

# Water Utilities Supply Chain Challenges and Case Studies:

## CO<sub>2</sub> AND THE DES MOINES WATER WORKS

The Des Moines Water Works (DMWW) provides drinking water to approximately 600,000 customers in the Des Moines metropolitan area. It operates three water treatment plants: Fleur Drive Treatment Plant, L. D. McMullen Treatment Plant at Maffitt Reservoir and Saylorville Water Treatment Plant. DMWW also operates Des Moines Water Works Park and Maffitt Reservoir Park. The treatment plants at Fleur Drive and L. D. McMullen both use CO<sub>2</sub> as part of the water treatment process.



Seasonal changes in demand affect treatment requirements therefore extending or limiting the duration that the CO<sub>2</sub> storage amount will last. To ensure a sufficient supply, an automated inventory system orders CO<sub>2</sub> when storage drops to a point so that the system can receive a full 40,000 lb. tanker load of product. DMWW has also established itself as a priority customer with their supplier. These practices have worked for decades, and there has always been a sufficient supply of CO<sub>2</sub> on-site. But this all changed with the COVID-19 pandemic.

### COVID-19 and Unintended Consequences

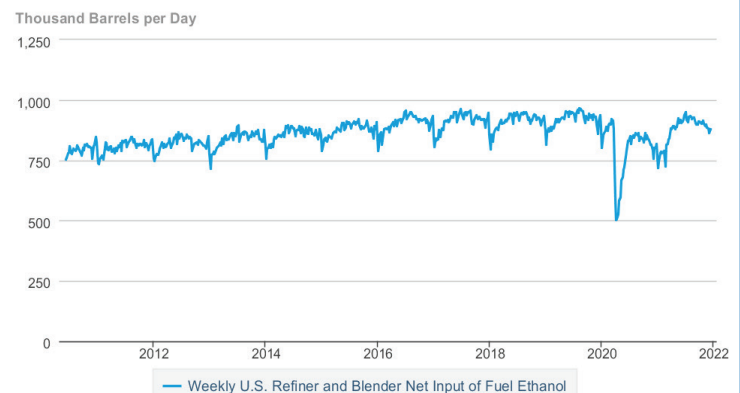
CO<sub>2</sub> is largely produced as a byproduct of other

processes, including the manufacture of ethanol, oil and natural gas refining, and ammonia and hydrogen production. The largest source of CO<sub>2</sub> (35%) comes from ethanol. DMWW is supplied CO<sub>2</sub> that is captured from this process.

In the spring of 2020, reductions in economic activities due to COVID-19 significantly lowered the demand for gasoline and hence for ethanol (see sharp decrease in graphic below). Lack of drivers on the road and the lowered demand for ethanol led many ethanol manufacturers to reduce their production levels or, in some cases, to shut their plants. When this happened, CO<sub>2</sub> shortages quickly followed.

To compound matters, there are many competing uses for CO<sub>2</sub>; its application in drinking water treatment makes up less than 4% of global use. The largest user of CO<sub>2</sub> in the Des Moines metropolitan area is the food industry. The competing uses for CO<sub>2</sub> made finding product more difficult. The effects of the shortage were soon felt by DMWW's supplier, resulting in a 24-hour notice that CO<sub>2</sub> would no longer be available to the Water Works.

Weekly U.S. Refiner and Blender Net Input of Fuel Ethanol



Source: U.S. Energy Information Administration

## Response and Mitigation

DMWW worried about its ability to continue treating water. If water could not be treated, they would not be able to provide safe drinking water for basic sanitation or to protect public health during the COVID-19 pandemic. This would have not only negatively impacted its residential customers but also other lifeline services such as hospitals and care facilities. Since these consequences were not acceptable to DMWW, staff immediately began looking for ways to locate and procure additional CO<sub>2</sub>.

*“How could you not help the city of Des Moines?” said Seth Harder, General Manager of Husker Ag, which oversees Lincolnway. “Drinking water is very essential.”*

DMWW contacted chemical suppliers, the Iowa Water and Wastewater Agency Response Network (IOWARN), the Iowa Department of Natural Resources, the Iowa Association of Water Agencies (IAWA), the neighboring utilities, and the Iowa Department of Homeland Security and Emergency Management (HSEMD). The plan was to communicate the urgent need for CO<sub>2</sub> to the Water Work’s entire public and private partner network to reestablish the CO<sub>2</sub> supply. HSEMD kept the Governor’s office updated which supported high level communication with various companies and organizations in an attempt to find a resolution.

The local CO<sub>2</sub> suppliers understood the criticality of the situation but were unable to make commitments to new customers. DMWW took it a step further and reached out to the ethanol manufacturer, Lincolnway Energy, that provides CO<sub>2</sub> to their supplier. Ultimately, persistence was key as DMWW was able to convince their supplier’s ethanol manufacturer in the Midwest to reopen its plant and start production to ensure CO<sub>2</sub> would be available again.

While hopeful that the local CO<sub>2</sub> shortage would be resolved, DMWW Water Production Department was ready with several “Plan B” actions to be able to continue to produce water, which included the following:

- Adjusting pH to reduce CO<sub>2</sub> use
- Implementing water use restrictions
- Reducing lime softening
- Switching to citric or phosphoric acid
- Issuing a boil water notice or boil water advisory and maintaining sanitary water and fire protection

## Lessons Learned

DMWW was fortunate – communication with the CO<sub>2</sub> manufacturer that serves their supplier proved successful. While the utility came close to running out of CO<sub>2</sub>, DMWW did not have to modify either water treatment or water usage. However, this experience did produce other lessons learned:

- **Establish relationships.** Start with your local emergency management agency (EMA) – EMAs can provide points of contact you may need during an emergency. Also, get involved with your state WARN. This will help you to know what other utilities in your state have and what they may be able to lend during emergencies.
- **Know your full supply chain to include manufacturers.**
- **Leverage interdependencies.** For example, the food industry is just as reliant on safe drinking water as it is on CO<sub>2</sub>. Agreements can be reached to share limited supplies of CO<sub>2</sub> if industry realizes that a lack of clean water could be just as impactful as a lack of CO<sub>2</sub>.
- **Be flexible.** Suppliers may not be able to make on-time deliveries because of the lack of drivers. By extending the times to receive chemical

deliveries, utilities have a much better chance of having chemicals in sufficient supplies. For example, DMWW no longer has set treatment chemical delivery hours.

- **Drive it yourself.** DMWW has considered what would happen if the treatment chemical were

available, but there were no truck drivers to make the delivery. The Water Works asked HSEMD if they would be able to assist by asking the state Department of Transportation for temporary emergency waivers if DMWW needed to use drivers that did not have the exact type of CDL required to haul chemicals.

As COVID-19 proved, treatment chemical shortages can be unforeseen and occur with little notice. While no utility can predict supply chain disruptions, all utilities can and should take steps to better plan for and respond to future challenges. These include communicating and working with suppliers and manufacturers, leveraging relationships with interdependent sectors, and coordinating with state primacy agencies on treatment alternatives in advance of any shortages.

## Additional Resources

You can find more information on using supply chain management best practices and preparing for supply chain challenges at <https://www.epa.gov/waterutilityresponse/water-and-wastewater-sector-supply-chain-resilience>.

