

Ready... Steady... Scale!

**Enabling Technologies and
Strategies for Chemical
Manufacturing**



17th November 2023

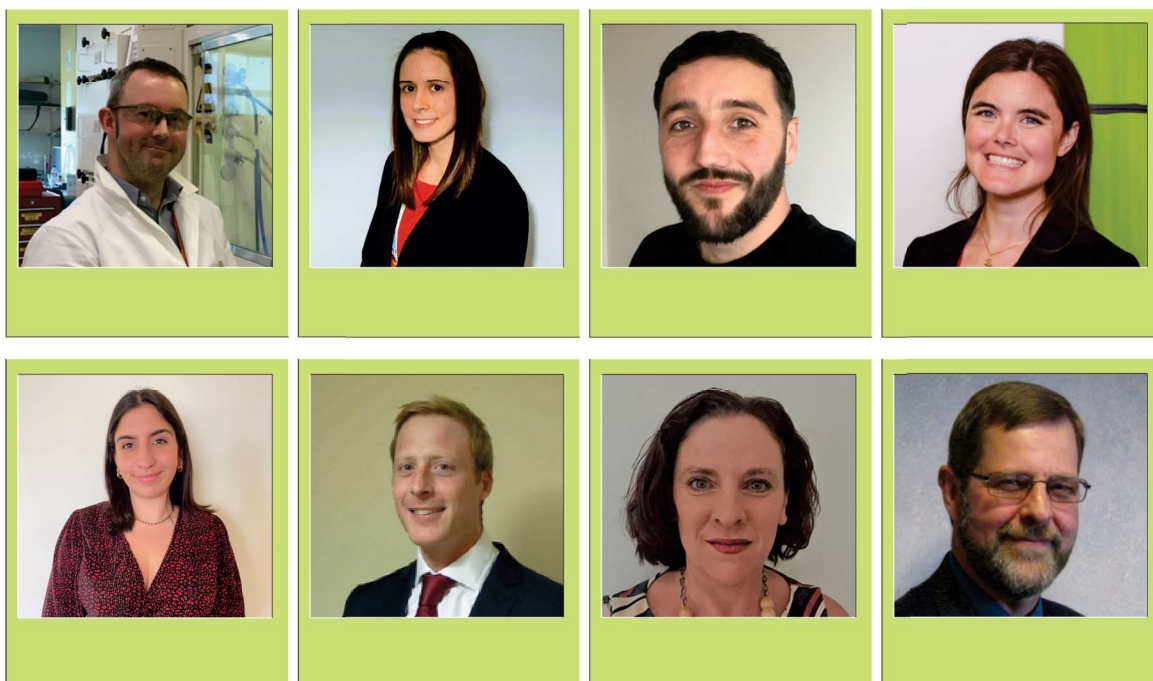
**Online & Burlington
House, Piccadilly,
London, W1J 0BA**

Join us for this year's RSC Process Chemistry & Technology Group annual conference on the theme of 'Ready...Steady...Scale! *Enabling Technologies and Strategies for Chemical Manufacturing*'. Get answers to you questions including...

1. How can technology help to navigate the journey from lab to plant?
2. Which technologies have allowed for process intensification during product development?
3. How can technology help to build value into products during development and to address supply chain vulnerabilities for launched products?
4. What stories of establishing ever greater levels of "readiness" for enabling technologies are there?
5. How have companies built cases for investing in enabling technologies?

Recognised industry & academic experts will provide answers:

Chris McKay- GSK, Helena Hutchins- Solvay, Marina Economidou- GSK, David Sale- Syngenta, Cathy Dwyer- Drochaid Research Services, Hugh Stitt- Johnson Matthey



Agenda for the Day:

10:00	Presentations
11:40	Panel Discussion #1
12:05	Networking Lunch & Posters
13:30	Presentations
15:30	Panel Discussion #2
16:00	Drinks Reception
17:30	Close

Register by 15 November.

Call for Posters:

The deadline for poster submissions is 20 October 2023. Students are encouraged to submit a short poster abstract (250 words max).

