

Chemicals Practice

Getting value from advanced digital technology for industrial gas companies

With relatively little risk, industrial gas companies can optimize parts of their operations with advanced technologies.

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Ever-increasing volumes of data, connectivity, computing power, and advanced analytics are putting Industry 4.0 tools—which transform manufacturing and industrial processes with up-to-date digital technology—more within reach.¹ Indeed, about half of leaders of industrial gas companies surveyed in informal interactions have expressed interest in developments in Industry 4.0. They have reason to be interested: our analysis suggests that the industrial gas sector stands to increase EBIT² margins by two to five percentage points—a significant competitive advantage in an industry in which historical EBIT margins are a healthy 20 to 25 percent for major players. For companies that may already be piloting advanced analytics, a small collection of similar Industry 4.0 tools (including machine learning), scaled throughout an enterprise, can create value at low risk for industrial gas companies.

Such measures could grow the profit margins of an industry that already creates significant shareholder value. Industrial gas companies can apply Industry 4.0 tools throughout the value chain, such as advanced analytics to enhance plant efficiency or optimize bulk or packaged gas deliveries. Digital and analytical tools could also help strengthen supply chains that are especially crucial during the COVID-19 crisis—particularly ones that involve delivering liquid oxygen to hospitals and enhancing capacity at dry-ice facilities that support vaccine transportation. Gas players could start by leveraging existing technologies and approaches to quickly capture value, creating a self-funding mechanism for further digital transformation.

Pipeline operations

While stand-alone facilities such as single air-separation units are fairly optimized thanks to advanced process controls, there is an opportunity to optimize more complex pipeline networks with multiple plants and gas consumers. For instance, years of historical data could be used to create a model that forecasts customer-demand volumes across the network. The model could monitor actual production and consumption across the pipeline, making optimized recommendations to meet all customer needs at a minimized cost. The models could calculate the probability of sudden changes in customer demand—such as a steel mill suddenly pulling a significantly higher volume amount of oxygen—and calculate an optimized output. In such a scenario, the model would simultaneously account for remaining uncertainty in the demand model and important operational-cost trade-offs, particularly between increasing pipeline pressure and vaporizing supplemental liquid. Operators can reference a display of real-time set-point recommendations for the relevant equipment as operating and ambient conditions evolve.

Bulk distribution

Bulk distribution (particularly trucking) can also benefit from Industry 4.0 tools. For example, an advanced-analytics model with the proper inputs and constraints—such as fleet size, fleet availability, and local transportation regulations—could optimize delivery of bulk gases to customers. A relevant model could forecast consumption and use inputs such as traffic patterns to create optimized delivery

¹ For an overview of Industry 4.0's status in the context of the COVID-19 pandemic, see Mayank Agrawal, Sumit Dutta, Richard Kelly, and Ingrid Millán, "COVID-19: An inflection point for Industry 4.0," January 2021, McKinsey.com.

² Earnings before interest and taxes.

Industry 4.0 tools could help grow the profit margins of an industry that already creates significant shareholder value.

routes for drivers. Optimized routes would reduce the total cost for customers by reducing trucking miles and fuel costs.

Furthermore, advanced models could also update trucking routes using real-time data. For example, if a highway is shut down because of an accident, the model could rerun its inputs, identify a faster route, and provide the updated route to drivers. An optimized distribution system would cut short-term costs and help industrial gas companies optimize their trucking fleets based on insights from models.

Plants and pipelines

In the longer term, drones and autonomous vehicles could contribute to the optimal functioning of plants and pipelines. Drones could automatically complete operator routes, collecting video data of the plant and leveraging unstructured data analysis to identify any concerns, such as ice accumulation on the top of cold boxes or unexpected leaks, and catch both safety and efficiency issues earlier. Similarly, autonomous vehicles could deliver

needed parts to job sites, helping mechanics be more effective by providing greater wrench time. The question now is how industrial gas companies can best prepare for successful transformations.

Industry 4.0 tools can generate significant business impact for industrial gas companies. Those that are ready and able to make the commitment can capture sustainable competitive advantages.

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