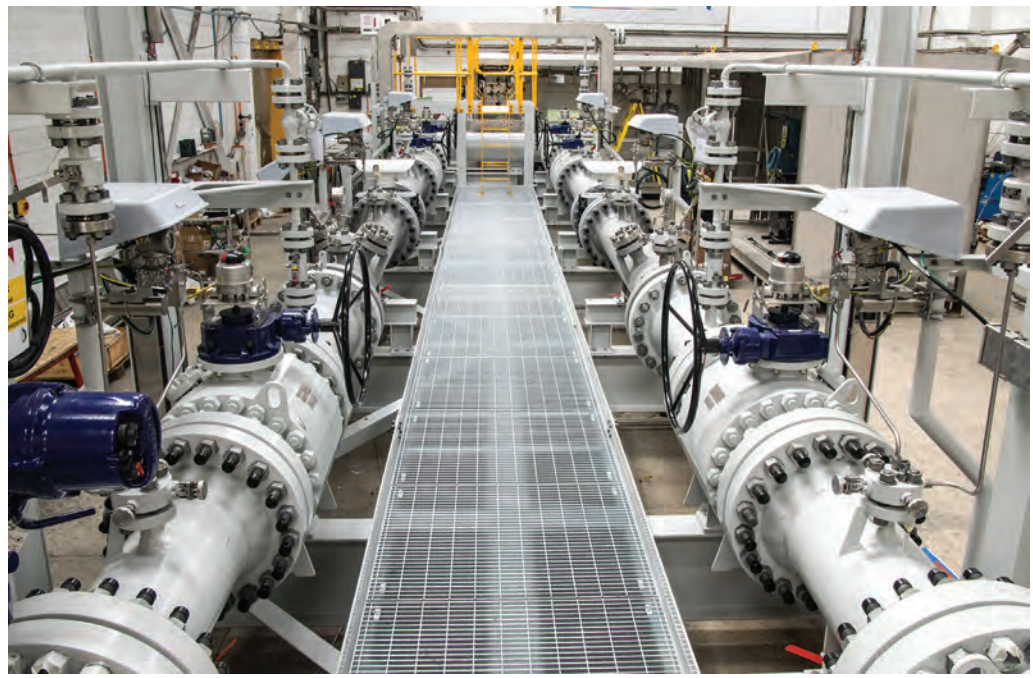
The energy transition: challenges and opportunities

The energy transition will impact the oil and gas sector and its supply base, including the flow control industry. Mark Goodfellow (Alderley) expects that the above development ultimately will lead to rationalization and consolidation in the valve sector. "However, this timeline might extend to 2050 as oil and gas could well continue to be a significant part of the mid-century energy mix. Nevertheless, the entire supply chain should take a pro-active role, sooner than later."

By Lucien Joppen



Metering system with condition based monitoring. These systems are designed to monitor critical equipment to avoid unexpected outages and downtime.

Mark has been active in the oil and gas industry for 25 years, initially starting in sales/marketing functions for various flow control/valve companies. Currently, he works as a valve lead engineer for Alderley (since 2013). In this function, he is responsible for the final selection and sourcing of O&G industry specification valves, actuators, controls and other related equipment.
He is also the technical authority for materials and specification compliance for all group locations, including the UK, United Arab Emirates and the Kingdom of Saudi Arabia facilities. Mark has created in-house valve and applications training for the engineering and non-technical staff including technical guidance and support documentation. He also engages in research related to new markets, applications and processes with marketing, business development and the technical team within Alderley.

Mark, as you mentioned earlier, the oil and gas industry is in a state of transition. What are your thoughts on this development?

"Well, it is clear that the global energy industry is in transition, driven by the imperative to address the climate change crisis and to move towards net zero emissions by 2050 as has been documented in the Paris agreement. This journey towards zero-carbon in 2050 poses two major challenges for the oil and gas sector: powering global economic growth and managing a smooth transition to a low carbon future to meet ever tougher climate goals. For me, this transition needs to be managed in a balanced manner.
First of all, we need energy security. The transition should be facilitated by maintaining a continued supply of safe, reliable and affordable energy. Second, the carbon intensity of existing energy operations and industrial applications should be reduced. Third, we should phase in as soon as possible new technologies and low-carbon energy sources. Having said this, oil and gas, as a critical part of energy, have a key role to play in this for many years to come, given the overall growing global demand for energy and the (lagging) potential of renewable energy."

What will be the implications of the energy transition for the flow control sector?

"In the short term, I don't expect an effect as the journey towards 'zero-carbon' will not happen overnight. At present, according to the recent DNV GL Energy Transition 2021 outlook, fossil fuels will still hold a 50 per cent share of the energy mix by 2050 which will no doubt have an impact on valve suppliers who traditionally operate in oil & gas

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markets and will ultimately lead to rationalization and consolidation in the industry. On the other hand, the energy transition also offers opportunities for the flow control sector to take a pro-active role and it is well-positioned to do this. Flow control has a key role to play in each of the above challenges (continuous supply, reduce carbon-intensity, ed). The valve industry could focus on high-performance and low-cost solutions, including new materials to improve longevity and re-use through a circular economy. New flow control solutions can also improve the performance and efficiency of energy operations, e.g., to reduce leakages/ fugitive emissions, and providing connectivity of assets for digital monitoring and management including remote condition-based monitoring solutions."