Registration:

Membership	In-person	Online
RSC Member	£100	£55
Non-member	£150	£75
Students (RSC Member)	£50	£30
Students (Non-member)	£60	£35

We are pleased to offer **free registration bursaries** to the first 10 students who are accepted to present a poster (first-come, first-served).

Sponsorship enables us to keep registration costs low. Please contact us (rscpctg@gmail.com) for details of **sponsorship and exhibition opportunities**.

Programme of Speakers

09:00	Registrations		For in-person attendees
10:00	Introductions	Process Chemistry & Technology Group	An introduction to the topics of the day.
10:10	Dr Chris McKay	GSK	Smaller, Faster, Cheaper, Better? Process Intensification In the Pharmaceutical Industry
10:40	Dr Helena Hutchins	Solvay	TBC
11:10	Martin Monedero & Dr Sarah Cleary	AMTechnology HyDregen	Heterogeneous biocatalytic hydrogenations in flow – case studies and scale-up considerations
11:40	Panel Discussion #1	Speakers from the morning session	
12:05	Networking Lunch		Poster exhibition for in-person attendees
13:30	Marina Economidou	GSK	From Catalytic Hero to Product Contamination Zero – Extractive Recovery of Palladium from Reaction Mixtures
14:00	Dr David Sale	Syngenta	Photochemistry Platform Development and the Implementation and Scale-Up of a Novel Photochemical C–N Oxidative Coupling
14:30	Dr Cathy Dwyer	Drochaid Research Services	Investments in Enabling Technologies: Intent versus Reality
15:00	Professor Hugh Stitt	Johnson Matthey	TBC
15:30	Panel Discussion #2	Speakers from the afternoon session	
15:55	Closing Remarks	Process Chemistry & Technology Group	
16:00	Close Online.		Drinks reception for in-person attendees
17:30	Close.		



Smaller, Faster, Cheaper, Better? Process Intensification In the Pharmaceutical Industry

Dr Chris McKay, GSK

Often the most commonly recognisable feature of intensified process equipment is that it is smaller than that it supersedes, but Process Intensification is not just about using smaller equipment. As defined by chemical engineers, intensification involves designing processing systems that significantly enhance heat and mass transfer rates, and give every molecule the same processing experience. By following these principles, a variety of safety, quality, sustainability and efficiency benefits can be realised. With the pharmaceutical industry under increasing pressure to reduce costs and decrease time to market while maintaining very high levels of product quality and regulatory compliance, this talk will explore some of the ways that Process Intensification could help achieve those goals.

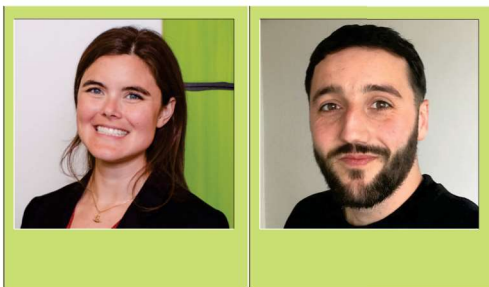
Dr Chris McKay joined GSK in 2007, initially in the R&D pilot plant at Stevenage, UK; and has now been with GSK for 16 years. Since 2016 he has worked in the Process Engineering team within Drug Substance Development; focusing on the development of batch and continuous processes for small molecule and oligonucleotide manufacturing, scaling from lab to plant. Chris holds a PhD in organic chemistry (University of Leeds, UK) and masters in chemical engineering (University of Manchester, UK); with postdoctoral studies at Lund University, Sweden. He is a member of the Royal Society of Chemistry (MRSC) and the Institute of Chemical Engineers (MIChemE) with whom he is a Chartered Chemical Engineer (CEng).



