



Outstanding Achievement

Biotechnology

Business Start-Up

Diversity & Inclusion

Energy

Food & Drink

Industry Project

Innovative Product

Oil & Gas

Pharma

Process Safety

Research Project

Sustainability

Team

Training & Development

Water

Young Industrialist

Young Researcher

IChemE Global Awards 2019 finalists



CPI, UCB Celltech, Lonza Pharma and Biotech, Horizon Discovery, Sphere Fluidics, and Alcyomics, UK - ***Defining and Developing New Generation Medicines***

The BioStreamline collaborative project which brought together complementary assets and cutting-edge expertise from the six partner organisations, across the spectrum of drug discovery and development, with funding from the UK Government's Advanced Manufacturing Supply Chain Initiative (AMSCI). The six partners were Lonza Pharma & Biotech, UCB Celltech, Sphere Fluidics, Horizon Discovery Group (Horizon), Alcyomics and CPI.

The project has been very successful and a similar approach could be used with other therapeutics, such as viral vectors, which are rapidly emerging as a major therapeutic area.

Institute of Biological Sciences, University of Malaya, Malaysia - ***Co-cultivation of Microalgae-bacteria for Wastewater Treatment***

One of the major global concern is on the environmental pollution particularly water pollution due to the release of industrial waste effluent to the environment. My project focuses on the innovative approach of microalgae-bacteria cocultivation for wastewater treatment. The overall goal of the project is to develop an efficient and technologically advanced wastewater treatment by utilising biological resources with the main objectives to investigate the potential of co-cultivation of algae and bacteria in effluent treatment, to study the effect of different parameters for microalgae-bacteria co-cultivation and large-scale application that will be beneficial for treating industrial effluent.

Malaysian Pepper Board, Malaysia - ***Bio-pepper Enhancer***

This technology is developed to ensure sustainable development of pepper industry, to conserve environment and to enhance its contribution to national economy. It is specifically designed for pepper. This enhancer, not intended to replace soil fertiliser, but serve as an enhancer to improve fertiliser utilisation, enhance growth, increase yield and manage pest infestation. MPB has started to commercialise it in small scale with total output of 500L (worth USD 10,000) in 2018 and is sought to use the product in Malaysia. MPB is looking towards a global partner who would be able to deliver this patented technology globally and commercialise it worldwide.

National University of Singapore, Singapore - ***Microbes Converting Polymerized Sugars to Chemicals***

Production of green biochemicals from renewable biomass is desirable, because the process is environmentally friendly, clean, and leads to less greenhouse gas emissions. To achieve this goal, we developed an efficient and cost-effective biotechnology to convert food and cellulose-/ hemicelluloses-containing organic wastes into butanol, riboflavin and many other value-added products. This technology will enable worldwide countries to manage their domestic biomass responsibly and transform our environment into eco-friendly living places. It will bring us one step closer to a "zero biomass waste generation" society for long-term posterity.

Proklean Technologies, India - ***Next Generation Biochemicals Using Probiotics***

Proklean has developed a unique technology platform from which it makes non-toxic and bio-degradable products that replace toxic chemicals in various applications. The key distinctive features that the products have are a) ability to deliver at least equal or better performance than existing products b) follow a circular approach thereby causing the least harm to ecology c) being extremely safe for living beings and d) the users not needing to incur additional costs.

University College London, UK - **Bioprocess Engineering Leadership Centre**

Biochemical Engineering skills underpin the translation of life science discoveries into industrial products and processes. Sectors reliant on these skills include chemicals and bio/pharmaceuticals, vaccines and the emerging cell and gene therapy market. For 20 years, the EPSRC CDT in Bioprocess Engineering Leadership has developed future leaders of the international bioindustries. The Centre helped pioneer Engineering Doctorate (EngD) programmes and has continually evolved to meet the research needs of the sector. To date, 171 EngD projects have been completed with 66 companies. 96% of graduates have progressed to relevant leadership positions in industry or established their own spin-out companies.



Engineers, UK - **Flawless Executions and Operational Excellence Specialist**

Engineers is a company that was started in 2015 to support EPC and operators achieve flawless execution in start-up and operational excellence using the latest digital technologies and a large network of engineering resources. Engineers have in their first few years of trading supported clients in major debottlenecking exercises, flawless start-up, operations and SimOps risk mitigation.

Floccess, Germany - **Software for Pillow-plate Heat Exchangers**

Floccess is a young technology company established in 2017 in Germany and is developing a unique web application for the reliable, optimal and automated design of innovative pillow-plate heat exchangers and pillow-plate jacketed tanks. Pillow plates represent heat transfer equipment with high energy and resources savings potential, however, up to now they lacked an accurate design tool for unlocking this potential. Floccess's software WASPP (Web Application for Analysis and Sizing of Pillow Plates) solves this bottleneck and will allow customers from different segments of process industry (chemical, pharmaceutical, energy, food, etc) to obtain reliable and optimal apparatus designs time and cost effectively.

University College London, UK - **Continuous Graphene Manufacturing by Microwave**

Considering the excellent performance and extremely wide application of high-quality graphene, a reproducible and robust manufacturing process is of key importance. A sustainable, economical and up-scalable system has been engineered to generate defect-free, single and few layer graphene in air without the need of toxic and expensive chemicals by a single-mode microwave reactor. Such a green approach is safe to both operators and the environment and can be carried out in a fluidic reactor with the potential for the production of tons of high-quality graphene annually.



Costain, UK - ***Costain's Inclusion Strategy: Implementation and Results***

Costain's goal is to be a safe and great place to work where people thrive and can be at their best every day. The company has taken significant proactive action in recent years to address the lack of diversity and inherent poor culture of inclusion in our industry.

An inclusion strategy has been developed to help Costain reflect the communities that it serves, embracing diverse thinking. The strategy links to wider corporate objectives and is embedded into all business activities. This enables the company to attract, develop and retain the very best people, recruited and developed by merit.

Ecolab, UK - ***Ecolab E3: Empower Engage Energise***

Ecolab's E3 mission is to Empower, Engage, and Energise Ecolab to measurably accelerate the advancement of women and develop leaders to drive business growth. Since 2006, E3 has created a global community that supports Ecolab's recruitment, development, and retention of female talent. E3's 4,000+ members create a positive climate for change and foster an inclusive culture where all Ecolab employees can thrive.

ExxonMobil Chemical and Esso Petroleum Company, UK - ***Diversity and Inclusion***

Fostering an inclusive workplace, where all employees can achieve their potential and where business decisions draw on diverse perspectives is a source of competitive advantage. This reflects ExxonMobil's ethos as staff join and continue in their careers. We aim to inspire and nurture students in STEM to ultimately want to be part of an all-inclusive organisation such as ours. We are keen to ensure that students in our community understand the opportunities for all in STEM and understand too that there are other supporting roles in other disciplines essential in sustaining our operation.

Fluor, UK - ***Driving Innovation Through Diversity and Inclusion***

Innovation Unwrapped, Fluor's innovation catalyst event, is emblematic of Fluor's commitment to and focus on Diversity & Inclusion in our global operations. Combining our 'Six Dimensions of Diversity Approach' with our practice that allows innovators to "self-identify" ensures not only that we find the top 40 innovators in our company that year (and in sequential years), but that achieving our desired diversity happens easily, we minimise unconscious bias, keep our employees engaged, and achieve our desired business results.

Rolls-Royce, UK - ***Continuing to Make a Difference***

Prism is an Employee Resource Group of Rolls-Royce. Prism aims to make the workplace a place where our LGBT+ employees can be themselves. Prism to date has almost 1000 members including those who identify as LGBT+ as well as non-LGBT+ allies.

