STEEL RESEARCH HUB:
CREATING A GLOBALLY COMPETITIVE, SUSTAINABLE AND RESILIENT STEEL INDUSTRY

THE ARC RESEARCH HUB FOR AUSTRALIAN STEEL INNOVATION (STEEL RESEARCH HUB) IS A FIVE YEAR (2021-2025), $28 MILLION RESEARCH PROGRAM DESIGNED TO SUPPORT THE TRANSITION OF AUSTRALIA'S STEEL MANUFACTURING INDUSTRY TO A MORE SUSTAINABLE, COMPETITIVE AND RESILIENT POSITION BASED ON THE CREATION OF NEW, HIGHER VALUE-ADDED PRODUCTS AND MORE ADVANCED MANUFACTURING PROCESSES. A GLOBALLY COMPETITIVE DOMESTIC STEEL MANUFACTURING INDUSTRY IS A STRATEGIC ASSET FOR AUSTRALIA'S NATION-BUILDING, ECONOMIC GROWTH AND EMPLOYMENT.

The first Steel Research Hub began operating in 2014 with the vision of bringing together teams of internationally recognised research and industry talent to deliver innovative solutions and breakthrough technologies in manufacturing and product development. These collaborative teams focused their attention on strategic outcomes that were not otherwise realisable.

Led by the University of Wollongong, the new Steel Research Hub brings together nine universities (RMIT University, Australian National University, Swinburne University of Technology, University of Newcastle, Deakin, University of Sydney, University of New South Wales, and Monash University) and eight industry partners (BlueScope, InfraBuild, Liberty Primary Steel, ArcelorMittal, Australian Steel Institute, Weld Australia and Australian Industry Group) to deliver innovative research designed to enable a significant technological shift in the steel supply chain.

To accomplish this goal, a new Steel Research Hub, which began in June 2020, brings together a network of preeminent academics, talented researchers and experienced leaders from across the steel manufacturing supply chain. Across four integrated research programs, the Hub is creating a multi-disciplinary team of 20 Post-Doctoral Research Fellows and 31 PhD candidates, and numerous steel plant engineers and scientists, creating a more skillful and diverse workforce that will be critical in achieving this transformation.

Areas of research focus include integrating advanced enabling technologies in large and small businesses, developing step-change performance in anti-corrosion treatments and coating lines, generating more functional and durable products, and improving material resource intensities.

A STRATEGIC ASSET FOR AUSTRALIA'S NATION-BUILDING

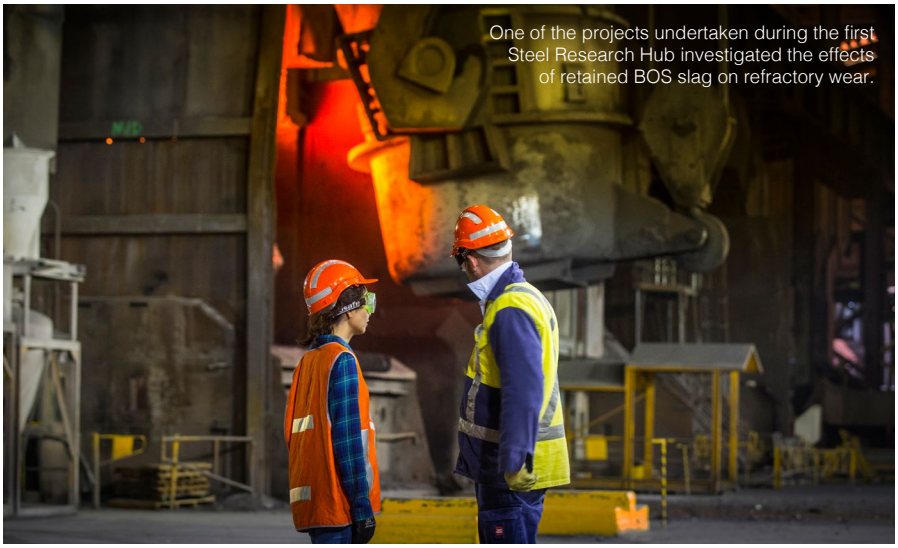
The Hub Director, Dr Paul Zulli is looking forward to the Steel Research Hub strengthening its collaboration with the Australian steel industry, through delivering both new innovative research outcomes and training of a new generation of capable and influential researchers and technologists.

"A globally competitive domestic steel manufacturing industry is a strategic asset for Australia's nation-building, economic growth and employment," Dr Zulli said.

