Engineering Sydney Industry Placement Scholarships (ESIPS)

Participating Organisations (past and present):

AB Mauri
Accenture
BHP
BOC
Cochlear
Coregas
Dow Chemical
Dupont
EBM Analytics
Evoqua
Fire Engineering Professions
Goldenfields Water
Griffith City Council
Hazer Group
Incat Crowther Pty Ltd
Jet Propulsion Laboratory
NASA
Microspace
Nanosonics
Neon Australia
Nearmap
Omniscient
Neurotechnology
Optimized Ortho
Orora Group
Osaka Gas
Osseointegration
Papuan Oil Search Limited
Parkes Shire Council
Qantas
Qenos
Rio Tinto Centre for Mine Automation
Saluda Medical
Shoalhaven Water
Stryker
Sydney Water
Thales
Treena
Trility
Visy
Westmead Hospital
Westmead Institute of Medical Research
360 Knee System

Example Projects:

Process design: modifications of a yeast plant to produce Y80F

AB Mauri Technology and Development Pty Ltd

Following the development of a new product, AB Mauri required the design of a process line that would allow for the production of Y80F product in one of their operational plants. It involved the retrofitting and sizing of unit operations, the development of a model to investigate operating parameters of the equipment, and the evaluation of key trade-offs in the design. Several experiments were also carried out to define key design parameters.

Feasibility studies: dynamic crossflow filtration for the recovery of valuable materials and development of premium product

AB Mauri Technology and Development Pty Ltd

This project evaluated the technical feasibility of using an alternate to traditional filtration technology for two potential applications; to recover valuable materials from waste and for the development of a premium commercial product. For the valuable materials recovery project, the equipment performance was compared to that of existing technology to justify its potential as a replacement. On the other hand, as no current premium product is commercially produced using the proposed process technology, this project aimed to investigate the technical practicability of its use for this purpose.

The process equipment components involved in this project were operated at benchtop scale for a series of process optimisations trials to identify the maximum filtration capability and operating

parameters whilst ensuring the optimal product quality was achieved; also, the evaluation of commercialisation feasibility, the identification of potential industrial operating trade-offs and implications, as well as justifications for the needs of upscaled future pilot plant trials.

Automation delivery

Accenture

As part of the Automation Delivery team at Accenture, this project was focused on taking machine learning and statistical approaches to root cause analysis. An automated root cause analysis pipeline was built which encapsulated complex multivariate, temporal behaviours of an IT system and carried out fault propagation on the developed models.

Automation Deployment

Accenture

As a member of the Automation Deployment team within Accenture Technology, this project focused on the implementation of systems used to automate the internal business processes of large enterprises. Common business problems were identified and a variety of technologies were used to develop highly sophisticated yet replicable solutions. These solutions were dependent on natural language processing techniques (NLP), with the thesis focussed on optimising the application of named entity recognition (NER, a sub-set of NER) to informal data.

Heap leach diagnostic leach development

BHP

A diagnostic leach method was developed with BHP as a rapid alternative to evaluate the processing performance of copper and uranium ores in a heap leach operation. Current large-scale test can take up to a year and is costly. The diagnostic leach method that was developed in this project potentially provides a simpler, cost effective and faster method for determining the uranium and copper extraction to determine potential revenue as well as reagent consumptions indicating key operating costs.

Copper solvent extraction laboratory development and process optimisation under hypersaline tenors

BHP

BHP's heap leach team has been operating a heap leach and solvent extraction (SX) pilot plant at Bureau Veritas, gathering essential data and experience for the future operation of heap leaching at Olympic Dam. This project was focused on testing and optimising a range of organics for the hypersaline copper SX (CuSX) process through laboratory mass transfer isotherm testing and analysis of reagents and conditions, flowsheet development, assessment of aqueous copper/acid interactions, requirements of scrub water and organic stripping performance. This work involved fundamental aqueous and organic understanding, as well as reagent screening and selection. The finished work will assist development of future predictive hypersaline CuSX process models and pilot plant test work.

