Paul Zulli

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Career Statement

An internationally recognised leader in steel manufacturing research, technology development and project deployment, combining over **35 years of technology and senior management experience** across various areas of the steel and related ferrous minerals industries (coal, iron ore). A **highly respected leader** of high-calibre, multi-disciplinary teams, with an **established reputation for delivery of tactical and strategic outcomes into operating businesses**. In recognition of this, an elected Fellow of the Australian Academy of Technological Sciences and Engineering (ATSE).

An experienced **chemical engineer** and **responsible project manager** accountable for a diverse set of technological programs and operational budget. An **influential senior manager,** active in seeking to **bridge the gaps between academic research products and innovative industrial solutions**, and ultimately in providing value-adding and sustainable outcomes. Successful in securing numerous **competitive national funds** for completing collaborative technological projects.

Recent personal achievements with **significant financial impact** to the business include a process design to maximise the removal of material inventory from a furnace ready to be relined, implementation of an injection technology for maximising coal combustion, development of novel process systems to substantially extend furnace asset life, the deployment of online models and control theory for lower hot metal quality variability, and experimental research on a small in-house constructed pilot facility which led to the deployment of a new operational practice to improve yield and flux consumption in steelmaking.

Specific areas of scientific reputation include development and implementation of simulation methods and operator guidance systems of complex manufacturing processes in a testing and difficult industrial setting, coupled with experimentation, piloting and plant trials activities.

Professional Experience

University of Wollongong, Wollongong NSW **April 2017 - present**

Director, ARC Research Hub for Australian Steel Manufacturing Steel and Professorial Fellow

Responsibilities:

- Provide leadership and direction the Australian Steel Manufacturing Research Hub
- Partner with senior executives across industrial organisations, academic institutions and the Australian Research Council, to ensure alignment of the Hub's outcomes and deliverables
- Lead the development and expansion of engagement of Australian and international industry with the Hub's activities and outcomes, including the strategic development of a transition plan enabling the Hub and associated activities to continue beyond current term
- Provide management control and leadership of the various stakeholders of the Hub, at all levels
- Develop new funding streams to support both the Hub aims, and the wider research and development activities of the University of Wollongong
- Partner with academics and postgraduates, and undertake collaborative research within the Sustainable Steel Manufacturing Platform of the Hub, across Wollongong, Newcastle, Monash, RMIT, Swinburne and Queensland universities
- Undertake collaborative research and technical development projects for BHP Billiton, focusing on raw material properties, and its application and utilisation in metallurgical processes.
- Act as a senior industrial research advisor to Faculty staff and academics associated with the Hub
- Build on strong, well established, national and international links with industry (steel and mining) and other academic institutions
- Provide expertise across steel manufacturing process chain, ferrous raw materials evaluation, mathematical modelling, process integration and data analytics

Selected Accomplishments

- Formulated, developed and articulated a clear vision and mission for all associated parties of the Hub including all Partner Organisations and specific Research Institutions
- Formulated, developed and articulated a strategic plan for the Hub, with an achievable set of overarching objectives to generate value for the industry in the short and long term, and with a corresponding action plan
- Developed strategic plan for preparation of a proposal for a new Steel-related research hub, instituting systems for engaging and communicating with steel industry partners, in order to distil new and novel technological areas on the basis of top- and bottom-driven activities
- Undertook and encouraged at all levels in the Hub, high-level engagements between senior management in university and industry, including large firms and SMEs, to enable a shared understanding of operational drivers
- Promoted the Hub and engaged with ArcelorMittal and Iron Ore Research Hub to work on new collaborative projects in ironmaking and ore preparation
- Successfully lead the establishment of a strategic BHP-sponsored project between Iron Ore Hub and Hub on an alternate process dealing with high phosphorus in WA iron ores, as well as an ACARP-sponsored activity dealing with metallurgical coke
- Ongoing role as a senior technical advisor to BHP, BlueScope, Iron Ore Research Hub, ACARP and, as well as internally within the University of Wollongong

University of Wollongong, Wollongong NSW **January 2016 – March 2017**

Professorial Fellow (0.6 FTE)

Responsibilities:

- Partner with academics and postgraduates, and undertake collaborative research within the Australian Iron Ore Hub based at Newcastle, with projects undertaken at Newcastle and Chinese universities.
- Partner with academics and postgraduates, undertake collaborative research within the Sustainable Steel Manufacturing Platform of the Steel Research Hub based at Wollongong, with projects undertaken at Wollongong, Newcastle and Queensland universities.
- Undertake collaborative research and technical development projects for BHP Billiton, focusing on raw material properties, and its application and utilisation in metallurgical processes.
- Develop new ARC project proposals
- Act as a senior industrial research advisor to Faculty staff and academics associated with Steel Research Hub, especially with respect to business acumen.
- Build on strong, well established, national and international links with industry (steel and mining) and other academic institutions.
- Provide expertise across steel manufacturing process chain, ferrous raw materials evaluation, mathematical modelling, process integration and data analytics.
- Undertake lecturing on specific research topics, when requested.