Reverting back to the oil and gas/ energy sector. What will be the operating challenges that will result from the energy transition?

"There are many challenges in the area of renewable energy, for example hydrogen technology which is being suggested as a fuel of the future. Carbon capture utilisation and storage is another area of much interest, especially for hard-to-abate industries, such as the production of steel, cement, fertilizers or large-scale power generation. These sectors may have to ultimately adopt this technology. After years of a declining investment pipeline, plans for more than 30 new integrated carbon capture and storage facilities have been announced since 2017. The vast majority are in the United States and Europe, but projects are also planned in Australia, China, Korea, the Middle East and New Zealand. There is no doubt that CCS will have a major role to play in the journey towards net zero.

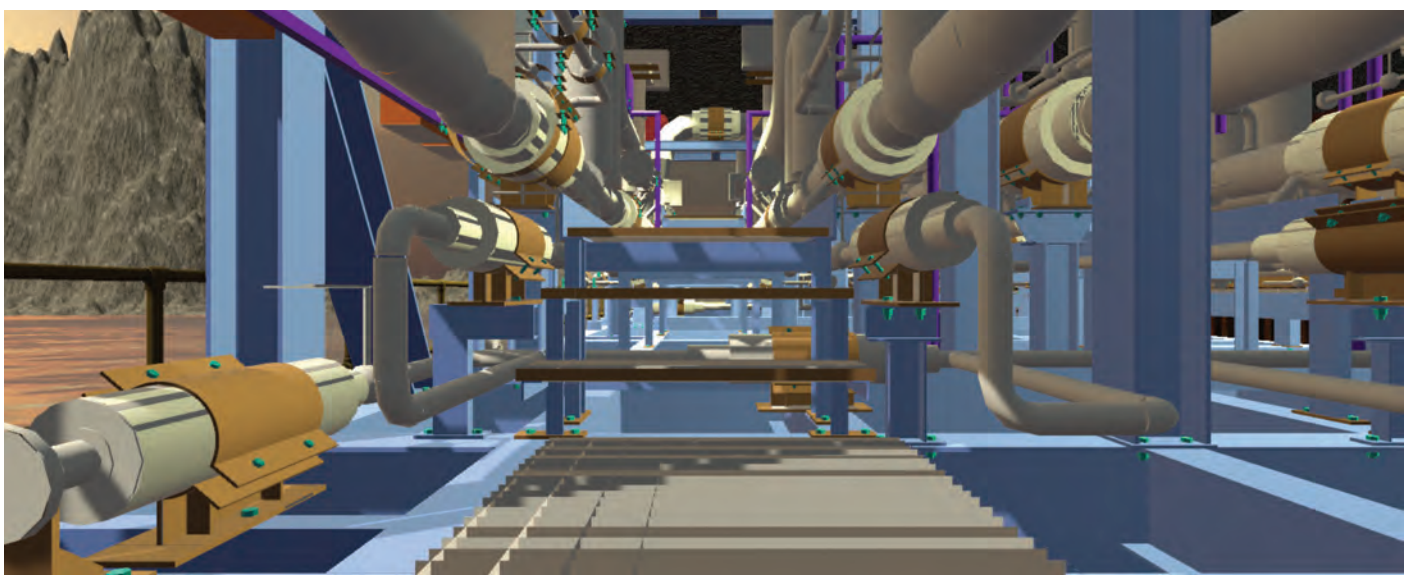
In terms of existing assets, end users are looking to minimize their plant downtime and avoid unexpected plant outages thereby reducing operating costs. They are looking extensively at concepts such as condition-based monitoring (digitalisation) to monitor critical equipment to avoid unexpected outages and downtime. This is an area where companies in the energy sector are making investments to provide appropriate solutions to end users. At present, in terms of valve condition-based monitoring, it is only applied to critical valves such as emergency shutdown valves but potentially as the technology develops and costs are reduced, it's conceivable this could be applied on a much broader basis.

Energy consumption is another area where changes are being made. One of the strongest challenges offshore production faces, is finding a suitable, sustainable, and cost-effective power source. There is a move towards electrification of offshore platforms via subsea cables rather than the traditional approach of having on board diesel- or gas-powered generators with all their incumbent maintenance issues. Renewables from wave buoys or floating wind turbines could potentially be used to further green offshore operations but these approaches are currently in the early stages of development."

> *"The traditional approach of reluctance to explore innovative solutions or look at alternative proposals will change as the industry evolves during the energy transition. Business as usual is no longer a viable option.*

Could you also indicate if there will be implications for flow control equipment resulting from the energy transition?