The Prism vision is one of connecting, encouraging and developing diverse people to drive innovation, attract new talent and to support global growth. Prism continues to make significant impact within the company and engineering more broadly to address the issues of LGBT+ engineers in the workplace.



AquaBattery, The Netherlands - **BlueBattery** - *Energy Storage in Table Saltwater*

AquaBattery has developed the BlueBattery which can store electricity from renewable sources in water and table salt. Our aim is to help accelerate the transition to renewable energy sources such as solar and wind. Electricity production from these sources are inherently intermittent. Therefore, energy storage is indispensable when we want to enable the world to be mostly powered by these sources. We offer a part of the solution, which is a sustainable, safe and affordable BlueBattery for relatively long-term stationary energy storage.

Birmingham Centre for Energy Storage, University of Birmingham, UK, and Chinese Railway Rolling Stock Company (CRRC), China - **Cold Storage for Integrated Road/Rail Transportation**

There is a growing global need for clean cooling technologies. The Cold Storage Technologies for Integrated Rail – Road Transportation project led by the Birmingham Centre for Energy Storage working with the Chinese Railway Rolling Stock company, CRRC Shijiazhuang, has developed a refrigerated freight container for road and rail transportation. The container utilises novel phase-change materials (PCM) to maintain a low temperature over several days and is a clean, near-zero-carbon replacement for a diesel engine-powered refrigeration unit. The technology has been successfully demonstrated transporting goods for 35,000 kilometres by road and 1000 kilometres by rail across different climatic zones in China.

Birmingham Centre for Energy Storage, University of Birmingham and Jinhe Energy, UK - **The NexGen-TEST Project**

'Wrong-time' generation of electricity from renewables leads to economic and resource losses and wastes clean energy. The NexGen-TEST project led by the Birmingham Centre for Energy Storage, in collaboration with industrial partners across UK and China, addresses this problem. A novel composite phase change material (CPCM) based thermal energy storage technology utilises surplus wind power to store energy as heat for space heating. The technology has been demonstrated as commercially viable at scale at the world's first CPCM based plant in Altay of Xinjiang, China and has significant potential as a low-carbon heating technology in countries with surplus renewable generation.

CST Wastewater Solutions, NH Foods Australia, and Oakey Beef Export, Australia and Global Water & Energy (GWE), Belgium - **NH Foods Australia Biogas Sustainability Initiative**

An international collaboration between NH Foods Australia (part of Nipponham Group), Global Water & Energy and CST Wastewater Solutions is demonstrating – with a focus on engineering excellence and safety – how to simultaneously achieve outstanding environmental outcomes and financial payback.

NH Foods Australia's Oakey beef export plant in Queensland – which stores biogas extracted from wastewater in a robust 6000m³ polyester gas storage vessel – has achieved a rare business and environmental ideal of cleaner performance with stable, profitable supplies of biogas. A recent review confirmed the plant's profitable and trouble-free operation, which has cut gas bills by 40% for NH Foods Australia.

Heriot-Watt University, Dearman Engine Company, Green Data Center, UK, and Universiti Teknologi Malaysia, Malaysia - ***Green Data Centres for Sustainable Future***

Our UK-Malaysia consortium has demonstrated an innovative and highly competitive engineering process to recover waste heat energy from data centres and convert into zero-emission cooling and power provision with an annual CO₂ savings of over 230 tonnes per Megawatt computing power. Our team has successfully demonstrated the technology, building nine 20-foot containers green data centre (2,268 servers, totalling 216 m³). Recently, we have launched the world's first commercial demonstration facility, which attracted investments to build South East Asia's largest sustainable data centre that could globally equate to removing 12 million cars.

Perlemax and Viridor Waste Management, UK - ***Enhanced DZAD Cycle***

The Enhanced Desai-Zimmerman Anaerobic Digestion Cycle is an AD process intensification (energy production, 50%-750% increase in biogas production rate depending on feedstock), waste remediation (ammonia (in situ removal and from centrate/THP liquor, solid waste management), GHG mitigation (controlled methane production), and sustainable chemical production (ammonium salts of carbonate and carbamate) process cycle. With support from Viridor, there have been several steps in this process which result in individual unit operations being useful for multitudes of process industries eg (DZ Microbubble Ammonia Stripping)/CO₂ utilisation or biogas sweetening, fermenter /digester intensification – which when combined cause synergistic increase as seen in the enhanced DZAD.

Tri-Y Environmental Research Institute and Qilu University of Technology, Canada - ***Biobased Natural TCM Energy Saver***

An innovative product Biobased Natural TCM Energy Saver, a Temperature Control Material (TCM), has been developed for cooling/heating energy-saving in buildings. The materials used are from renewable natural sources, and the product can be recycled after its 30 years life span. It is an environmentally friendly product.

It can be installed on walls absorbing and releasing heat when temperature falls outside the human comfort range (18-26C) in rooms or constructed a TCM Air Conditioning System (TCM-AC), thus reducing 38-56% of cooling/heating energy demands.

Biobased Natural TCM Energy Saver benefits to environment and economy of the society.

University of Sheffield, Imperial College London, and Newcastle University, UK - ***Assessment of Intensified Solvent-based CO₂ Capture***

CO₂ emission from power plants and industries has caused huge concerns worldwide because it is widely believed to be a key driver of climate change. This research project aims to make a significant improvement in carbon capture using solvents. Conventional technology requires multiple huge packed columns due to poor mass transfer. The key idea of the project is to rotate the packed column so that it spins at hundreds of times per minute. Better mass transfer will be generated inside the rotating packed bed (RPB). The research indicated that the size of key equipment can reduce about 10 times.



Food & Drink

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Bitrez, UK - **Bitrez Curaphen**

Curaphen bisphenol A (BPA) free phenolic resin is used with non-epoxy-based systems in lacquers for the internal coatings of food and drink packaging. Its development was driven by worldwide health scares surrounding the use of BPA following scientific research picked up by the mass media (with emphasis on expectant mothers and babies) which resulted in legislative changes.

An alternative to BPA based grades, Curaphen meets new regulations without the associated health risks, while maintaining the performance qualities of BPA derivatives. The acceptance of the product by industry has enabled Bitrez to deliver strong growth and enter new markets.

Ecolab, UK - **Ecolab's Manufacturing Processes Improve Food Safety**

With growing world populations, a desire for more protein rich foods and reducing malnutrition, the need for safe food is increasingly important. The World Health Organisation estimates annually 1 in 10 falls ill and 420,000 people die from eating contaminated food.

Ecolab manufactures and supplies a full range of cleaning products to the Food and Beverage (F&B) industry.

Designed to improve food safety in the F&B industry, Ecolab's implementation of food safety standards (HACCP and ISO22000) in two key chemical plants in Europe works hand in hand with the customer to provide farm to fork food safety.

Global Water & Energy (GWE), Belgium - **Water Reclamation for Breweries**

Global Water & Energy (GWE) water reclamation plants transform a process and sustainability challenge into an environmental asset.

Breweries reclaiming post-production wastewater through a range of filtration and disinfection technologies create a high-quality water resource for use in cleaning and other processes.

This technology not only reduces breweries' environmental footprint and benefits bottom-line profits, but it also saves millions of litres of drinking water annually, which can be allocated to domestic usage.

GWE's three turnkey water reclamation projects are currently reusing approximately 7,000 m³ of wastewater daily, equating to more than 2.5 million m³ of saved water annually.