Selected Technical Accomplishments

- Formulated, developed and worked collaboratively with staff from UOW, University of Newcastle and BHP Billiton to submit a new ARC Linkage Project proposal dealing with research on more effective partitioning of phosphorus oxides in steelmaking slags in order to negate the impact of increasing levels of phosphorus in iron ores on BHP Billiton's market share (decision pending on proposed funding ~$650,000 cash over 3 years).
- Working collaboratively with UNSW staff, successfully obtained ACARP (Coal industry) funding to enable the extension of a current ARC LP activity, dealing with a new methodology for evaluating the properties and performance of metallurgical coke under more realistic blast furnace (in-situ) conditions ($167,000 for 12 months).
- Completed several research and technical projects for BHP Billiton Iron Ore Marketing, including the implementation of a global BF model for evaluation of iron ore softening-melting properties, a high

temperature testing program to evaluate the impact of alumina levels on iron ore properties in the BF and a report on a new alternate ironmaking process.

- Formulated, developed and negotiated a research project with Arcelor Mittal Europe to study the productivity limits in ironmaking.
- Mentored and supervised several doctoral and PhD researchers working on collaborative research projects, and provided a limited set of lectures to undergraduates. Provided expertise as well as technical and managerial guidance to UOW academics.

Other Accomplishments

- Significant contribution to a recently published ATSE Action Statement dealing with increasing the productivity in Australia's minerals sector.
- Provided a consultant's report to a pellet manufacturer on their product's performance in two Chinese BFs.

BlueScope Steel, Port Kembla, NSW **November 2011 – November 2015**

Manager BF Technology and Steelmaking Research (Executive Position)

Responsibilities:

- Partner with general managers and senior plant managers, providing effective leadership and a clear articulated technical direction, and working within the organization in a way that generates widespread commitment and energy.
- Active in leading and engaging with research and technology people to achieve optimal business outcomes, under challenging and changing business conditions.
- Build organizational technical capability, evaluating future requirements of the business, providing development opportunities and coaching and mentoring for subordinates.
- Strategically influence the organisation through persuasion and communication, both within and external to the organization.
- Define clear accountabilities, goals and standards for self and others, supported by follow up activities, to ensure current and ongoing delivery against business expectations.
- Establish systems and processes to ensure the ongoing integrity, effectiveness, quality and efficiency of all research and technical activities.
- Recognize and understand those external developments that will be most likely to impact fundamental business aspirations and to shape meaningful and practical responses that may span varying timeframes.
- Scan local and global environments, to gather diverse information that will potentially be relevant to achievement of business objectives, both now and in the future.
- Apply astute business sense to respond to evolving opportunities and pressures, in a way that protects and builds the future health of the business, while maximizing short term returns.
- Provide specialized expertise through application of professional scientific and engineering skills, and provision of technology solutions and options for the business.
- Utilise technology expertise to understand the manufacturing process and/or raw material issues fundamental to the business, to recognize relevant opportunities and solutions within the business constraints or provide a path to advance beyond the confines of the business.

Selected Technical Accomplishments

- Constructed a small pilot facility (vacuum induction furnace with a vacuum capability and external cooling equipment) and designed/executed a novel set of high temperature experiments to provide essential information for risk-mitigation (safety issues) on an operational practice now deployed and realising a step-change in yield improvements and flux consumption reductions (current savings of ~$2M p.a.).
- Completed a strategic project which, together with other operational and mechanical activities, significantly extended the operating life of a major ironmaking asset beyond previous expectations (asset value is ~$450M, hence significant NPV).