Dr Helena Hutchins, Solvay

Dr Helena Hutchins is a Research Chemist in the early stages of her career at Solvay Solutions UK. Helena graduated from Aston University in 2022 with a PhD in Polymer Chemistry and also has a PGCE (Wolverhampton University, 2017) as well as a BSc in Applied Chemistry (Aston University, 2016). Previously, Helena worked for AkzoNobel in the development of new overprint varnishes for Beer and Beverage cans to meet an ever-changing market demand and regulations. In her current role, she is involved in the development and manufacture of high-value specialty ligands within the Phosphorus Specialties portfolio at the Solvay Oldbury site in Birmingham.

Helena is routinely challenged with the handling and use of moisture sensitive and pyrophoric reagents. This role also involves support with the scale-up of processes developed in the laboratory from gram to multi-kilo scale.



Heterogeneous biocatalytic hydrogenations in flow – case studies and scale-up considerations

Martin Monedero, AM Technology & Dr Sarah Cleary, HydRegen

Flow chemistry is well-established within bulk chemical manufacturing. Smaller working volumes and improved reaction control lead to a range of well-established quality, safety, and cost benefits. A major barrier to flow process development and scale-up is the versatility limitations at lab-scale when compared with batch, such as with cocurrent handling of solid, liquid and gas.

Hydrogenations are attractive flow chemistry candidates, reducing the mass transfer limitations when using solid catalyst, liquid medium, and gaseous hydrogen, as well as reducing working volumes of pressurised, highly flammable gas. Heterogeneous biocatalytic hydrogenations are of particular interest, alleviating the reliance by traditional hydrogenation methods on toxic precious metals, high-energy conditions, and flammable solvents.

Presented here will be AM Technology's case studies and scale-up considerations when transferring heterogeneous catalytic hydrogenations to flow, HydRegen's work in decarbonising NADH-dependent biocatalysis, and the application of both technologies to a critical industrial process.

Martin Monedero

Martin Monedero is a senior flow chemist at AM Technology. He has a background in advanced materials development and mixed-matrix membranes for gas separations.

Currently, he leads feasibility and process development studies at AM Technology, collaborating with research institutions and companies across the chemical industry. His focus is on helping organisations transfer batch production to flow and develop novel chemical processes in flow. Several processes he has developed from proof-of-concept stage in the lab have progressed to large-scale manufacture.

Dr Sarah Cleary (She/Her)

Dr Sarah Cleary is Chief Scientific Officer and cofounder of HydRegen, and has a passion for innovation and sustainability. Sarah earned her PhD in organic chemistry from the University of Vermont (USA) in the Brewer group, after which she joined Prof. Kylie Vincent's group at the University of Oxford as a postdoc on IB Catalyst technology translation funding. Under the project management of Dr Holly Reeve (now HydRegen CEO), Sarah helped the Vincent group develop an exciting biocatalytic hydrogenation technology for asymmetric double bond reductions. During this time, she implemented the biotechnology in typical laboratory batch equipment, quantified the sustainability metrics that the catalyst provided, and also contributed to two patents including one for a biocatalytic nitro-to-amine hydrogenation system.

HydRegen then spun-out of the university in 2021, and Sarah and the team have worked to demonstrate these biotechnologies in existing hydrogenation infrastructure, validating the process scale-up strategies in batch and continuous flow.



From Catalytic Hero to Product Contamination Zero – Extractive Recovery of Palladium from Reaction Mixtures

Marina Economidou, GSK

Marina Economidou obtained her MChem degree from the University of Edinburgh in 2021. During her degree, she undertook an industrial placement at GSK, where she studied impurity rejection during crystallisation processes. She then joined the GSK/University of Strathclyde collaborative PhD programme, working in the Drug Substance Development department at GSK under the supervision of Dr Nisha Mistry and Dr David Lindsay. Her PhD research focuses on the investigations into the ligand- and oxidation state-dependent extraction of residual palladium from pharmaceutically relevant molecules.



Photochemistry Platform Development and the Implementation and Scale-Up of a Novel Photochemical C-N Oxidative Coupling

Dr David Sale, Syngenta

The development and evolution of photochemistry capabilities and platforms within Syngenta will be presented, which have enabled the early assessment and subsequent development of process opportunities through to scale-up. The primary focus will be a recent example, involving the direct C-N coupling of a functionalized pyridazinone and veratrole, where the process was ultimately commissioned on a pilot scale (ca. 1.2 m²) as a semi-batch process. Scale-up considerations and challenges will be discussed.