Debottlenecking of high CO2 feed-gas LNG facility

BOC Limited

BOC's LNG facility in Dandenong, Victoria, assists with mitigating the demand/supply gap during periods of high natural gas demand in Victoria. The CO2 concentration in the natural gas feedstock

has increased in recent years, overloading the amine system, resulting in plant turn down. This project involved seeking a solution to this high CO2 problem, helping to reduce the degree to which the plant would need to turn down when CO2 concentration exceeded plant specifications.

Designing a tool to automate analysis of Cochlear implant CT scans

Cochlear

Working in the Advanced Innovation team within Cochlear, this project focused on the development of a tool for the automated analysis of cochlear implant CT scans. The tool was designed to streamline the processing of post-operative CTs by automatically obtaining a view of the cochlea and locating certain landmarks in the CT. Using various computer vision and image segmentation techniques implemented in Python, the reliability of the tool performed was higher than any other tools currently in use or in literature for this kind of medical image analysis. Working closely with an extremely experienced team of mechanical, electrical and software engineers, their expert guidance helped produce a piece of work which will be useful for many years to come.

Design and testing inductive coils for cochlear implants

Cochlear

An explorative study at Cochlear Ltd. to design, test and implement transcutaneous inductive coils for cochlear implants. Changing the coil material, insulation and winding configuration increased the power transfer efficiency, whilst satisfying regulatory mechanical safety requirements and decreasing the cost of manufacturing the coil.

Basic process control and emission management system improvement

Dow Chemical Australia Ltd

A safe plant operation requires process control actions to remain within specified limits and process safety actions to prevent reaching dangerous states. This project was aimed to enhance the overall plant safety of DCM Geelong by studying current interlocking systems. Meanwhile, the secondary aspect of the project was aimed to eliminate any gaps in data collection for site fugitive emission estimation technique and hence provide consistency across various standards in terms of data capturing, monitoring, recording and reporting.

Optimising energy use in an industrial steam system

Dow Chemical Australia Ltd

Rising electricity and natural gas prices have created a financial imperative for industry to lower its energy intensity. At the same time, environmental concerns about climate change have also created social pressure to lower carbon emissions. The project was focused on optimising energy use within the Altona site's steam system, so as to reduce natural gas consumption and carbon emissions. The system was analysed to identify areas of high energy use. Solutions were then devised to lower energy input requirements for process equipment and minimize energy losses during steam generation and distribution.

Characterising Chlorine Decay

Goldenfields Water

Goldenfields Water County Council supply drinking water to more than 40,000 people across the Riverina in NSW. This study involved investigating historical issues with chlorine residuals, causes of

chlorine decay, developing a water quality model and recommending strategies to improve residual retention across the two largest distribution schemes.

Kinetic Optimisation of the Hazer Process

Hazer Group

This project aimed to provide a fundamental insight into the reaction kinetics and thermodynamics of the Hazer Process by investigating the effects of different reaction parameters on the production and growth morphology of graphite. The preliminary information obtained from these studies will be beneficial for the company's present and future commercialisation plans for its eponymous process.

Investigating the fluidisation phenomena of fine particles

Hazer Group

The Hazer process utilises thermo-catalytic decomposition of methane to produce hydrogen and a variety of graphitic morphologies. This project focused on the characterisation of particles used in the process and how these characteristics impacted a gas-solid contacting system. Key objectives of the project were to provide initial upper and lower reactor conditions relating to the operation of Hazer's pre-pilot plant.

Upset management in a paper mill water system: a case study into process control and water management practices

Orora Group

Water system upsets at Orora Botany Mill (B9) have the potential to detrimentally impact the site operations. To minimise process downtime and improve overall site performance, this project focused on optimising upset management protocols, defining higher level process control opportunities and enhancing discharge capacity. The project delivered a number of positive outcomes including; increased operator understanding of the water balance pinch-points, process set-point changes and the design of a new separation unit into discharge stream.

Hydraulic modelling and hydrate formation of onshore multiphase flow pipeline gathering systems

Oil Search Limited

The project aimed to expand and enhance the understanding of dynamic multiphase flow conditions in the pipeline gathering systems located in Papua New Guinea. The project involved creating multiple robust and validated pipeline network models in the refining and petrochemical optimisation software Petro-SIM. The temperature and pressure profiles from present to 2022 were modelled, allowing identification of pipeline areas predicted to be at risk due to low operating temperatures and hydrate formation. Management strategies were recommended to mitigate these risks and provide viable options to allow continued safe production.