- Formulated, led and completed a successful strategic mission to the world's largest steelmaking company, which allowed the business to confirm its operational practices for life extension of the ironmaking asset (asset value is ~$450M, with significant NPV).
- Managed a tactical research project to lower the cost of manufacturing a row of copper cooling elements (cost reduction of ~$200,000 per application).
- Completed bench-scale testing, technic-economic evaluation and plant trials of a poorer quality, lower cost, raw material, resulting in ongoing savings to the business (benefit of ~$750,000 p.a.).
- Developed, trialled and deployed a new online temperature sensor to lower the product quality variability and overall fuel rate of the ironmaking process (future savings of ~$400,000 p.a).
- Developed and deployed two new testing techniques to evaluate raw materials under more realistic process conditions in order to assess the impact of lower cost coals and iron ores to the business (future projected savings of ~$1.5M p.a. based with the use of low cost, materials identified).
- Led a long-term external collaborative research program to evaluate the use of sustainable, environmentally-friendly substitutes for fossil fuels in order to reduce a future "cost of carbon" impost to the business (future savings dependent on carbon impost to the business).

Other Accomplishments

- Led a multi-organisational team (Arrium, CSIRO and BlueScope) which prepared a detailed submission seeking significant funding ($5M funding from AusIndustry's Clean Technology Innovation Program) for the demonstration of renewable biomass materials as substitutes for fossil-based fuels across the steelmaking business [A change in Federal government in 2013 removed this funding stream].
- Initiated a successful submission for government funding for a research program dealing with the sustainable manufacturing of steel, resulting in the Steel Transformation Hub based at University of Wollongong [~$5M funding from the ARC for the overall Hub and ~$1M for the program].

BlueScope Steel, Port Kembla, NSW **April 2008 – October 2011**

Manager Iron and Steelmaking Research (Executive Position)

Responsibilities:

- Partnered with the General Manager Engineering, Manufacturing and Environment and General Manager R&D to establish a portfolio of programs targeted at improving or obtaining new technical capability within primary operations.
- Contribute to the Research lead team, to establish Research direction and selecting/approving strategies to achieve the long and short-term results.
- Active in leading research personnel to work under challenging and changing business conditions.
- Deliver the agreed program outcomes from each R&D activity.
- Provide technical leadership to Business Units, including agreed governance and stewardship functions.
- Develop and maintain high technical competence within teams/technical disciplines.
- Monitor each project team's processes and outputs and take corrective action.
- Develop and maintain a network of R&D providers and collaborators, both nationally and internationally.

Selected Technical Accomplishments:

- Designed, trialled and installed new oxy-coal lances on a furnace to enhance coal combustion by 15%, allowing use of poorer quality coal or increased production (benefit of ~$500,000 p.a.).
- Led a plant-wide energy analysis for Environment Department as part of the GHG Target setting exercise, allowing a benchmark for future energy minimisation activities (necessary government requirement).
- Initiated and directed a strategic project prior to a major furnace shutdown, which provided the design for process conditions to maximise the removal of iron inventory and minimise the down time which would have been required for blasting solidified material (business benefit of ~$3.5M once off).
- Represented the business and successfully managed national and international interactions with various steelmaking operations, mining businesses and research organisations.

- Initiated and directed a tactical project for the Slabmaking Department for a new submerged delivery system in the steel tundish, one which was specifically designed and shown to minimise hot spots in the copper mould (yet to be implemented).
- Directed technical work associated with various Operational Taskforces including the performance of furnace cooling elements and increasing coal injection levels (direct benefits greater than $1M once off).
- Led the first phase of research work designed to introduce higher levels of non-prime (lower cost) coking coals and selective crushing into the Cokemaking operation (significant benefits derived from non-prime coals, estimated to be greater than $3M p.a.).
- Actively led a multi-disciplinary assessment of accretion problems in the multihearth furnaces, working with engineering and operations to determine root cause, evaluate potential solutions and increase throughput for the New Zealand business (benefit difficult to estimate).

Other Accomplishments

- Elected as a Fellow of the Australian Academy of Technological Sciences and Engineering in 2010.
- Examples of active research and technology collaboration include a) BHP Billiton on various raw material and processing projects, b) European companies and academic institutions in the area of Process Integration Methodologies in the Steel Industry based around the International Energy Agency's Annex program.

