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The dynamic role of chemical engineers and impact on our economy

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The role and engagement of chemical engineers in the industry is changing. New methods of teaching and scope are required by the universities to adapt to these growing and challenging demands. The explosion of this growth in demand for chemical engineers is rooted in many sectors: The need to develop clean and sustainable technologies for energy, chemicals and bio related sectors; the growth in spin-out companies offering a diverse range of products and processes; the rapid growth in introduction of “bio” processes into mainstream traditional chemical engineering processes and products. A good example of this is LanzaTech converting waste gases from steel manufacture into ethanol (fuel) and other valuable chemical and fuel feedstocks. The transition from coal and oil to gas as the feedstock of choice for bulk energy and petrochemical products is in full swing supported by advances in shale gas extraction. This short talk will explore a rapidly growing sector of chemical engineering innovation, i.e. the repurposing of chemical or biochemical plants for other duties and production, rather than scrapping the assets and losing valuable skilled workforce. We will explore the conversion of a bioprocess plant for manufacture of dl-lactic acid for use in PLA biodegradable polymers into a world class plant for the production of green solvents/intermediates and a new class of bio-derived epoxy coatings competing directly with traditional epoxides such as ethylene oxide and propylene oxide. We will cover the conversion of the unit, the role of the chemical engineers working with chemists and business development/commercial teams, in selecting the process and by way of repurposing existing chemical plants establishing a record for chemical engineering in reduced time to market. The entire process we describe, will take less than four years from concept to demonstration plant in the re-purposed asset.



Figure 1: Re-purposing chemical plants, saves time, money and resource by modifying existing assets rather than scrapping the asset. We are highly appreciative of Plaxica for the opportunity to acquire their lactic acid/PLA demonstration asset and convert in less than six months to a completely new process making speciality epoxides.

Recent Publications

1. Delavoux Yoan, Gilmore Mark, Atkins Martin P, Swadzba-Kwasny Malgorzata and Holbrey John D (2017) Intermolecular structure and hydrogen-bonding in liquid 1, 2-propylene carbonate and 1, 2-glycerol carbonate determined from neutron scattering. *Physical Chemistry Chemical Physics (PCCP)* 19:2867–2876.
2. Anderson K, Atkins M P, Borges P, Chan Z P, Rafeen M S, et al. (2017) Economic analysis of ultrasound-assisted oxidative desulfurization. *Energy Sources* 12(4):305–311.
3. Hogg James M, Coleman Fergal, Ferrer-Ugalde Albert, Atkins Martin P and Swadzba-Kwasny Malgorzata (2015) Liquid coordination complexes: a new class of Lewis acids as safer alternatives to BF₃ in synthesis of polyalphaolefins. *Green Chemistry* 17(3):1831–1841.
4. Carbon dioxide uptake from natural gas by binary ionic liquid-water mixtures. Anderson Kris, Atkins Martin P, Estager Julien, Kuah YongCheun, Ng Shieling, et al. (2015) *Green Chemistry* 17(8):4340–4354.

5. Abai Mahpuzah, Atkins Martin P, Hassan Amiruddin, Holbrey John D, Kuah Yongcheun, et al. (2015) An ionic liquid process for mercury removal from natural gas. Dalton Transactions 44:8617–8624.

Biography

Martin P Atkins spent 34 years in the Oil & Gas/Energy industry, mostly with BP and partners and PETRONAS (Malaysia) before moving to Queen's University Belfast, where he holds the Chair of Chemical Innovation and Sustainability and CEO of Green Lizard Technologies. He spent five years in China building BP's clean energy centre in Dalian Institute of Chemical Physics (DICP) where he commercialized five technologies in five years including new catalytic processes for syngas/methanol conversion, zeolite membranes for alcohol purification and hydrogen membrane technologies.

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