Industry Project

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CPFD Software, USA and Viva Energy Refining, Australia - **Risk Reduction Through Virtual Reactor Digitalisation**

CPFD's Virtual Reactor digitalisation technology reduces risks associated with the design, scale-up and operations of fluid-particle processes throughout the chemical process industries. Virtual Reactor determines the root causes of underperformance and enables the safe, virtual testing of alternatives. Viva Energy's Geelong refinery, as an early adopter of the technology, achieved increased throughput and 75% reduction in upsets for their FCCU process. Partly through Viva Energy's leadership in sharing their success story, the CPFD technology is now deployed beyond refining on 6 continents affecting similar gains in petrochemicals, gasification, power generation, materials processing and clean energy industries, enabling a sustainable future.

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The project has been very successful and a similar approach could be used with other therapeutics, such as viral vectors, which are rapidly emerging as a major therapeutic area.

Haldor Topsøe A/S, Denmark - **Topsoe Improved Gasoline Process (TiGAS™)**

Haldor Topsøe has successfully commercialised its TiGAS™ or Topsoe Improved Gasoline Process gas-to-gasoline technology in a first industrial scale facility. This first full-scale 15,500 BPSD (600,000 ton/y) TiGAS™ facility has been constructed in Turkmenistan and successfully started-up. This facility converts natural gas into gasoline that meets all the required fuels specifications.

After more than 20 years of process development and R&D, Topsøe's TiGAS™ process has now successfully being proven at a commercial scale. This deployment is the culmination of years of complex heterogeneous catalyst development and process engineering.

Johnson Matthey, UK - **Johnson Matthey Delivers Commercial Manufacturing in Annan**

The project at the JM facility in Annan applied process engineering skills to assist in delivering site remediation, strong project processes and delivery of the technical transfer processes to achieve the commercialisation of two products from this site within a tight timescale. This was achieved by application of process safety techniques and good engineering practice and incorporated teamwork with all departments at the facility in Annan.

The investment made by JM in the facility in Annan has provided benefits to the local and national economy.

Johnson Matthey and Eastman Chemical Company, UK - *Methanol and Syngas to MEG*

Johnson Matthey and Eastman Chemical have developed and commercialised a new route to make mono-ethylene glycol from methanol and synthesis gas, using a range of feedstocks and without the need for access to ethylene. An integrated approach and highly efficient catalysts and process routes maximises feedstock conversion, reduces waste, and lowers utility consumption. This novel technology has been developed using JM's mini-plant process development and scale-up methodology that avoids the need for large scale pilot or demonstration plants. The first commercial plant at a world scale capacity of 1,000 ktpa of MEG is now under construction in Inner Mongolia, China.

Sellafield Ltd, UK - *Safe Retrieval of Legacy Nuclear Waste*

The First Generation Magnox Storage Pond (FGMSP) contains some of the most radioactive sludges within Sellafield, contained within an ageing building, and this sludge needs to be removed from this location to modern stainless steel containment from where it can go on for forward processing. A previous attempt at remobilising and removing sludge from this particular location had been unsuccessful, so a new system needed to be developed to relocate the sludge.

This new approach implemented by rigorous and extensive application of chemical engineering skills combined with support from external experts from around the UK has underpinned the design of what is a simple 'concept' and has successfully started the process of relocating this hazardous material.

The result is a major step in reducing the overall UK legacy nuclear hazard.

Sellafield Ltd and National Nuclear Laboratory, UK - *Dynamic Modelling Effluent Treatment Facilities*

The Enhanced Actinide Removal Plant and Site Ion-Exchange Plant are two of the major aqueous effluent treatment plants on the Sellafield site. High fidelity dynamic process models have been developed for both facilities and these are already demonstrating the significant benefit they can bring to the business, environment and public.

These models have provided new crucial insights on Sellafield Ltd's integrated waste management strategy, including the ability to optimise operations in terms of cost, schedule, and environmental detriment, as well as assessing the consequential impact of upstream facilities feed on plant abatement and secondary waste generation.

Synthomer, UK - *Synthomer NBR Expansion Project*

Synthomer is market leader in Nitrile Butadiene Rubber (NBR) technology and manufacturing. The Pasir Gudang site, Malaysia, recently completed JoB5 - a major expansion project to increase NBR output from the site by 40%, this project represented the biggest single capital project expenditure in Synthomer's history.

The project includes a new reactor line and major plant debottlenecking. Kicking off in 2015, the JoB5 project was completed successfully in Q4 2018, to the highest standards of safety, project excellence and technical performance. Successes included achieving 1.4 million safe manhours, in-specification product from the first batch and project delivery under budget.



Innovative Product

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Dow Chemical, Belgium - ***DOWSIL™ ACP-3073 ANTIFOAM COMPOUND***

The DowSil™ ACP-3073 silicone compound is a new, sustainable, robust, reliable, efficient antifoam technology for the pulp and paper market that provides superior antifoam performances, improved drainage of water and improved robustness in a broad range of pulp mills. This new antifoam also providing a significant reduction of the risk of silicone deposition on the pulp fibers, is contributing to the reduction of water, energy and chemicals consumption as well as the recovery of valuable chemicals; it has a significant contribution to the reduction of the carbon and environmental footprint of the pulp mills.

Dow Chemical, Republic of Korea - ***UV-Moisture Hybrid Curing Silicone Adhesive***

DOWSIL™ SE 9160 adhesive offers unique dual cure chemistry within one silicone material. It provides repairable adhesion that enables defective units to be reused and complete waterproof performance for the protection of the mobile unit from water damage. An initial UV fast cure is performed, followed by a moisture cure to ensure full curing in shadow areas that do not receive full UV exposure. This dual cure approach provides the functionality, including waterproofing, required by newer cell phone designs, while providing cell phone manufacturers advantages in assembly time (faster cure), re-workability and lower temperature cure to protect device components.

Dow Performance Silicones, USA - ***Si-Foam Enabling Efficient Renewable Energy Storage***

DOWSIL™ EF-6525, an innovative two-part, room-temperature-cure silicone foam encapsulant solution for lithium ion battery modules, was developed and commercialised through an excellent cross-functional and geographically diverse team. Careful work was completed by the Dow team to fine tune material and cure properties, optimise process conditions, and manufacture DOWSIL™ EF-6525 in record time, while maintaining keen focus on safe handling in transportation and application of the reactive system. The result was arrival at a safe and sustainable solution to address the emerging opportunity to harness renewable energy more efficiently and thus apply its benefits to society.

Johnson Matthey and Catalyst Technologies, UK - ***Chromium-free Hydrogenation Catalyst***

Johnson Matthey's chrome-free liquid phase hydrogenation catalyst, provides superior performance to existing products with a reduced environmental footprint. The product is highly innovative, utilising improved dispersion of the active phase on a chrome-free support. The project was accelerated to meet a customer demand, from inception to successful commercialisation of this new product within an 18-month time frame, only made possible through collaboration using a multi-disciplined team across Europe and China.

Micropore Technologies, UK - ***Membrane Emulsification Finally Comes of Age***

Micropore Technologies has overcome the long-standing scalability limitations of membrane emulsification, which has demonstrated many benefits for formulators including product performance enhancement, increased yields and lower energy usage. With the Micropore AXF-7 retaining the precision of near monodispersity while scaling to capacities of up to 10,000 tes/yr is now a reality. Scalability of membrane emulsification together with its long-established but hitherto unreachable cost and performance benefits is no longer an issue.