"This depends highly on the medium and various process conditions. Take the handling of CO2 (capture, transport, storage, ed.), which could involve supercritical CO2. This handling is difficult as the operating pressures typically will require ASME Class 900 # valves or higher. A complicating factor is the rate of depressurisation. If this happens too fast, the supercritical CO2 could become a solid. The safety integrity and reliability of such systems is critical as a major CO2 pipeline rupture would be catastrophic in a populated area. Hydrogen presents other issues in terms of material integrity. Much research is needed in terms of materials suitability, embrittlement, sealing solutions and the implications for natural gas piping that contains mixes of



The advance of digitalisation/virtual reality. Alderley has developed a VR training simulator propane metering skid.

natural gas and hydrogen.
There is also a major debate on providing raw hydrogen as a fuel. The quickest approach is blue hydrogen - hydrogen from natural gas - which has large scale capability compared with electrolyser technology - for green hydrogen - which is relatively small scale at present.
Third, there is role for the flow control industry to help to reduce CO2 emissions. There will be over time significant needs to improve fugitive emissions for valves to minimize methane emissions, a very potent greenhouse gas. There have been recent innovative developments of completely stemless valves which remove any potential for fugitive emissions. Whilst standards regarding (fugitive) emissions have been improving steadily over the years, I envisage these will be tightened further."

On site inspection and testing. These activities increasingly will take place remotely.

Could you rate the impact of digitalization in maximizing value and (energy) efficiency, partly also impacting CO2 emissions?

"This is an important area. Many oil and gas companies are focussing on this topic, including Alderley. Our company has been investing in this area with our smart asset management system, which is cloud-based. There is much interest in these systems, especially for critical equipment such as ESD and shut down and blow down valves. However, a broader application, individual manual valves or even basic on/off actuated valves, is not adopted yet. Over time, this will change as equipment cost will come down. This would facilitate the adoption of plant wide monitoring systems, allowing end users to transition from time-based and reactive maintenance to condition-based and proactive maintenance. In the end, condition-based maintenance will lead to fewer disruptions on an operational level and reduced operation costs.
The technology exists broadly today to fully implement CBM-technology. However, in new projects the approach is limited to critical items to avoid increasing capital cost. If a whole life cycle cost analysis was taken at the project stage, then the long-term benefits of CBM in terms of reduced operational costs and downtime may outweigh the costs of additional instrumentation et

cetera. The key to facilitate this, is data acquisition and data transfer, utilising edge devices, then smart analytics in the cloud which can be accessed from anywhere in the world (e.g. a global operator's HQ). This (wireless) approach removes the need for additional cost and potentially invasive work to retrofit devices on site. All benefits can be realised through software as a service solution in the cloud. Companies like Alderley, who focus on maximising the value and efficiency of our clients' assets and work agnostically across all OEM instrumentation, are best placed to provide this expert and impartial assessment and offer solutions (both devices on site and analytical solutions in the cloud). This is something we are working closely with our clients and supply partners to develop."

Zooming in on valves specifically, in which areas do you see room for improvement within the supply chain for end-users to boost their efficiency levels?

"Historically, oil and gas operators ask suppliers to deliver against a different set of requirements for each order, often in voluminous documents. Specifications can be different even for projects from the same company. It's incredibly inefficient. By standardizing the specifications used for procuring equipment, the supply chain can become better, faster and cheaper. The IOGP JIP 33 is attempting to produce harmonized standards for common equipment items, including valves to reduce costs but regrettable at present - despite the involvement of most of the oil & gas majors - this is not being reflected in specifications issued by the clients or their EPC contractors. At present, initial cost is the main driver for new projects. Companies accept sub-optimal solutions, which goes at the expense of innovative, initially more expensive solutions. The focus must move from initial capital cost (lowest purchase cost) to a whole life optimum solution, incorporating the potential of remote CBM systems reducing operational costs to the benefit of the operator over the entire life cycle of the project. To optimise and reduce operational costs, operators must adopt a more open mind set to new technologies and innovations. The traditional approach of reluctance to explore innovative solutions or look at alternative proposals will change as the industry evolves during the energy transition. Business as usual is no longer a viable option."

Company profile

Alderley

Technical excellence: delivered

Alderley PLC supplies equipment to the oil, gas and petrochemical industries. The company, founded by the late Tony Shepherd in 1989, provides gas metering systems, modular well-site skids, and de-oiling and de-sanding hydrocyclone equipment. Alderley PLC also offers a comprehensive suite of aftermarket and digital services. As such, Alderley has evolved as an integrated solutions provider for the global energy industry. "Our priority is to maximise the value and efficiency of our clients' energy assets – from concept to operation and beyond", the company states. Besides being fully-integrated, Alderley focusses on local presence (local, flexible and agile teams to provide the best support and in-country value, backed by a global team of experts) and being best-in-class ("60+ years of delivering reputable solutions and solving our clients' challenges – onshore, offshore and on FPSOs.")