Artisan Partners Global Equity Team

Building A Resilient Future with Industrial Gas

Resilient Growth

Issue 6—September 2023

What do computer screens, rocket fuel, soft drinks and medical procedures have in common? The odds are that you didn't think of industrial gas. However, gases such as nitrogen, oxygen, argon and hydrogen can be thought of as the unheralded "silent enablers" that support manufacturing processes around the world to create the products and services that touch all aspects of our lives.

Industry sales stood at $99 billion in 2022 and are expected to reach $173 billion by the end of the decade. That translates into a 7.4% compounded annual growth rate, a faster pace than many developed or emerging markets. It is predicted that much of this growth will be driven by the manufacturing sector in developing markets. In addition, the fast-developing market for hydrogen could be a game-changer in helping societies achieve their net-zero goals to avoid the worst effects of global warming.

At its core, industrial gas companies utilize air—a costless input—to separate useful commodities, such as oxygen and helium, to sell as essential products to their customers. As investments, industrial gas stocks offer opportunities for short- and long-term growth.

One person who thoroughly understands the industry's investment potential and has been following companies in this space for over 20 years is Richard Logan, CFA, a senior analyst on the Artisan Partners Global Equity Team who has worked with Portfolio Manager Mark Yockey, CFA, for over 10 years.

Framework for Growth

With degrees in chemical engineering and finance and stints at noteworthy firms Arthur Andersen, Goldman Sachs, and Morgan Stanley, Richard has spent decades covering the chemicals industry, including industrial gas companies. During his more than 10 years on the team, Richard has worked out of the London office researching companies that span multiple specialties, including fragrance and flavor companies, renewable biofuel producers and infrastructure players.

No matter the industry, Richard seeks out companies that are well-positioned in the market, have strong competitive advantages, talented management teams and benefit from exposure to secular trends. Moreover, he tends to focus on companies that have strong bargaining power over customers and those that face minimal threats from new entrants or new products. These are the key components of fundamental analysis as outlined in Porter's five forces framework, the renowned textbook tool used by academics and corporate strategists for the past 45 years, as well as by Logan.

"You have the demand side factors, such as the exposure to megatrends like population growth, urbanization, emerging markets growth, and so forth, but, more importantly, you have supply side factors to consider, like industry consolidation, pricing power, barriers to entry, etc.," says Logan. "The strength of management team and stock valuation are also crucial factors that I look at closely."

This approach helps him identify companies relatively well-positioned with the characteristics needed to generate high returns and sustain growth over time. "I'm looking for companies that can grow somewhat

Richard Logan
Research Analyst

"Sustainable growth is the key mantra for the Global Equity team."

—Richard Logan

independently of the economic environment with high underlying cash flow and a high return on capital employed," he explains. When it comes to industrial gas companies, one important way they can deliver sustained growth is through distribution density.

Distribution Density Leading to Wide Moats

Industrial gas is supplied in three ways: On-site, merchant delivery, or packaged delivery. These methods are used to reach a wide variety of businesses, from large, complex businesses to mom-and-pop retailers. These diversified end markets add to the industry's resilient profits.

> "When the capital investment is $20 billion, the security of supply is critical. You can't afford to have an outage."

On-site distribution means that a supplier, such as Linde or Air Liquide, will build an industrial gas plant next to a client's plant, or connect a client's plant to their gas network, which also connects other industrial gas production plants. The client could be a petroleum company, pharmaceutical manufacturer or a semiconductor fabrication plant, or "fab." Back-up liquified gas supplies are often included in case of power failures or required maintenance. The switching costs of on-site distribution are typically very high given the client's large, up-front capital investment to build the custom infrastructure. These agreements often result in long-term contracts—often 20 years or more—and contain take-or-pay clauses that ensure a level of revenue for the supplier, even when a customer requires little or no gas. They typically include price escalators and other special clauses that allow, for example, variable energy costs to be passed through to the customer. This risk-sharing arrangement benefits both parties. The supplier gains assurance that it can cover its high fixed costs and most of its variable costs, while the customer gains assurance of an uninterrupted supply, a critical consideration for a large refinery, for example, where production downtime can be extremely costly. Further decreasing customer price sensitivity is the fact that industrial gases normally constitute a relatively small cost for their businesses. While industrial gases typically account for less than 5% of a customer's operating costs, they are an essential input to production. At the end of the contract, the on-site market often has customer retention rates of over 95%, given that a plant is often already established on the customer site.