Stora Enso, Finland - ***Renewable Micro-fibrillated Cellulose Replaces Fossil Materials***

Stora Enso has created a portfolio of microfibrillated cellulose (MFC) products that help customers to provide more sustainable and natural options to their consumers. Integrant™ by Stora Enso is a unique multi-purpose microfibrillated cellulose, extracted from sustainably managed forests and made with pure water from the Nordics. It is a fine material with a high surface area with unique properties ideal for specialty papers, paints and coatings as well as personal and home care products. It can replace fossil-based ingredients and helps to shift into a bio-based, renewable and biodegradable offering. [Please note that the brand name Integrant will be officially launched only in August 2019]

Tri-Y Environmental Research Institute, Canada and Qilu University of Technology, China - ***Biobased Natural TCM Energy Saver***

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ExxonMobil Chemicals, UK - **10" Heavy Hydrocarbon Line Freeze**

Following the shut down and start-up of the refinery's largest crude and vacuum distillation unit due to a leak, coke from within the vacuum tower was dislodged, and carried through to the bottoms' pipework off the tower. This caused blockages in the pump strainers and settled coke under valve seats, resulting in poor pump performance post start-up, which was impacting unit capacity utilisation. Due to the coke lay down in the isolation valves, the strainers could not be taken out and cleaned to restore pump/unit performance. If the strainers could not be isolated "on the run", then the unit would have to be shut down again, costing £3million. A 10" hydrocarbon plug was created through freezing the line with liquid nitrogen, the strainers cleaned and operation resumed at a cost of only £30,000.

Fluor, UK - **Oxygen Enhanced Claus CO₂ Recovery Process**

Fluor's patent pending OEC2RP Technology provides a means of recovering Sulfur and CO₂ from SRU/TGTU efficiently, safely and cost effectively. Fluor's OEC2RP Technology operates the SRU/TGTU with pure or close to pure oxygen to produce a tail gas containing about 65% CO₂, 22% H₂ and H₂O. After an oxidation/cooling/de-watering step, a product gas stream of >98% CO₂ is derived. Further dehydration will purify the product stream with up to 99.9+% CO₂. Fluor's innovative technology helps to provide a much greener environment for surrounding communities by recovering both sulfur and CO₂ with significant less CAPEX and OPEX compared to conventional technologies.

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PETRONAS Penapisan (Terengganu), Malaysia - **Efficient Sampling Using Desorbent Sight Glass (DSG)**

Creative Desorbent Sight Glass (DSG) incorporates the concept of lean whereby the intent is to deal with the difficulty and inefficient desorbent sampling process/activity. The utilisation of DSG is proven to shorten the sampling time from 25 minutes to 2 minutes. It also prevents the degradation of desorbent Para diethyl Benzene (P-DEB) which contributes to the reduction of desorbent disposal to DOC (Drain Oily Contaminated). This facility operates on a closed loop system thus ensures excellent HSE aspect towards the operator. The innovation of this desorbent sampling process leads to cost saving of up to RM15000 per year.

Saudi Aramco, Saudi Arabia - **Flare Gas Recovery System (FGRS)**

Although gas flaring has negative environmental and economic impacts, it is indispensable in the oil and gas industry for safety reasons in case of process upsets or emergency. However, Saudi Aramco has innovated a revolutionary system called the Flare Gas Recovery System (FGRS).

Not only does it eliminate flaring completely, it also saves energy by utilising the plants' existing infrastructure (high pressure injection water) instead of new compression units. So the FGRS has the best of both worlds, it protects the environment, and saves energy and useful natural resources.

Saudi Aramco, Saudi Arabia – **Saudi Aramco Flare Gas Recovery System**

The flare gas recovery project has contributed towards realising the corporate environmental objectives, monetising the recovered flare gas, and enhancing the flare system reliability. We are the first in the company to use the gas ejector technology that proves to be cost-effective and environmentally friendly. Energy to drive the unit is the motive gas instead of power. The project was executed successfully in a timely manner and on budget while adhering to the utmost safety standards. Such a cost-effective project and its associated environmental achievement have elevated our organisation profile — we have an excellent environmental standing in the company.

Saudi Aramco, Saudi Arabia - **Water Management Dashboard**

Pumps are significant energy users (SEU) and, therefore, monitoring their performance (particularly recycling) can significantly reduce the operating costs. Therefore, Saudi Aramco has developed an innovative water injection pumps dashboard that provides real-time data to monitor the pumps performance which can help resolving any issues instantaneously to reduce power losses.

University College London, UK - **Solar Driven Methane to Fuels**

The conversion of methane to value-added chemicals and fuel is a very promising and profitable route to utilise the abundant shale gas and methane hydrate reserves. The existing catalytic processes require harsh reaction conditions together with substantial CO₂ emissions. We developed a solar-driven catalytic technology that can directly produce liquid fuels using methane as a feedstock by a very economic and safe approach operated under ambient conditions. Our process brings about substantial benefits to the environment and drives us towards a more sustainable society.



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North Carolina State University, USA - **Fast-Acting, Broad-Spectrum Antimicrobial Polymers**

Drug-resistant microbes constitute a growing threat to global healthcare by increasing hospital-acquired infections, especially for elderly and immune-compromised patients. While various antimicrobial strategies have been developed, some are microbe-specific while others introduce environmental contamination. We demonstrate that anionic block polymers inherently provide self-sterilizing surfaces that rapidly kill 99.9999+% of several bacteria, including those that are antibiotic-resistant, and viruses in 5 minutes due to a dramatic reduction in surface pH. As a promising addition to the arsenal of broad-spectrum antimicrobial materials, these anionic polymers afford a facile, fast-acting, refreshable, and eco-friendly preventative route to combat the worldwide proliferation of infectious microbes.



AstraZeneca, UK - *Duty of Care When Outsourcing*

Assessment of AZ's outsourcing partners capability, hazard potential of chemistry, scale of manufacture, level of input to the development process were all used to develop a process and tool that ensured each outsourced project had the right and consistent level of process safety expertise / input aligned. The project ensures that AZ's outsourcing partners have the capability and support necessary to safely carry out the development and manufacture of APIs and intermediates whilst efficiently and effectively utilising the available AZ internal resource.

Environment Agency on behalf of the COMAH Strategic Forum (CSF), UK - *Improved Process Safety for Flooding Events*

The COMAH Strategic Forum (CSF) is a partnership of high-level representatives from the COMAH Competent Authority (CA), industry and trade unions. It has assessed the need for major hazard sites to be better prepared for the impacts of flooding and severe weather conditions. They have commissioned and approved guidance, implementation strategies and shared best practice to enable all industry sectors to improve, thus protecting people and the environment whilst supporting improved operational resilience and speed of recovery for industrial sites that could be affected by flooding.

Esso Australia - *Data Insights Drive Improved Process Safety*

Esso Australia has conducted a focused campaign to improve process safety literacy across the organisation, in particular the value of reporting all potential process safety hazards, near misses and incidents. This awareness has enabled a deeper level of understanding of risk in all phases of production operations, and led to insights and actions taken that improve integrity and reliability programs, resulting in improved process safety performance.

ExxonMobil Chemical, UK - *Delta HAZOP*

ExxonMobil are committed to making a step change in its process safety performance through enhancing process safety and becoming a clear industry leader in this area. Learning from others, we identified the need to focus our existing risk discovery processes and begin to also manage by scenario. EMCL Fawley has led the development of this new way of thinking. Amongst other measures we introduced the Delta HAZOP methodology, and improved it based upon learnings from industry and the regulator.

The site is significantly more focused on major accident hazard related activities, both in study execution and its follow-up.

JGC Corporation, Japan, Arcadis, The Netherlands, and Atkins, DBD, GSB, UK - *Wylfa ABWR Radwaste Process Safety*

JGC was assigned the role to develop the design and safety arguments relating to the Wylfa Newydd Nuclear Power Plant Radwaste Building (Rw/B), justifying the safety of the designs Wylfa design, progressing the project through HAZOP 2 and the production of the Pre Construction Safety Report (PCSR) for the Rw/B facilities.