BlueScope Steel, Port Kembla, NSW **December 2000 – March 2008**

Senior Principal Research Engineer – Cluster Leader

Responsibilities:

- Partner with the Manager R&D and plant managers, lead a portfolio of projects targeted at improving or obtaining new technical capability within BlueScope's primary operations business.
- Deliver the agreed outcomes from each R&D team.
- Provide specific technical leadership to the various research teams.
- Monitor the project team's processes and outputs.
- Maintain or develop new scientific and technical expertise.
- Develop and maintain a network of R&D providers to BSR, both in Australia and internationally.

Selected Technical Accomplishments:

- Led and delivered relevant research outcomes for the safe and beneficial introduction of a new auxiliary fuel for the ironmaking process (operational benefit of ~$700,000 p.a.).
- Formulated, developed and delivered a new expert system for the Gas Processing plant to provide operators with an improved understanding of multiple process interactions across the business unit (operational benefit of ~$250,000 p.a.)
- Negotiated and executed various University-based research projects, ultimately implementing various research products including new modelling systems which were adopted into the business' metallurgical processes (operational benefits to product quality alone of ~$1.5M p.a.).
- Led and directed the development and application of various new particle technology techniques into the business (various practical and minor [<$100,000] financial benefits).
- Influenced senior operations and engineering management to adopt new modelling techniques for numerous applications ranging from plant-wide holistic assessments of energy and carbon emissions, engineering troubleshooting and problem solving to equipment performance (various practical and minor [<$100,000] financial benefits).

BHP, Newcastle/Port Kembla, NSW **December 1993 – November 2000**

Principal Research Engineer - Coordinator

Responsibilities:

- Liaise with different business groups to coordinate a broad portfolio of ironmaking-related research projects to develop new or improved technical capabilities within BHP.
- Coordinate the company's Asset Life Extension programs.
- Provide effective mechanisms for regular reporting to external stakeholders on R&D and technical support outcomes from a variety of multidisciplinary researchers and team outcomes.
- Influence and negotiate the R&D funding with various business groups across the company.
- Lead and direct the R&D ironmaking team.
- Monitor project team's processes and outputs.
- Develop a network of R&D providers including universities, both in Australia and internationally.

Selected Technical Accomplishments:

- Led a large pilot scale facility to assess the combustion characteristics of a suite of company coals for potential international markets (marketing benefits of > ~$1M once off).
- Coordinated and contributed to teams which successfully completed the Asset Life Research program for all:
    - Iron plants across the steel Division, providing new modelling and sensory techniques for assessing plant condition (operational benefits across Divisions of > ~$3M p.a.).
    - Cokemaking plants across the steel division, providing new remote inspection devices for assessing the condition of different plant equipment (operational benefits across Divisions of > ~$2M p.a.).
- Introduced and worked on the first Data Mining project for steel division, undertaking to solve a serious long-term operational problem with a furnace, and resulting in the identification of both a raw material impact and a process change (benefit of ~$500,000 p.a. on the basis of life extension).
- Developed improved and effective project management reporting systems for ironmaking R&D.
- Successfully retained a R&D budget over the term of the appointment, despite significant cost reduction measures during the period.

Other Accomplishments

- Participated in a team which completed a Business Improvement Program at BHP's Newcastle Program designed to re-organise the technical function across the steel manufacturing chain and resulting in a significant re-organisation of this function across the plant.

Education, Professional Development and Training

- Ph.D. in Engineering (Chemical), University of NSW - Sydney, NSW
- Bachelor of Engineering (Chemical), Honours 1, University of NSW - Sydney, NSW

Professional Development and Training (selected)

- Residential Management Course (2 weeks)
- Group Leadership Program
- Managers Essential (4 days)
- KT Training - Project Management, Potential Problem Analysis
- Targeted Selection (2 days)
- Lecturer at University of Wollongong (2001-2003)
- Instigator of International Symposium, Wollongong

Memberships and Awards

Current Memberships

2015: Deputy Chair for Minerals Development Forum, Australian Academy of Technological Sciences and Engineering

2014: Advisory Board Member (Elected), Iron and Steel Institute of Japan

2010: Fellow (Elected), Australian Academy of Technological Sciences and Engineering (ATSE)

Awards

2016: Adjunct Professor, University of NSW

2015: Adjunct Professorial Fellow, University of Wollongong

2010: American Society of Metal (ASM) author award

2010: BlueScope Innovation Award (Best Business Outcome from Innovation)

2008: American Iron and Steel Society Conference (Best Paper)

2005: Adjunct Professor, University of NSW

2001: American Iron and Steel Society Conference (Best Paper)

1997: American Iron and Steel Society Conference (Best Paper)