Merchant delivery involves suppliers transporting bulk liquified gas by truck to a customer's storage tank. Because transportation costs account for a large portion of this service and customers require timely deliveries, the delivery radius from a supplier facility is typically around 200 miles. This limitation often leads to regional leaders dominating local markets by fiercely protecting territories from new entrants. Here, too, take-or-pay contracts of three to seven years are often used to lock in customers and ensure consistent cash flows for gas suppliers.

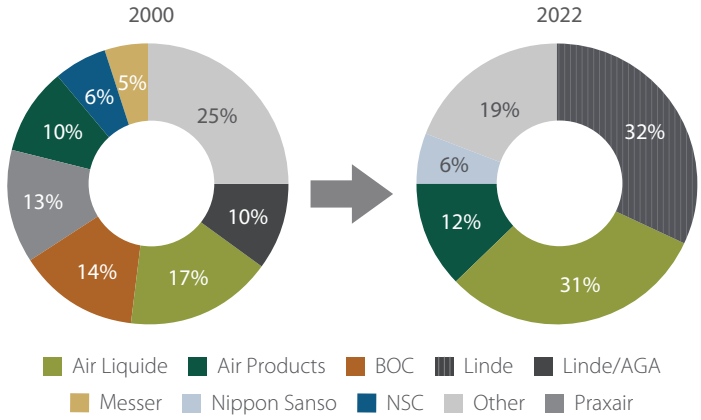
In packaged distribution, industrial gas suppliers ship compressed gas cylinders to small-volume users, such as those in welding, construction, food and beverage, and medicine. The cylinders are often distributed through independent middlemen.

Overall, distribution underlies the economics of the industry and is an important factor in influencing stock valuations. Increased density of industrial gas distribution in each of its forms leads to stronger returns. The two leading firms, Linde and Air Liquide have built particularly strong regional distribution advantages over the years, which have lowered their costs and increased supply reliability and convenience for their customers.

Structural Advantages

According to Logan, another appealing aspect of industrial gas is its concentrated industry structure. Linde, Air Liquide, Air Products and Nippon Sanso account for over 80% of the global outsourced industrial gas market by revenues. In 2000, seven companies accounted for approximately 75% of revenues. Since then, companies began to make smart acquisitions including Linde's acquisition of BOC in 2006, Air Liquide's acquisition of Airgas in 2016, and, most notably, Linde and Praxair's merger of equals in 2018.

Exhibit 1: Moving toward an oligopoly



Source: Deutsche Bank, 2022

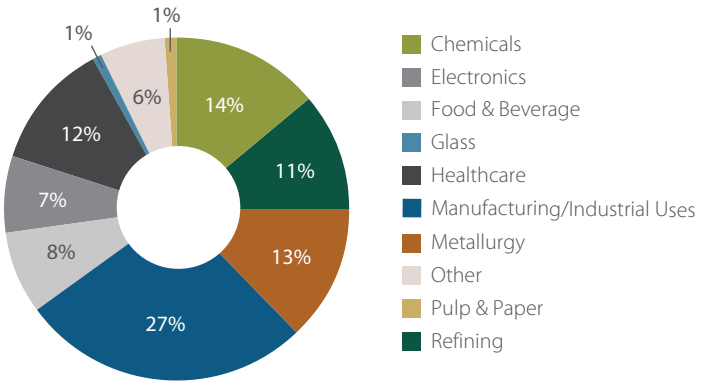
The resulting concentrated industry structure has enabled well-positioned companies like Linde and Air Liquide to raise prices when needed with minimal effects on sales volumes. Pricing power is a key component of protecting margins and delivering resilient earnings growth during inflationary times.

> "The pricing we have seen in the industry over the last four or five years has really changed."

Exposure to Megatrends

On the demand side, industrial gas touches virtually all industries, making revenues durable.

Exhibit 2: Industrial gas: An essential input across many end markets



Source: Deutsche Bank, 2020

Growth can be linked to several megatrends benefiting its widespread customer base: outsourcing, emerging markets industrialization, aging populations, decarbonization (supported by subsidies and legislation such as the Inflation Reduction Act), and the rise of advanced electronics and digitization—particularly semiconductor fabs needed to support data center growth. These trends provide secular tailwinds for the industry and add to stock resiliency.

Hydrogen's Multicolor Growth Story

Hydrogen is the most abundant element in the universe. It has been used in energy production since the mid-1800s. It is now coming into sharper focus as societies around the world look for cleaner alternatives to carbon-producing fossil fuels that lead to climate change, according to the large majority of climate scientists.