JGC assembled an international team between the UK and Japan managed from its Japanese operations centre in Yokohama, across different countries, organisations and areas of expertise, into a unified project team. JGC's philosophy was to utilise 'best in class' expertise from within the UK supply chain.

The team worked tirelessly to progress the project through HAZOP 2 until the pausing of the project in February 2019.

Novartis Grimsby, UK - *Implementation of a Human Factors Programme*

The project objective was to implement a human factors programme to site for control of critical tasks that aligned with industry good practice. To achieve this, benchmarking against local industry groups was completed as well as review of industry guidance. The outcome was a register of critical tasks that was well defined. A clear line of sight from risk analysis, to critical task, to human reliability analysis, to critical procedure and to competence management means that it is a holistic approach with consistency throughout and that those doing the tasks are clear on what is critical and why.

PETRONAS Penapisan (Terengganu), Malaysia - *Early Warning Analytics Using DRA*

In journey to achieve world class operational performance and maximising value of integrated oil chain; maintaining plant performance while embarking in transformation journey has powered DRA implementation in PP(T)SB.

Dynamic Risk Analyzer (DRA) is an analytical tool by Near-Miss Management (NMM) that provides early warning and detection of hidden near misses to engineers and plant operators. The early warning provides time for personnel to troubleshoot plant deviations to prevent unwanted incidents or accidents. With DRA realisation, RM6.5 million of cost avoidance was captured and successfully inculcated generative culture on providing insight and making right decision in time.

Sellafield Ltd, UK - *Using History to Improve the Future*

Learning from the past can truly help replicating misconceptions based on folklore and results in a more robust safety case to deliver hazard reduction. This work generated a new understanding of the heat balance in a high hazard nuclear plant, which has been in operation since the 1960's. It produced a tool that can now be confidently used to explain previous thermal runaway reactions and deterministically show that they cannot occur in the future. Multiple safety and operational benefits have been realised.



Research Project

Sponsored by



Birmingham Centre for Energy Storage, University of Birmingham, UK and Chinese Railway Rolling Stock Company (CRRC), China - **Cold Storage for Integrated Road/Rail Transportation**

There is a growing global need for clean cooling technologies. The Cold Storage Technologies for Integrated Rail – Road Transportation project led by the Birmingham Centre for Energy Storage working with the Chinese Railway Rolling Stock company, CRRC Shijiazhuang has developed a refrigerated freight container for road and rail transportation. The container utilises novel phase-change materials (PCM) to maintain a low temperature over several days and is a clean, near-zero-carbon replacement for a diesel engine-powered refrigeration unit. The technology has been successfully demonstrated transporting goods for 35,000 kilometres by road and 1000 kilometres by rail across different climatic zones in China.

Birmingham Centre for Energy Storage, University of Birmingham and Jinhe Energy, UK - **The NexGen-TEST Project**

'Wrong-time' generation of electricity from renewables leads to economic and resource losses and wastes clean energy. The NexGen-TEST project led by the Birmingham Centre for Energy Storage, in collaboration with industrial partners across UK and China, addresses this problem. A novel composite phase change material (CPCM) based thermal energy storage technology utilises surplus wind power to store energy as heat for space heating. The technology has been demonstrated as commercially viable at scale at the world's first CPCM based plant in Altay of Xinjiang, China and has significant potential as a low-carbon heating technology in countries with surplus renewable generation.

Fluor, UK - **Oxygen Enhanced Claus CO₂ Recovery Process**

Fluor's patent pending OEC2RP Technology provides a means of recovering Sulfur and CO₂ from SRU/TGTU efficiently, safely and cost effectively. Fluor's OEC2RP Technology operates the SRU/TGTU with pure or close to pure oxygen to produce a tail gas containing about 65% CO₂, 22% H₂ and H₂O. After an oxidation/cooling/de-watering step, a product gas stream of >98% CO₂ is derived. Further dehydration will purify the product stream with up to 99.9+% CO₂. Fluor's innovative technology helps to provide a much greener environment for surrounding communities by recovering both sulfur and CO₂ with significant less CAPEX and OPEX compared to conventional technologies.

Heriot-Watt University, UK - **Low Carbon Jet Fuel**

Our project will pave the way to decarbonise the aviation sector through the introduction of a low-carbon sustainable aviation fuel. Our innovation entails the production of low carbon jet fuels through the integration of three process technologies, taking CO₂ and waste biomass and a combination of co-electrolysis to produce a jet fuel that is negative in CO₂ emissions compared to conventional jet fuel (A1). We have completed research work at TRL levels 1-3 at our lab scale biorefinery and we are now planning a pilot plant unit to produce around 50-100 litres of jet fuel/day.

Johnson Matthey and Eastman Chemical Company, UK - **Methanol and Syngas to MEG**

Johnson Matthey and Eastman Chemical have developed and commercialised a new route to make mono-ethylene glycol from methanol and synthesis gas, using a range of feedstocks and without the need for access to ethylene. An integrated approach and highly efficient catalysts and process routes maximises feedstock conversion, reduces waste, and lowers utility consumption. This novel technology has been developed using JM's mini-plant process development and scale-up methodology that avoids the need for large scale pilot or demonstration plants. The first commercial plant at a world scale capacity of 1,000 ktpa of MEG is now under construction in Inner Mongolia, China.

National Energy Technology Laboratory, USA - **CO₂-SCREEN**

Carbon Capture and Storage (CCS) is a powerful method for reducing the amount of carbon dioxide (CO₂) released into the atmosphere from man-made sources, ultimately helping to mitigate the effects of climate change. However, in order for government and industries to make critical energy-related policy and business decisions, they must have reliable and accurate estimates of the storage potential of geologic formations. CO₂-SCREEN is a substantive and user-friendly tool that use proven methods and equations to provide a dependable method for calculating prospective CO₂ storage resources that allows consistent comparison of results between different research efforts.

Tianjin University, China and Loughborough University, UK - **Next-Gen Fuel Cell Engine**

Fuel Cell Vehicle (FCV) based on Proton Exchange Membrane Fuel Cell (PEMFC) is a future option to deliver efficient, clean and economical energy sources for road transport. To support the next generation fuel cell engine with transformative electrode and cell structures design, this project has developed a comprehensive multi-dimensional full-range scale PEMFC simulation platform which includes macroscopic full cell/system model and microscopic porous electrode model. The simulation tool has been successfully applied by our industrial partners to support the generation fuel cell engine innovation, which contributed to the development of China's first 5,000-hour fuel cell product.

University of Sheffield, Imperial College London, and Newcastle University, UK - **Assessment of Intensified Solvent-based CO₂ Capture**

CO₂ emission from power plants and industries has caused huge concerns worldwide because it is widely believed to be a key driver of climate change. This research project aims to make a significant improvement in carbon capture using solvents. Conventional technology requires multiple huge packed columns due to poor mass transfer. The key idea of the project is to rotate the packed column so that it spins at hundreds of times per minute. Better mass transfer will be generated inside the Rotating Packed Bed (RPB). The research indicated that the size of key equipment can reduce about 10 times.



Avertana, New Zealand - *Industrial Waste to Essential Raw Materials*

Avertana is a process technology developer and licensor.

Our proprietary technology converts industrial waste streams into drop-in raw materials used to make everyday products like paint, paper, fertilizer and cement. It both consumes existing industrial waste and leaves behind no residual solid waste.

Avertana's technology has a significantly lower production cost and much smaller environmental footprint than existing routes. Our process can either be deployed at new, greenfield plant or retrofitted to certain existing brownfield production facilities, reducing capital cost and buildout time.

