil potting process will simplify the complex and exacting ten-step process, layering copper coils, cooling and shimming (for making a magnetic field more homogenous) layers.

Digitising key aspects of the processes will provide a manufacturing cost saving and will build on Magnetica’s competitiveness through matching advanced processes to its current advanced knowledge.

“We must remain competitive over the long-term and that means we need to manage our costs while ensuring we develop and manufacture high-quality products,” says Stovell.



“**Investing in our team’s skills and capabilities, together with developing and deploying advanced manufacturing methods and processes, will enable us to scale up in volume while controlling our costs.**”

The extremity MRI system will provide a highly attractive alternative for MSK imaging not currently available to medical professionals. Other benefits from the successfully completed product include new jobs creation for manufacturing engineers and highly-skilled technicians as production volumes increase.

“As a smaller company, we carefully monitor and control our cashflows,” explains Stovell.

“**AMGC’s support for the project has enabled us to undertake activities at an earlier timeframe than would otherwise have occurred, thus advancing our capacity and capabilities at an earlier stage. We can now exploit this to build our business more quickly and achieve customer deliverables with more confidence in terms of timeframes and workload.**”

1 <http://mriquestions.com/why-shimming.html>

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