When burned, hydrogen does not produce carbon dioxide, only water vapor, making it an attractive replacement for fossil fuels. However, hydrogen is not found on its own but must be separated from other elements, which requires energy. In traditional gray hydrogen production, natural gas is used with a steam methane reformer, producing about 10 kg of CO_2 for every 1 kg of hydrogen. This production method represents 99% of all hydrogen produced today. However, new, cleaner methods have been developed. For example, blue hydrogen uses carbon capture utilization and sequestration (CCUS) to reduce CO_2 in the process and store it underground indefinitely. This method produces some carbon, but less than gray hydrogen. Green hydrogen, utilizing renewable forms of energy as feedstock (inputs), offers a completely carbon-free form of energy, both in the production and usage of it.

Exhibit 3: Methods of Hydrogen Production

HYDROGEN COLORS	DESCRIPTION
Gray	Using natural gas to produce hydrogen. CO_2 is the byproduct.
Blue	Producing gray hydrogen (above) then capturing CO_2 emissions and storing them underground. Emits some CO_2, depending on the process.
Green	Using renewable energy sources with electrolysis (an electrical current) to split atoms of water into oxygen and hydrogen. Carbon-free emission.

FactSet Consensus Estimates for 12/31/23.

Within clean energy, Linde, Air Liquide and Air Products are currently in the driver's seat of the nascent hydrogen economy. Their offerings are supported by decades of experience in manufacturing and handling hydrogen as well as existing infrastructure such as pipeline networks. Richard estimates that of the current 5,000 km of hydrogen pipelines globally, Air Liquide owns and operates about 2,000 km, Air Products 1,300 km, and Linde 1,000 km. These companies not only provide large, complex clients with the efficiency, competency, and redundancy they require, but they are also able to leverage their proprietary infrastructure to help clients develop blue and green hydrogen, the forms of hydrogen most in demand. These vast pipeline networks, along with their expertise, are strong selling points for producers considering financing and building an in-house hydrogen operation from scratch. Included in this expertise is the ability to design and develop CCUS solutions. As mentioned above, these solutions are used in blue hydrogen production and can also be used more generally to reduce greenhouse gas emissions from other energy-intensive industrial facilities and power plants.

Another benefit of hydrogen is that it can be used to store and transport renewable energy sources, such as wind or solar energy, that are carbon-free but intermittent by nature. Converting green hydrogen (made from renewables) into ammonia enables energy to be stored in bulk for long periods under modest pressure or when refrigerated to -33°C. A distribution network currently exists in which ammonia can be stored in large, refrigerated tanks and transported around the world by pipes, road tankers, and ships. Once green ammonia reaches its destination, it can then be transformed back into hydrogen, available for use. In this way, an irregular but renewable source of energy can be stored and used when needed, solving a fundamental problem with renewables.

The Race for Clean Energy

The Hydrogen Council, a global CEO-led initiative to support the clean energy transition, predicts that hydrogen could eventually provide up to 20% of the world's energy and serve as a major component of the solution needed to reach net-zero climate goals.

Today, hydrogen is mainly used in refineries to remove sulfur from fuel to meet environmental regulations and in nitrogen-based fertilization production. Nevertheless, the demand for doing more with this most abundant element is building. More than 1,000 hydrogen projects have been announced, representing $320 billion in investment globally. Many aim to use hydrogen more widely to decarbonize industries such as steel, trucking, maritime transport and aviation. While only 10% of these projects have reached final investment decision, this number is expected to grow as well.

Linde is currently a leader in hydrogen production, accounting for 10% of its revenues. This is almost exclusively gray hydrogen, however. Nevertheless, the company is positioned to benefit from the increase in demand for blue and carbon-free green hydrogen, as production continues to ramp up to meet the growing global demand. Linde operates in each step of the value chain—from production to distribution and storage—including CCUS technologies. Linde estimates it plans to invest over $50 billion in hydrogen projects over the next 10 years. This year, the company signed clean hydrogen development deals with BASF, Evonik, OCI, BP and Dow as these companies look for cleaner ways to power their industries. Linde's new project with Dow aims to create the world's first net-zero carbon emissions ethylene processing facility. When completed, it will effectively decarbonize plastic production. And as more large oil companies begin to invest in hydrogen, Linde sees increased opportunities. With hubs already built, along with transportation and production facilities and close to 200 hydrogen vehicle refueling stations worldwide, Linde already has essential assets in place and the ability to scale up quickly.

Air Liquide predicts it will invest more than $9 billion in the low-carbon hydrogen value chain by 2035. At that point, hydrogen sales are expected to be three times higher than today. In 2022, it opened its largest hydrogen production facility, in Nevada, which produces 30 metric tons of liquid hydrogen per day. Importantly, the infrastructure used in the project can be leveraged to attract other companies to the area. Nevada aims to build on this success as hydrogen hubs spring up in different parts of the US.