CST Wastewater Solutions, NH Foods Australia, and Oakey Beef Export, Australia and Global Water & Energy (GWE), Belgium - *NH Foods Australia Biogas Sustainability Initiative*

An international collaboration between NH Foods Australia (part of Nipponham Group), Global Water & Energy and CST Wastewater Solutions is demonstrating – with a focus on engineering excellence and safety – how to simultaneously achieve outstanding environmental outcomes and financial payback.

NH Foods Australia's Oakey beef export plant in Queensland – which stores biogas extracted from wastewater in a robust 6000m³ polyester gas storage vessel – has achieved a rare business and environmental ideal of cleaner performance with stable, profitable supplies of biogas. A recent review confirmed the plant's profitable and trouble-free operation, which has cut gas bills by 40% for NH Foods Australia.

Dow Chemical, Belgium - *DOWSIL™ ACP-3073 ANTIFOAM COMPOUND*

The DowSil™ ACP-3073 silicone compound is a new, sustainable, robust, reliable, efficient antifoam technology for the pulp and paper market that provides superior antifoam performances, improved drainage of water and improved robustness in a broad range of pulp mills. This new antifoam also providing a significant reduction of the risk of silicone deposition on the pulp fibers, is contributing to the reduction of water, energy and chemicals consumption as well as the recovery of valuable chemicals; it has a significant contribution to the reduction of the carbon and environmental footprint of the pulp mills.

Econic Technologies, UK - *Turning CO₂ into Endless Potential*

Econic's ground-breaking catalyst technology turns waste CO₂ into benefit. The technology liberates manufacturers from their reliance on expensive oil-based raw materials, while also enabling them to create added value through use of a much cheaper waste material to generate enhanced products. Environmentally speaking, for every tonne of CO₂ utilised, a further two tonnes of emissions are avoided – assuming 50% adoption, this would equate to 10M of CO₂ saved.

By creating new value from waste CO₂ for the plastics industry, Econic is building a future where a damaging greenhouse gas can be transformed into endless commercial and environmental benefit.

Heriot-Watt University, Dearman Engine Company, Green Data Center, UK, and Universiti Teknologi Malaysia, Malaysia - **Green Data Centres for Sustainable Future**

Our UK-Malaysia consortium has demonstrated an innovative and highly competitive engineering process to recover waste heat energy from data centres and convert into zero-emission cooling and power provision with an annual CO₂ savings of over 230 tonnes per Megawatt computing power. Our team has successfully demonstrated the technology, building nine 20-foot containers green data centre (2,268 servers, totalling 216 m³). Recently, we have launched the world's first commercial demonstration facility, which attracted investments to build South East Asia's largest sustainable data centre that could globally equate to removing 12 million cars.

JTI, Malawi – **Waste to Community Assets**

JTI Malawi produces 450 metric tons of coal ash annually as a waste product of its factory operations.

Coal ash poses environmental risks as it can potentially contaminate soil and groundwater with heavy metals. JTI Malawi devised an innovative approach to mitigate the environmental and reputational risk that the disposal of coal ash posed.

JTI Malawi uses the coal ash as the main ingredient in making building blocks. JTI Malawi has converted over 3000 MT of coal ash into construction blocks resulting in the rehabilitation of landfills and promotion of forestry.

London South Bank University and MEL Chemicals, UK - **Novel CO₂ Utilisation Process**

CO₂ utilisation is the process of using emitted CO₂ as a feedstock for new products and underpins the UK's ambitions for a low carbon economy. The team have developed a simple to operate, small-scale technology that can economically produce sustainable organic carbonates via CO₂ utilisation. Understanding and controlling various operating parameters, and developing innovative catalysts, this project has provided the essential design tools to allow optimisation of the CO₂ utilisation process. The present approach for dimethyl carbonate synthesis is about 53% more energy efficient than conventional processes, produces no hazardous wastes and reduces CO₂ emission by more than 76%.

Sime Darby Research and Novozymes Malaysia - **Enzymatic Assisted Extraction of Palm Oil**

A green and novel process is developed to decipher the OER stagnation issue of the palm industry. Cell wall degrading enzymes are used to hydrolyse complex structures of the oil-bearing cells to liberate more oil, reducing losses, and improving downstream processing. A 1.0% OER increase can generate additional revenue of RM6.6 million/mill/year for SDP and RM2 billion/year for the palm oil industry in Malaysia, with payback period of 0.85 years. Sustainability-wise, it can enable 4% production increase from same amount of land, as well as a 9% reduction in GHG emission per tonne of CPO produced, according to LCA study currently under peer-reviewing.



Dow Performance Silicones, USA - ***Si-Foam Enabling Efficient Renewable Energy Storage***

DOWSIL™ EF-6525, an innovative two-part, room-temperature-cure silicone foam encapsulant solution for lithium ion battery modules, was developed and commercialised through an excellent cross-functional and geographically diverse team. Careful work was completed by the Dow team to fine tune material and cure properties, optimize process conditions, and manufacture DOWSIL™ EF-6525 in record time, while maintaining keen focus on safe handling in transportation and application of the reactive system. The result was arrival at a safe and sustainable solution to address the emerging opportunity to harness renewable energy more efficiently and thus apply its benefits to society.

Engie Fabricom UK, Nippon Gohsei, INEOS Oxide, and Zeeco, UK - ***Design and Build Temporary Site Flare***

This project was a collaboration between Nippon Gohsei, INEOS, ENGIE Fabricom, and Zeeco to design and install a temporary flaring solution enabling Nippon Gohsei's EVOH Plant in Hull to continue manufacturing whilst its permanent flaring facility was non-operational due to turnaround activities. The project was completed within 7 months from concept to commissioning, seemingly a 'near-impossible' task at the outset. It was achieved by the complete commitment and dedication of all parties, placing the success of the project above any individual organisational interest. As a result, over 2000 tonnes of product were manufactured which otherwise would have been lost.

Environment Agency on behalf of COMAH Strategic Forum, UK - ***Improved Process Safety for Flooding Events***

The COMAH Strategic Forum (CSF) is a partnership of high-level representatives from the COMAH Competent Authority (CA), industry and trade unions. It has assessed the need for major hazard sites to be better prepared for the impacts of flooding and severe weather conditions. They have commissioned and approved guidance, implementation strategies and shared best practice to enable all industry sectors to improve, thus protecting people and the environment whilst supporting improved operational resilience and speed of recovery for industrial sites that could be affected by flooding.

National Nuclear Laboratory, Lancaster University, University of Liverpool, University of Manchester, and Sellafield, UK - ***CINDe: Bridging the Research-Industry Gap***

CINDe is a unique training and development programme that brings together leading academics with professionals from the National Nuclear Laboratory (NNL) and Sellafield Ltd (SL) to perform innovative Research and Development (R&D) to support the national decommissioning mission.

A collaboration between academia, the national laboratory and industry, this programme is a model for a new way of working that closes the gap between academic research and industrial application, growing skills and bringing real economic benefits alongside academic excellence.

CINDe contributes to the community in which it is based, raising the reputation of the industry and those who work in it.

Petroleum Development Oman, Oman - *Accident Prevention and “Lessons Learnt” in Safety*

The project demonstrates the good practice of implementing learnings from previous incidents in improving the projects design to avoid recurrence of similar process safety incidents within the company. The incident data book in our company existed for a long time, the team took the initiative to improve safety by converting the collected data into a functional tool. The compiled learnings from previous incidents were used to create a checklist which is now used to screen the applicable learnings from previous incidents related to each project and demonstrate compliance by relevant discipline engineers. This initiative is an added safety tool alongside the current AI-PSM assurance tools applied in all PDO's projects. The idea can be adapted by different companies using their own learnings from previous incidents.

