Breaking ground

Rob Grant, Founder and CEO of GR2L outlines its progressive approach to gas recovery and recycling

GR2L was founded in 2008 to commercialise chemical looping combustive purification technology, and developed in collaboration with Cambridge University. Its innovative approach addressed a critical gap in conventional gas purification technologies, targeting impurity levels ranging from 10 to 10,000 parts per million (ppm).

GR2L specialises in the recovery, purification, and recycling of inert purge gases from vacuum furnaces primarily operating in high-value manufacturing sectors such as solar photovoltaics (PV), microelectronics, and 3D metal additive manufacturing in aerospace and medical markets.

In 2010, GR2L forged a strategic partnership with the UK Gas Technologies Group, headquartered near Gatwick, UK, to facilitate the manufacturing and market launch of their flagship product, ArgonØ™.

The UK Gas Technologies Group boasts a proven track record in delivering high-purity gas installations, particularly in semiconductor and medical markets. This collaboration synergised with GR2L's mission, enhancing their capabilities, and positioning them for further growth and impact in the world of gas purification and recycling technologies.

How does the ArgonØ ™ work and how does it change things for solar manufacturing?

The chemical looping combustive purifier at the heart of the ArgonØ ™ is GR2L patent protected, delivering gas purities better than 0.5ppm. This enables GR2L to offer a compact, point of use, argon recycle system distributed across an entire facility.

Its easy installation, lack of requirement for additional process gases, and inherent multiply redundant design typically offer a factory recycle rate of 93-98%, depending on the customer's process

The equipment is easy to use, requiring only minimal user intervention and ideal to retrofit to the thousands of vacuum furnaces already installed as well as for new installations.

The system recovers the furnace exhaust gas through a 3-port valve that diverts the exhaust from venting to atmosphere to being recovered by the ArgonØ ™ for subsequent purification. Being a point of use system that connects to four to six furnaces allows customers to effectively 'try before they buy' and verify the argon recycle rates in their own facilities, before a wider factory roll-out.

The advantages of point of use systems over centralised

One of the main challenges that GR2L has met head on is combating

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the issues presented by centralised recycling systems, introducing the first point of use gas recovery and recycling system on the market. Put simply, centralised recycling systems are a single point of failure, vulnerable to breakdowns and malfunction at a single point. When it goes wrong, everything goes wrong. Distributed point of use recycling eliminates this.

Centralised systems tend to be more complex in terms of design, operation, and maintenance. This complexity can increase the likelihood of technical failures and require specialised expertise for troubleshooting and repairs.

The scheduled maintenance shutdown duration for a centralised system spans between one to two weeks, whereas for point-of-use systems, it's phased and typically only requires four hours per year. This prolonged one-to-two-week shutdown translates to a significant loss, ranging from 2% to 4% of overall productivity.

In response, GR2L developed its point of use solution; smaller in scale and designed to treat gas streams locally at the source. Such systems offer advantages such as flexibility, efficiency, and tailored treatment for specific processes.

The environmental and financial benefits of Argon Recycling with GR2L's ArgonØ ™

Current customers are seeing factory recycle rates of about 93 to 98%, giving the systems a simple payback of between twelve to twenty-four months, depending on the regional price of virgin argon.

"This prolonged one-to-two-week shutdown translates to a significant loss, ranging from 2% to 4% of overall productivity"

One GR2L installation, comprising of fifteen ArgonØs and recycling the argon purge gas from sixty CZ pullers with a facility recycle rate of between 93 and 98% means the whole facility can be run with an average flow of

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ArgonØ™

Argon Gas Recycling

GR2L is the leading global authority in point of use argon recycling and their flagship product ArgonØ™, developed in collaboration with Cambridge University, achieves gas purities better than 0.5ppm and delivers a profitable alternative to centralised recycling systems.

- Point of use argon recycling.
- Significant decrease in initial expenses when contrasted with constructing a centralised system, providing the flexibility to grow at your own pace.
- ROI is typically 12 to 24 months.
- Instant reduction in Scope 3 CO_2 footprint.
- The ArgonØ™ operating expenses are between one quarter and one third that of a central system.

GR²L

Gas Recovery & Recycle Limited

gr2l.co.uk

only 125slm of a fresh, top-up, argon.

In addition to the obvious cash benefit, the ArgonØ ™ system removes the toxic carbon monoxide gas impurity in the argon. This can be as much as 5,000ppm during recharge and is otherwise just vented into the atmosphere without any concern for the potential environmental impact this may have.

Also, by virtue of the significantly reduced argon deliveries, there is a commensurate reduction in diesel cyro-tanker mileage and emissions – without argon recycle a facility may have as many as four to six liquid tanker deliveries a day.

How the ArgonØ ™'s 'ramp-up' effect is saving customers money, one furnace at a time

A modern solar gigafab will have many hundreds of vacuum furnaces needing to be installed over six to nine months or more. As they come online, they will consume argon from day one. A centralised system, being a fixed size, cannot economically recycle this argon until approximately 80% of the furnaces are installed.

GR2L's distributed approach gives customers the flexibility to construct their factories incrementally, installing ArgonØ recycle systems alongside the furnaces and simultaneously ramping the argon recycling volumes alongside ingot production.

Benno Kuttruff, Consulting engineering firm SSB's Managing Director, said, "We have seen an overwhelming benefit by implementing the ArgonØ™ straightaway. The capability to recycle argon immediately has a substantial positive impact on the customers cash flow during the crucial ramp up period of potentially saving many millions of dollars."

"The capability to recycle argon immediately has a substantial positive impact on the customers cash flow..."

India's renewable energy revolution and government incentives

The renewable energy sector in India is experiencing a significant boom, fuelled by ambitious goals set by the government to achieve self-sufficiency in solar panel and wind turbine manufacturing by the end of the decade.

With substantial support from the Indian government, manufacturers are being incentivised to invest in new facilities through schemes like the Production Linked Incentive (PLI), which offers subsidies across the entire solar supply chain. Interestingly, the level of subsidy increases for manufacturers who opt for more vertically integrated facilities, encouraging comprehensive investments that span from raw material sourcing to final product assembly.

The target of reaching approximately 60GW of solar PV production by the mid-2020s, and doubling that capacity by 2030, necessitates a substantial increase in the consumption of argon, a crucial gas used in purging solar ingot furnaces. This growth in demand is projected to exceed an additional 200,000 tonnes of argon per year by 2025.

For manufacturers, the surge in argon demand presents both opportunities and challenges. On one hand, it underscores the importance of securing a stable supply of argon to support the rapidly expanding solar industry. On the other hand, it highlights the need for innovation and efficiency improvements in argon recycling and purification technologies to meet the escalating demand sustainably.

Innovating sustainable Gas Recovery and Recycling Solutions of the future

GR2L's pioneering approach not only addresses technical challenges but also significantly contributes to increased sustainability practices. By minimising the need for new production and associated emissions, ArgonØ™ facilitates significant reductions in environmental footprints, aligning with broader sustainability initiatives.

The ArgonØ™ represents a paradigm shift from centralised recycling systems, offering greater flexibility, efficiency, and tailored treatment for specific processes. With advantages such as ease of use, minimal user intervention, and retrofit capabilities for existing installations, GR2L's solutions pave the way for sustainable and efficient gas recovery and recycling practices in various industries.

As renewable energy adoption surges globally, particularly in India, and challenges persist for European solar manufacturers amid intense competition, GR2L's innovative technologies and progressive approach position them as leaders in the field of gas recovery and recycling, driving sustainability and efficiency in high-value manufacturing sectors worldwide. gw