Many of these projects have been made possible by the 2021 Bipartisan Infrastructure Law in the US. It earmarked $9.5 billion in federal funding for clean hydrogen: $8 billion for the development of at least four regional hydrogen hubs, $1 billion to reduce the costs of green hydrogen, and $500 million for clean hydrogen recycling and manufacturing. With close to $370 billion dedicated to energy transition and renewables, the 2022 Inflation Reduction Act has also supported a boom in clean hydrogen production. More specifically, the IRA provides a subsidy of $0.60 to $1.00 per kilogram for blue hydrogen and $3.00 per kilogram for green hydrogen. However, even though the subsidy is larger for green hydrogen, the higher production costs involved in green hydrogen may tip the scales toward blue hydrogen. Logan estimates that the effects of the government program will bring the cost of US blue hydrogen to parity with gray hydrogen, likely leading to a large ramp-up in blue hydrogen projects in the US.

> "The IRA has effectively brought blue hydrogen to parity with gray hydrogen in the US."

In the coming years, equally bold legislation is widely expected to be passed in Europe. In the REPower EU Hydrogen Plan, the European Union advocates for producing 10 million metric tons of clean hydrogen production and importing an equal amount by 2030. Meanwhile, similar legislation is currently under debate in Canada where the government projects hydrogen could deliver as much as 30% of the country's end-use energy by 2050. All of this stimulus is creating a backlog for large investment projects.

So, what does a hydrogen boom mean for an industry that already produces steady earnings growth and ample cash flow? "The scale of these projects is just getting bigger and bigger," Logan says, as awestruck as anyone about the dramatic shifts he has seen over the last few years.

According to the Hydrogen Council, $700 billion in global investment is needed by 2030 to stay on track for meeting the Net Zero 2050 goal set out in the Paris Climate Agreement. And as more projects are funded, companies like Linde will be able to leverage existing infrastructure and scale to further press their advantages over competitors. One only needs to look at other consolidating industries where the leaders control essential assets, benefit from economies of scale, and are experiencing secular growth to see where things may be headed (think: data centers).

While the future is never certain, one thing is clear: Share prices for these industry leaders have generally benefited from both the resilient pricing they have shown in their traditional business and the long-term opportunities they see in their future.

For more information: Visit www.artisanpartners.com | Call 800.344.1770

Carefully consider the Fund's investment objective, risks and charges and expenses. This and other important information is contained in the Fund's prospectus and summary prospectus, which can be obtained by calling 800.344.1770. Read carefully before investing.

Current and future portfolio holdings are subject to risk. The value of portfolio securities selected by the investment team may rise or fall in response to company, market, economic, political, regulatory or other news, at times greater than the market or benchmark index. A portfolio's environmental, social and governance ("ESG") considerations may limit the investment opportunities available and, as a result, the portfolio may forgo certain investment opportunities and underperform portfolios that do not consider ESG factors. International investments involve special risks, including currency fluctuation, lower liquidity, different accounting methods and economic and political systems, and higher transaction costs. These risks typically are greater in emerging and less developed markets, including frontier markets. Securities of small- and medium-sized companies tend to have a shorter history of operations, be more volatile and less liquid and may have underperformed securities of large companies during some periods. Growth securities may underperform other asset types during a given period.

This summary represents the views of the portfolio managers as of 30 Jun 2023. Those views may change, and the Fund disclaims any obligation to advise investors of such changes. For the purpose of determining the Fund's holdings, securities of the same issuer are aggregated to determine the weight in the Fund. The holdings mentioned above comprised the following percentages of the Fund's total net assets as of 30 Jun 2023: Artisan International Fund - Linde PLC 5.0%, Air Liquide SA 4.8% and Nippon Sanso Holdings Corp 0.4%. Artisan Global Equity Fund— Linde PLC 1.0%, Air Liquide SA 3.0% and Nippon Sanso Holdings Corp 1.0%. Portfolio holdings are subject to change without notice and are not intended as recommendations of individual securities.

This material is provided for informational purposes without regard to your particular investment needs. This material shall not be construed as investment or tax advice on which you may rely for your investment decisions. Investors should consult their financial and tax adviser before making investments in order to determine the appropriateness of any investment product discussed herein.

Artisan Partners Funds offered through Artisan Partners Distributors LLC (APDLLC), member FINRA. APDLLC is a wholly owned broker/dealer subsidiary of Artisan Partners Holdings LP. Artisan Partners Limited Partnership, an investment advisory firm and adviser to Artisan Partners Funds, is wholly owned by Artisan Partners Holdings LP.

A R T I S A N  P A R T N E R S

9/20/2023 – A23865L-vR