Sellafield Ltd and Axiom Collaborative Solutions, UK - *Thorp Evaporative Capacity Project*

The TEC project was tasked with maintaining evaporative capacity until at least 2030 for medium active wastes on the Sellafield site, to support the changing site mission for high hazard reduction. Rather than replace the existing MASFE Mk. 2 double effect thermosiphon evaporator, part of which does not have enough remaining life to fulfil these needs, with a new system, it was chosen to repurpose part of the original system and use innovative thinking to make this fulfil the site requirements. This saved on raw materials, wastes and cost and lessened the future POCO and remediation burden on the site.

Synthomer, Malaysia - *Synthomer NBR Expansion Project*

Synthomer is market leader in Nitrile Butadiene Rubber (NBR) technology and manufacturing. The Pasir Gudang site, Malaysia, recently completed JoB5 - a major expansion project to increase NBR output from the site by 40%, this project represented the biggest single capital project expenditure in Synthomer's history.

The project includes a new reactor line and major plant debottlenecking. Kicking off in 2015, the JoB5 project was completed successfully in Q4 2018, to the highest standards of safety, project excellence and technical performance. Successes included achieving 1.4 million safe manhours, in-specification product from the first batch and project delivery under budget.

University of Chester and Unilever R&D, UK - *Chemical Engineering Degree Apprenticeships*

The University of Chester has partnered with regional companies including Unilever to offer the first chemical engineering degree apprenticeships. The was a major challenge but now provides a working model for a completely new way to training and recruit high calibre chemical engineering graduates.



Training & Development

Sponsored by



BP European Acetyls, Honeywell, UK, and BP Petrochemicals RT, USA - ***Accurate Simulation Ensures Safe Operator Training***

A necessary step in BP Hull's ongoing competence assurance programme of control room technicians is to train and assess them on a simulation model which is an absolute imitation of the equipment they are operating. It is not effective or efficient to train on a model that doesn't reflect the equipment and to do so, can have detrimental safety implications.

An essential rebuild of our A4CO plant model was potentially cost prohibitive but utilising a joint BP/vendor scope project collaboration ensured this accuracy requirement was not compromised, whilst also delivering significant project cost and duration savings in challenging economic times.

IChemE Nuclear Technology Special Interest Group and Chester University, UK - ***Nuclear Lectures at Chester University***

The Nuclear Technology Special Interest Group and Chester University have worked together to produce a series of lectures on chemical engineering applications in the nuclear industry. The lectures consisted of presentation material and group exercises with all material created and presented by volunteers from industry.

This successful initiative has demonstrated the benefits of bridging the gap between academia and industry and has provided chemical engineering students at Chester University with access to experienced professional chemical engineers and an interesting insight into the technology and challenges associated with the UK nuclear industry.

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CINDe contributes to the community in which it is based, raising the reputation of the industry and those who work in it.

PETRONAS Chemicals Methanol, Malaysia - ***Process Safety R2C2***

Process Safety R2C2 is a 3-years transformation journey started in 2017. It aims to take a quantum leap to achieve the next level of process safety performance and culture excellence in PETRONAS Chemicals Methanol. Process Safety R2C2 was designed based on the influence model to effectively drive and sustain the organisational culture change. A combination of best practices was implemented as a single ecosystem to make this ambitious endeavour possible.

PM Group- *Pharma SME Development Programme*

Technical expertise is a key component of PM Group's service offering – most especially in the Pharma sector. The Pharma SME (Subject Matter Expert) Development Programme is focused on bringing talented engineers and architects to world class expert level, across PM Group's global office network.

The tailored programme is based on three core pillars – training modules, mentoring and on the job experience. It is an innovative, high-impact learning approach that enables knowledge transfer from current SMEs and allows the company to provide the best possible solutions to clients around the globe.

Sellafield, Ltd UK - *Sellafield Ltd “Cradle to Grave” Training Scheme*

Developing others, whilst developing ourselves.

Our objective: create a scheme that engaged and developed at all ages - from school students through to fresh-face engineers taking their first steps in the world of full-time employment to fully engaged, demonstrably professional chemical engineers. The totality of our training scheme is what sets it apart.

University College London, UK - *Bioprocess Engineering Leadership Centre*

Biochemical engineering skills underpin the translation of life science discoveries into industrial products and processes. Sectors reliant on these skills include chemicals and bio/pharmaceuticals, vaccines and the emerging cell and gene therapy market. For 20 years, the EPSRC CDT in Bioprocess Engineering Leadership has developed future leaders of the international bioindustries. The Centre helped pioneer Engineering Doctorate (EngD) programmes and has continually evolved to meet the research needs of the sector. To date, 171 EngD projects have been completed with 66 companies. 96% of graduates have progressed to relevant leadership positions in industry or established their own spin-out companies.

University of Queensland, Australia - *Risk and Safety Education for the Next Generation*

The School of Chemical Engineering at The University of Queensland have developed two innovative risk and safety courses that actively engage industry people, case studies and projects. The courses aim to help students gain the risk and safety management knowledge, skills and attributes that professional chemical engineering graduates need effectively to help industry manage the risks and process safety challenges that will ensure sustainable process operations.



Water

Sponsored by



Global Water & Energy (GWE), Belgium - ***Water Reclamation for Breweries***

Global Water & Energy (GWE) water reclamation plants transform a process and sustainability challenge into an environmental asset.

Breweries reclaiming post-production wastewater through a range of filtration and disinfection technologies create a high-quality water resource for use in cleaning and other processes.

This technology not only reduces breweries' environmental footprint and benefits bottom-line profits, but it also saves millions of litres of drinking water annually, which can be allocated to domestic usage.

GWE's three turnkey water reclamation projects are currently reusing approximately 7,000 m³ of wastewater daily, equating to more than 2.5 million m³ of saved water annually.

Jacobs Engineering and Public Utilities Board, Singapore - ***Tuas Nexus and Tuas WRP***

Tuas WRP is a process plant being developed by the Public Utilities Board of Singapore to address the country's long-term needs for used water collection, treatment and reclamation.

Tuas WRP will be co-located with the Integrated Waste Management Facility (IWMP) being developed by the National Environment Agency. This will allow realisation of the synergies of integrating used water and solid waste treatment while optimising land use.

Tuas WRP will be a compact and highly automated plant with an initial treatment capacity of 800 MLD and a production capacity of 114 MLD NEWater and 90 MLD Industrial Water.

Sellafield Ltd and National Nuclear Laboratory, UK - ***Dynamic Modelling Effluent Treatment Facilities***

The Enhanced Actinide Removal Plant and Site Ion-Exchange Plant are two of the major effluent treatment plants on the Sellafield Site. High fidelity dynamic process models have been developed for both facilities and these are already demonstrating the significant benefit they can bring to the business, environment and public.

These models have provided new crucial insights on Sellafield Ltd's integrated waste management strategy, including the ability to optimise operations in terms of cost, schedule, and environmental detriment, as well as assessing the consequential impact of upstream facilities feed on plant abatement and secondary waste generation.

United Utilities and Royal Haskoning DHV, UK - ***Magic Granules***

An innovative new wastewater treatment technology utilising granular activated sludge (Nereda® technology) has been installed at Kendal WwTW. This new process has delivered high quality effluent and affordability due to its reduced footprint, power consumption and chemical requirements for BOD, Ammonia and Phosphorus removal. The project was delivered with a high degree of collaboration between United Utilities, LiMA, and Royal HaskoningDHV to ensure minimal impact on the existing process during a parallel build and commissioning. The Nereda® process has also brought process safety improvements by removing the need for chemical and liquid oxygen storage and use on site.