Removal of scale-forming compounds from recirculating water systems

Osaka Gas

In addition to supplying natural gas in Japan, Osaka Gas also develops a range of product systems and processes, including in the field of water treatment. Research had been undertaken to examine the selective removal of scale-forming species from water with a specific reagent. This project delivered the operational and economic feasibility of applying this reagent for a continuous flow process by analysing its kinetics and regeneration capability.

Formulating a backflow prevention program for the B-Section network

Parkes Shire Council

Parkes Shire Council supplies drinking water to more than 10,000 consumers in regional NSW. Managing backflow at the customer's property boundary is essential to protect public health. This project involved analysing industry approaches, characterising risk, and developing and recommending implementation pathways for a backflow prevention program across the rural supply scheme.

Recycle Water Scheme

Parkes Shire Council

Parkes Shire Council are developing a recycled water scheme to irrigate community spaces. This project progressed key areas essential to finalise the project design. Supply and demand modelling, considering soil moisture balance was undertaken to quantify end user requirements, assess peak day demand and quantify top-up water requirements. Potential soil chemistry changes associated recycled water use were modelled to assess the potential for environmental impacts. End user irrigation practices were reviewed for efficiency and sustainability. Output and recommendations from the project will be used for the design and operation of the scheme.

Simplifying consequence assessment in a major hazard facility

Qenos

This project involved working as part of the Qenos Process Risk Team to assist in the submission of the 2017 Altona Safety Case. Specifically, this project was to develop detailed case studies demonstrating that Qenos has reduced the risk of major incidents So Far As Reasonably Practicable (SFARP). The submission of the 2017 Altona Safety Case is an essential requirement for Qenos to be a licensed Major Hazard Facility.

Multi-agent optimisation research project

Rio Tinto Centre for Mine Automation

A multi-agent optimisation research project with the general objective to improve efficiency of Rio Tinto's mining operations. It turned out to be an NP-Hard problem, so the work focused on developing a heuristic to generate near-optimal solutions to the optimisation problem in polynomial-time (quick computation), which could be used verbatim or to warm-start a MILP solver to more quickly solve a MILP problem formulation.

Developing pilot testing systems to optimise filter operation and predict media performance for water treatment

Shoalhaven Water

Shoalhaven Water’s largest water treatment plant has just turned 35 years old. The filter media has not been replaced since commissioning, and the company is unsure if a replacement is necessary now or later. The project encompassed the design and building of a unique and applicable accelerated water treatment testing system. The project developed the first filter testing in Australia at pilot scale, providing Shoalhaven Water with the resources and information to predict how the current filter would continue to perform over the coming years and how alternative filter replacements would tie in with their current operations schedule.

Characterisation of hazardous wastewater events detected by real-time online monitoring

Sydney Water

Sydney Water has been trialling an innovative technology, developed by Griffith University as a part of an ARC project, for the real-time online monitoring of wastewater. This project involved characterising and evaluating the potentially hazardous events detected by the monitoring unit. Pattern-matching techniques were examined to enable real-time risk management of future wastewater events.

Implementation of kidney technology and water loop closure in the paper industry

Visy Paper

The project investigated potential applications to utilise biologically treated water in the mill rather than dispose it. An option to use the treated water from the wastewater treatment plant in the dilution of starch to replace recycled water was further developed and as a result, will be trialled further. The investigation also analysed the potential to increase the mill water quality via kidney technology.

Enterprise wide performance monitoring at Visy Paper 3&6

Visy Paper

This project focused on the digital transformation of ICT systems at Visy Paper 3&6 through the development of an IIoT (Industrial Internet of Things) based performance monitoring dashboard. This dashboard allows for real time monitoring of KPIs (Key Performance Indicators) through the integration of heterogeneous data from multiple systems. The increased availability of information enables faster, smarter decision making to ultimately improve operational performance and enhance business competitiveness.