



Has CO2 industry lost its fizz?

By [Sam A. Rushing](#) on Oct 01, 2020

The shortages of merchant carbon dioxide (CO₂) during the summer of 2020 are perhaps unprecedented in many ways. First, in the winter, and into the spring, came the lockdown, and reduction of industry and the economy precipitated by Covid-19.

The reduction in gasoline consumption, and subsequently the ethanol added, has suffered a steep decline in many markets, particularly during the spring of this year. Ethanol production, per the US Energy Information Administration (EIA), averaged 1.04 mm barrels per day during the first quarter (Q1) in the US. In Q2, it was predicted to fall to 630,000 barrels; while in the third quarter, increasing to 740,000 barrels. In Q4, 860,000 barrels.

Along with this, there was a drop in production and availability from certain CO₂ plants associated with ethanol plants which led to the first shortage. Beyond this are other source types, such as anhydrous ammonia, experiencing outages in Ohio and planned for Virginia, as well as other outages.

What were the worst months for supply, and are things getting back to normal, an if so, how?

It was hoped during the driving season this summer, more gasoline and ethanol would be consumed. This is likely true, where per the US EIA, ethanol production dropped around 65% in Q2. It is estimated that about 75% compared to Q1 would be consumed during Q3, and perhaps up to about 87% by Q4. There has been a decline in CO₂ supplies from various ethanol plants in turn, which is the first problem with supplies. Based upon this uptick, after Q2, it appears more ethanol will be consumed, and some companies are converting to hand sanitiser, which is small compared to gasoline addition.

The worst months for CO₂ supplies can often be in and around the summer season. Beyond ethanol, this summer has been particularly harsh, due to key plants in the Midwest and Mid-Atlantic closing or planning to turnaround which are anhydrous ammonia sources. This will continue well into the fall, with the Hopewell, Virginia plant reducing capacity. There may not be a return to supply normalcy for some time.

Are some customers and distributors still on allocation?

Yes, very much so. Allocations are only a small part of today's problems. In the Midwest, where the lion's share of CO₂ demand for food processing, it is said that CO₂ can easily sell for \$1,000 per tonne, particularly to those who are seeking supplies outside of their normal, and often contracted supplier of the product. Shortages are perhaps the worst I have seen in my experience over the years.

Should customers expect some spot shortages over the summer?

Absolutely, shortages are extremely common in the industry, which many fear will be of a longer term nature.

Is production at ethanol plants back to normal?

No, production is not back to normal, driven by a reduction in gasoline mixed with ethanol being consumed less than last year. Ethanol production continues to be reduced in capacity and, in some cases, contamination of product with sulphur in at least one case has occurred.

Has there been an increase in the cost of product?

In some cases, the cost is \$1,000 per tonne, for product outside of contract, which is sold to those customers, such as major food processors, who cannot obtain the product from their normal suppliers (such a processor could have been paying \$60/tonne before this really harsh summer season). The gas companies are supplying as much and as well as they can during this CO₂ supply crisis, but supplies are limited, outages are occurring not just from ethanol sources, but from other types, such as anhydrous ammonia.

What sort of price increases should industry expect, or has seen for product – \$20/ton?

In many cases, increases are steeper than \$20/ton, when under contract, due to a force majeure, driven by the supplier adding much more freight to the product due to plant outages. In some cases, when supplies are inadequate for major food processors, they seek other suppliers who often quote \$1,000/tonne, which can entail hundreds of dollars in freight, when shipped across the country. In the end, when the customer must have product, they often will pay any price... at least for now. This scenario is not an example of the supplier taking advantage, but a reaction representing sheer survival. This outage, starting with Covid-19 in the winter and spring, and growing worse in the summer, may well lead to conversion away from CO₂ usage, where possible, to nitrogen and mechanical refrigeration.

With respect to an increase of \$20/tonne, it is likely at least this amount will be added, since the industry is often adding more freight to cover what requirements they can provide, often under allocations. In some cases, there are allocations of 50%, stated as common practice.

What geographical areas have been worst hit by CO₂ supplies?

I can readily say that many regions have been hard hit by such supply shortages. The Midwest has been hit hard because so much supply relies heavily on ethanol sources, and coupled by outages in Ohio, and soon to be Virginia. Further, the east and Mid-Atlantic has been affected, as well as other regions such as the west coast which rely on ethanol and reformer operations found in refineries.

How do you see CO₂ shortages playing out over the remaining months of the year?

Based upon EIA estimates, ethanol production will continue to be depressed, but gaining ahead of Q3; thus, CO₂ sources relying upon these operations will continue to suffer, maybe to a smaller degree. However, the ammonia plants in the Midwest and Mid-Atlantic will represent a further problem into Q3 at least. Lastly, other sources which have suffered contamination, could add to the hardship. I believe shortages will continue for the rest of the year, driven by ethanol issues. Until Covid-19 is under control, it is hard to see things returning to normal, considering our current CO₂ supply portfolio domestically.

What lessons can the industry learn from the shortages?

I believe we are too invested in ethanol as a CO₂ source type in the US, and the need for diversification is essential in the future. We need to examine source types from perhaps difficult and smaller capacity options, such as biogas, and support carbon credit legislation which can subsidize expensive source types such as flue gas. Back in the 1990s, when flue gas was subsidized by the so-called QF status, it was possible for the expanding cogeneration industry to recover CO₂ in a competitive manner. Such developments are needed to shore up a reliable CO₂ supply ahead. Despite having certain tax credits and the LCFS (low carbon fuel standard), we are a long way off from making progress in a green direction, such as affordable CO₂ recovery from flue gas. It is critical the industry further diversify their source types.



About the author

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Sam A. Rushing is a chemist, and President of Advanced Cryogenics, Ltd, a global carbon dioxide (CO₂) and cryogenic gas consulting firm. The business offers a full menu of consulting services from technical, process, and applications-based to sourcing, purity, and business/market research work.