Adedolapo Oyawoye - PM Group

Possessing an excellent chemical engineering knowledge base and an ability and willingness to apply it to his work, Ade is proving to be an exceptional engineer. His ability to quickly understand the issues and determine the important factors mark him out as an impressive engineer. This combined with his ability to communicate clearly makes him an effective and invaluable member of any team.

Ahsan Zafar - Bouygues Energies & Services, UK

Ahsan has graduated with 1st Class Degree attained in MEng (Hons) Chemical Engineering & Business Management (IChemE Accredited); highest achieving student on the course.

Natural leader, ambitious, organised and focused chemical engineer with experience in the design and management of projects, Ahsan has shown his open mind and strategic approach to chemical engineering within a diverse range of industries; chemical manufacturing, pharmaceutical, medical devices, water and foods. With a hands-on approach and leadership qualities, Ahsan is a highly effective communicator with a professional touch working on multidisciplinary projects, concept/feasibility, detailed design through to commissioning, delivering successful outcomes for his customers.

Angus William John Strowbridge - AECOM, UK

Angus does not expect others to do his work for him and is prepared to lead the tasks assigned to him becoming an example to more junior staff and colleagues. Angus has overcome a permanent hearing disability sustained as a child and is able to communicate effectively and clearly tasks and ideas to all AECOM staff no matter what level of authority and seniority. He fully understands the importance of collaboration with task teams and clients and that working with this ethic will more likely exceed task expectations and goals.

Ashira Bindels - GlaxoSmithKline, Italy

Ashira Bindels is a biopharmaceutical engineer with GlaxoSmithKline and is a member of GSK's Future Leaders Programme (FLP). Ashira's responsibilities include continuous process improvements to improve the yield of biopharmaceutical products and technology transfer to ensure rapid and successful transfers from R&D to manufacturing to provide commercial supply for patients. She is also active in mentoring younger FLPs through the programme. She graduated with a first from Imperial College London and holds an MEng in chemical engineering.

Edison Tan Hong Seng - Shell Eastern Petroleum, Singapore

Edison was offered a position with Shell after internship in his third year of studies in chemical engineering in NUS. He joined the process technologist team and later moved to operations after four years. His professional achievement includes conducting a study on Mogas Reid Vapor Pressure (RVP) giveaway; outcome of this study help identify (helped to) structural gaps and quick action to resolve these resulted in a net margin gain of USD1.4M / year. He has demonstrated technical mastery in troubleshooting that target root causes and leadership in collaborating with various stakeholders to rectify issues such that issues will not re-occur.

Georgia Kotsiopolou - OMV, Austria

Georgia is an Associate member of IChemE with a diploma of chemical engineering. During her studies, she has completed two internships in the food industry and oil and gas industry. In September 2017 she joined OMV, as a Professional Process Engineer with a strong focus on Smart Oil Recovery projects. These projects include water treatment technologies of back-produced polymer water and polymer or alkaline-polymer flooding. Apart from her involvement in SOR projects, she has had the opportunity to gain some operational experience in OMV's facilities in Gänserndorf and in the pilot plant for water treatment technologies

Irene Lock Sow Mei - PETRONAS Group Technical Solutions, Malaysia

Irene graduated with bachelor's degree of chemical engineering (Hons) from Universiti Teknologi Petronas with C.G.P.A 3.98/4.00 and was conferred Chancellor Gold Award. She started her profession with PETRONAS Group Technical Solutions, as water technologist in 2015. She contributed significantly to PETRONAS capital projects and innovative solutions for utility and wastewater, translating towards engineering excellence, cost savings, process safety and environmental sustainability. She was conferred as the Associate Fellow for ASEAN AAET and Malaysia ambassador by IEM due to her extraordinary achievements. Irene won numerous gold awards, which include IEM Best Engineering Graduate, Most Inspiring Alumni and ASEAN Young Innovative Writer.

Thomas Isaac - Progressive Energy, UK

Tommy is a chartered chemical and mechanical engineer with a passion for harnessing engineering fundamentals such as thermodynamics and fluid mechanics to deliver technical solutions to societal problems. His career has spanned multiple aspects of the energy industry and has led him to focus on enabling energy transition towards sustainability. By combining technical ability, industry knowledge and consortium management skills, Tommy has played a key role in overcoming barriers to hydrogen deployment within the UK energy system. Tommy continues to support the industry to overcome the remaining barriers through his drive to see commercial scale decarbonisation via hydrogen deployment.



Young Researcher

Sponsored by



Florence Gschwend - Chrysalix Technologies, UK

Dr Florence Gschwend is co-founder and CEO of Chrysalix Technologies, an Imperial College spin-out company commercialising the BioFlex process, a circular bio-economy technology. A chemist by training, she co-founded Chrysalix after completing her PhD in chemical engineering. The BioFlex process enables the use of unwanted waste wood for the production of renewable chemicals, material and fuels. Dr Gschwend has won several awards in relation to it and was named by Forbes 30under30 as one of Europe's most promising game changers under 30 in Science and Healthcare.

Leandro Buchmann - ETH Zurich, Switzerland

Mr Buchmann is a doctoral candidate within the Sustainable Food Processing Laboratory at ETH Zurich. Mr Buchmann's research aims to contribute to a better understanding of Pulsed Electric Field (PEF) processing and thus increase the technology readiness level. Mr. Buchmann's highly interdisciplinary research combines fluid dynamics, multiphysics modelling, rheology, electrical engineering, microfluidics and biology. Thereby, Mr. Buchmann integrates process engineering into innovative applications. The induced growth stimulation of biological cells and specific cell constituents combined with a possible biological mechanism for the induced effects after nanosecond PEF treatment as one of the exceptional achievements.

Leela Sarena Dilkes-Hoffman - University of Queensland, Australia

Leela is completing her PhD in chemical engineering at the University of Queensland, supported by a very competitive Westpac Future Leaders Scholarship. Her research has focused on the role of biodegradable plastics in achieving a more sustainable plastics system and spanned traditional chemical engineering (investigating material properties of biodegradable plastics), through to life cycle assessment (of food packaging alternatives), to covering a social science perspective (understanding the public's attitudes towards plastics). Her research has led to the publication of peer-reviewed publications, engagement with government and private organisations, and a job with a leading global sustainability driver, the Ellen MacarthurThi Foundation.

Serene Lock Sow Mun - Monash University

Serene is a doctoral and master graduate in chemical engineering from Universiti Teknologi PETRONAS. She graduated with Bachelor of Applied Science (Hons) in chemical engineering from University of Toronto for her undergraduate study. Her specialties include multi-scale simulation, modeling, process simulation and molecular modelling. Her works have enabled development of software entitled Hollow Fiber Membrane Prediction Program, which has been commercialised to industry partners since 2014 and is in demand until today within South East Asia and Middle East. Her research works have received awards as well as scholarly recognitions through publications in journals and book chapters with international collaborations.

Vasileios Charitopoulos - University of Cambridge, UK

Vasileios is one of the most eminent young researchers in the process systems engineering community for developing novel methods for problems related to digital manufacturing and energy. He was a finalist for the IChemE Best Young Researcher award in 2018 and received the prestigious UCL Newton Prize in 2019. Currently at the University of Cambridge, he is working with policymakers on the decarbonisation of heat, while, from September 2019 on, he will be joining UCL as lecturer. His inquisitive and visionary nature combined with his talent in communicating engineering in a societal context make Dr. Charitopoulos a stellar young academic.