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Significant large-scale ASU growth ahead



By [Rob Cockerill](#), Global Managing Editor | 13 October 2021

We are leaping 'orders of magnitude' from mega-scale to giga-scale hydrogen projects globally, and with that will come significant growth in large-scale ASU (air separation unit) projects.

This is a trend that is in fact already in motion, with demonstrable examples showing the path ahead.

That's the verdict of Stephen B. Harrison, Managing Director of sbh4 consulting, and formerly of Linde with over 30 years' experience of the industrial and specialty gases business.

Harrison was speaking during Part One of a new two-part webinar series from **gasworld**, sponsored by Evonik and exploring the nuances of the air gases business.

Applications were in focus, with additive manufacturing (AM), medical oxygen and hydrogen and syngas projects they key talking points to emerge.

Harrison discussed the ramp-up of hydrogen production, stating that we're leaping 'orders of magnitude' from mega-scale to giga-scale projects and that scaling up needs to occur for hydrogen production from natural gas and coal.

Giving an example, he suggested the H2H Saltend project planned to support decarbonisation of the Humber industrial cluster in East Yorkshire proposes a 600 MW autothermal reactor to make hydrogen rich syngas.

"To enable 600 MW of hydrogen production, the air separation unit would need to produce about 1,200 tonnes of oxygen per day, that would make it one of the largest in the UK."

When pressed whether we could, therefore, see significant large-scale ASU growth ahead as a result, Harrison affirmed not only that this is likely, but that it's already a trend in-progress.

"Yes, and the ASU growth opportunity stretches beyond natural gas reforming and partial oxidation. We must also consider coal and petcoke gasification as a pathway to make hydrogen-rich syngas. Gasification has been used for more than 100 years to produce syngas. Gasification like autothermal reforming and POX, requires oxygen. The use of pure oxygen, instead of air, is beneficial for precise control of the oxidation chemistry and avoids costly flue-gas de-NOx systems."

"It also makes the integration of carbon capture and storage more cost-effective because the system can be much smaller due to the avoidance of processing thousands of tonnes of nitrogen from the air."



Source: Air Products

The mega-scale Jazan project in the Middle East.

'Hungry gasifiers'

“One of the world’s largest gasification projects is currently in full swing at Saudi Aramco’s Jazan refinery, where more than a dozen gasifiers built by Técnicas Reunidas will produce syngas from heavy refinery residues and petcoke. In total, the gasifiers at Jazan will be capable of producing more than two million normal cubic metres hour of syngas.”

“At Jazan, the gasifiers will produce enough syngas to generate a total of 4 GW of power and steam. The syngas is fired directly in gas turbines which produce 2.4 GW of electricity in an integrated gasification combined cycle, or IGCC power plant. The syngas-island will also export hydrogen and steam to the refinery. To feed the hungry gasifiers at Jazan, the process requires six giga-scale ASUs supplied by Air Products, each one is rated at 3,000 tonnes per day (tpd) of oxygen.”

Harrison explained that coal or petcoke gasification is a robust technology that can cope with oxygen at around 95% purity and the ASUs that feed gasification projects are generally optimised on this basis.

They can simultaneously produce nitrogen for refinery purging and inerting processes at a conventional ASU purity close to

99.999%. These plants could theoretically also produce large quantities of argon or the rare gases neon, krypton and xenon.

Giving further examples of these kind of projects in action and the potential ahead, Harrison continued, “Air Products has been instrumental in the Jazan refinery heavy residue gasification project and has secured their position in coal gasification through the acquisition of the GE Gasification business and Shell’s coal gasification technology.”

“The stated goal of these deals was not to become a technology licensor rather to enable the company to leverage gasification to win the associated ASU and syngas processing contracts as an integrated part of their industrial gases portfolio.”

“The Lu’an coal to chemicals project at Changzhi in China’s Shanxi province, is one of the giga-scale coal gasification investments that Air Products has made. Four gasification reactors have been constructed to supply syngas to the chemicals complex.”



Gasifiers at the Lu'an project in China.

Challenges ahead

With the expected growth in ASU projects on the horizon, Harrison identified the raising of the required capital to make ASU plant investments and safety as the challenges this trend presents.

“Safety beats in the heart of industrial gases but there are inherent hazards, and the challenge is to minimise the risk,” he said. “The devastated ASU site at the [Henan Gas Group Yima coal gasification plant in Sanmenxia in China](#) reminds us that

ASU operations have the potential to lead to tragedy. Fifteen people lost their lives because of that explosion in July 2019, and 16 others were seriously injured.”

Having explained the fundamental findings behind official investigations into the incident, he added, “Reflecting on these issues is a stark reminder that ASU design and operation must be left in the hands of industrial gases experts to ensure that the giga-scale production of oxygen to make hydrogen is done safely.”

Air Gases webinar: Part 1

In Part One of a two-part **gasworld** TV webinar series, sponsored by Evonik, air gases were the main topic of discussion.

Hosted by **gasworld** Global Managing Editor, Rob Cockerill, Part One explored all things additive manufacturing (AM) with guest Pierre Foret, Director of R&D at industrial gas company Linde, hydrogen production and its role in driving growth of large-scale ASUs with Stephen B. Harrison, Managing Director of sbh4, and medical oxygen production in the wake of a global pandemic with Bernard Zenou, President of NOVAIR.

Read the recap [here](#) and watch the webinar for yourself, on-demand and for free, at www.gasworld.tv