David is a physical organic chemist with a strong interest in understanding the fundamental mechanisms of catalytic systems.

David's interests were triggered through his PhD where he studied the structure, speciation and mechanism of Pd-catalysed allylic alkylation under the supervision of Prof. Guy-Lloyd-Jones at the University of Bristol. After completing his PhD, he undertook a PDRA position in the group of Donna Blackmond at The Scripps Research Institute, San Diego, investigating kinetic aspects of C-H activation alongside Prof. Jin-Quan Yu.

In 2011, David joined the Process Studies Group in Syngenta as a Process Chemist. After several roles within the group and the wider Process Technology and Research organisation, David currently leads the global Physical Organic Chemistry group within Syngenta.



Investments in Enabling Technologies: Intent versus Reality Dr Cathy Dwyer, Drochaid Research Services

Enabling technologies encompass equipment, methodologies and other tools which can assist businesses to better deliver on their key objectives. In research and development organisations, this could be achieved through improvements in cost, schedule or performance of technology projects, or through more effective de-risking of the proposed solution.

In the context of the energy and chemicals sectors which rely on innovative research to improve on existing processes or develop new ones, such enabling technologies can include:

- scale-up equipment to progress through technology readiness levels (TRL's);
- novel techniques to provide greater insights into the chemistry at hand;
- tools to speed up experimentation and/or data acquisition and processing;
- methodologies to improve decision-making and risk management

This presentation will run through several examples of the adoption of such enabling technologies from both a multinational petrochemical company and a small contract research organisation. Although the two perspectives might seem very different, a number of similarities emerge. The examples will show that such investments can be a risky and costly game, and that many factors should be taken into consideration when contemplating such acquisitions. In particular, the traditional approach of doing it all in-house does not always provide the intended benefits.

Dr Cathy Dwyer is the Managing Director of Drochaid Research Services, a position she took up in April 2023. Prior to that she held the position of Vice President: Science Research at Sasol, a South African petrochemical company, where she spent most of her 23 year industrial career.

Dr Dwyer graduated from the Rand Afrikaans University with a PhD in palladium catalysis applied to organic synthesis under the supervision of Prof Cedric Holzapfel. She also held a postdoctoral position in asymmetric catalysis at York University in the United Kingdom, in the research group of Prof Richard Taylor. Her technical background spans many areas of homogeneous and heterogeneous catalysis, including hydroformylation, metathesis, and various other chemical and refining technologies. In recent years she was also responsible for Sasol's Fischer-Tropsch catalyst development to enable production of sustainable aviation fuels, as well as various other activities in support of Sasol's Net Zero strategy.

She serves on various boards and committees including the International Advisory Board for the International Symposium on Homogeneous Catalysis, the CSIR Parliamentary Grant Investment Committee and various panels advising on government research funding and strategy, academic and departmental reviews. Her passion is mentoring and developing young scientists through their careers, and enabling the delivery of technical solutions that contribute to a sustainable future.



Professor Hugh Stitt, Johnson Matthey

Professor Hugh Stitt has over 30 years industrial experience in R&D and scale up of reaction engineering and catalyst manufacture, with a significant emphasis on related modelling methods (reaction kinetics, CFD, DEM). He has over 150 refereed journal publications and is a Fellow of the IChemE (FIChemE) and of the Royal Academy of Engineering (FREng).

The PCTG Vision is to be a leading voice that champions the adoption and advancement of Process Chemistry and Technology. We serve the whole community of scientists and engineers in this field and facilitate the sharing of best practices across industry and academia.

Organising Committee: Jade Markham- Solvay, James Barber- AstraZeneca, Erin Maciejewski- GSK, Alan Steven- CatSci, Charles Gordon- Scale-Up Systems, Phil Kay- JMP