"The domestic industry must continue to provide a secure, flexible and high-quality local source of steel and products for infrastructure and construction, manufacturing, mining and agriculture. The research outcomes delivered over the coming five years will benefit the competitiveness and future growth of large and small steel-related businesses in Australia."

"In turn, these should positively affect key societal challenges, such as providing affordable housing and quality infrastructure, developing longer-lasting materials, recycling of resources, and training a more capable and diverse workforce," said Dr Zulli

(L to R): Hub Director Dr Paul Zulli, Chief Investigator Professor Lip Teh, Lecturer Dr Aziz Ahmed, Dr Refat Ahmed, and Lab Manager Cameron Neilson. Picture: Paul Jones.



One of the projects undertaken during the first Steel Research Hub investigated the effects of retained BOS slag on refractory wear.

HIGHLIGHTS FROM THE FIRST STEEL RESEARCH HUB

Improved Abrasion Resistant Quench and Tempered Plate Steels

In collaboration with BlueScope and Bisalloy Steels, this project aimed to improve the performance of abrasion resistant quench and tempered (Q&T) plate steels for various applications including in the minerals and defence industries. It offered enhanced wear resistance over conventional metallurgical approaches but without the traditional useability trade-offs including reduced weldability, formability and toughness. In comparison, the conventional approach to increasing wear resistance in Q&T plate products is via raising the hardness of the martensitic phase by increasing the carbon content of the steel.

Liquid Metal Processing and Coating Quality

Continuous high-speed deposition of metallic alloy coatings, thinner than a human hair, on steel substrates is a challenging industrial process. This project generated new knowledge on the properties of liquid Al-Zn metallic alloy, providing a better understanding of how these properties vary with processing conditions, alloy composition and atmospheric exposure. New data helped identify a change to processing conditions that may improve the coating surface stability. Another highlight was the use of micro X-Ray fluorescence at the Australian Synchrotron, which helped elucidate the potentially important role of trace elements on the coating process and properties.

Development of Antimicrobial Coatings for Steel Surfaces

The aim of this project was to develop coating technologies that contribute to the defence of a coating against fungal attack, helping reduce the build-up of microbial organisms that may impact the product appearance, increasing maintenance and replacement costs. The team was able to develop a family of surface-modified nanoparticles, that provided added biofouling resistant functionality to the material.

Trace Element Modelling and Optimisation of Byproduct Use in an Integrated Steelworks

This project aimed to deliver a reuse-focused optimisation model that would allow BlueScope to assess its use of by-products, and reduce both the cost of raw materials, and further accumulation of by-products at its Port Kembla Steelworks. The model was fine-tuned based on plant trials, was flexible enough to be extended to various by-product reuse scenarios, and incorporated the key trace elements that limit reuse.

Effects of Retained BOS Slag on Refractory Wear

While there has been much work carried out on the effects of BOS slag composition on carbon-bonded magnesia refractories, there has been little that has dealt with the specifics of retained BOS slag practice on refractory wear. This project was aimed at providing a fundamental understanding of the effects of retained slag practice on furnace refractory wear. This was to inform the most effective strategy for BOS vessel operation with respect to balancing flux and slag composition targets with refractory wear and maintenance. The importance of the work was in extending the life span of the BOS refractories, leading to a decrease in the cost per tonne of steel and a decrease in the amount of waste, thereby improving the economic and environmental sustainability of the steelmaking process.

THE NEW STEEL RESEARCH HUB PROGRAMS

Process Integration and Sustainability

New specific manufacturing processes and methodologies that significantly improve resource intensity and utilisation, and energy efficiency, while maintaining productivity, quality, and asset life objectives, including:

- Integrated and efficient steel manufacturing
- By-product utilisation and sustainability

Product Innovation and Technology

Novel approaches to next-generation product solutions incorporating improved functionality such as higher strength, ductility, durability, and material resilience, including:

- Product durability and functionalisation
- Structural steel and Cold Formed Steel (CFS) optimisation

Advanced Corrosion Performance and Operational Efficiency

Step-change performance in anti-corrosion treatments, together with new processing capability and more productive coating manufacturing lines, including:

- Corrosion performance and prediction
- Coatings process effectiveness

Steel Supply Chain Transformation

New applications of enabling technologies and advanced manufacturing to achieve a generational shift in capability across the entire Australian supply chain, including:

- Enabling technologies integration
- SME engagement and innovation

CLICK HERE FOR FURTHER INFORMATION ABOUT THE STEEL RESEARCH HUB AND ITS PROJECTS >>>