

Lowering temperatures and costs

Chart's ChillZilla[®] Bulk CO₂ Liquid Supply System enables significantly colder product, which translates to cost savings

By Nick Parkinson

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With rising carbon dioxide (CO₂) costs, the ChillZilla® Bulk CO₂ Liquid Supply System offers the opportunity to reduce CO₂ consumption for food freezing and dry ice systems, resulting in savings, according to the leading cryogenic equipment manufacturer.

The ChillZilla liquid supply system increases the refrigeration capacity of the liquid CO₂ by as much as 24% over traditional bulk tanks and reduces deliveries at the bulk tank site, according to Chart statistics.

The bulk CO₂ food freezing and ice production system, which comes in 30, 50-ton and 75-ton models, was developed because customers with liquid CO₂ at a high saturation pressure were restricted in the yield of dry ice or snow. Chart saw the need to assist in providing savings to end-users by super-chilling the liquid CO₂ before dispensing to atmosphere to increase dry ice yields. The small amount of electricity needed outweighed the cost of liquid CO₂ in some areas of the US. The ChillZilla CO₂ product was introduced first in 2011 and the liquid nitrogen followed in 2012.

The ChillZilla system minimizes heat gain in piping to process efficiently and maintains liquid CO₂ at sub-zero temperatures as low as -40°F. Chart, which has US facilities in Ball Ground, Georgia,

and New Prague, Minnesota, says the ChillZilla CO₂ system's key benefits are significantly colder product with higher dry ice or snow yield, with a reduction of overall pellet production costs in applications that consume one to two trailer loads per day (22-44 tons/day).

"We are definitely seeing the benefits of the ChillZilla system as we are providing a much colder product than what they are used to seeing," Richard Rosik, Business Development Manager, Projects D&S Americas at Chart, told *gasworld*.

"In some installations we are seeing the liquid CO₂ as low as -40°F. This translates into a higher yield of liquid CO₂ to dry ice as well as higher efficiency for food freezing as the incoming liquid is much colder than typical."

The external refrigeration system, an internal heat exchanger coil and an insulating baffle, means the temperature of the liquid CO₂ is effectively reduced. This system sub-cools the saturated liquid CO₂ from 300 psig to 120 psig while the electric pressure builder maintains the high tank vapor pressure necessary for consistent CO₂ delivery to the application. The result is an increase in refrigeration capacity in the liquid or an improved snow yield from 41 to 51%.

The ChillZilla system has also recently been upgraded, as Rosik explained, "As this product is complex, we upgraded

our standard ChillZilla design to have much more telemetry on the tank as well as the process and re-condensing unit. As the re-condensing unit is a key part to the ChillZilla liquid supply system it is critical to ensure the unit is running at its peak performance."

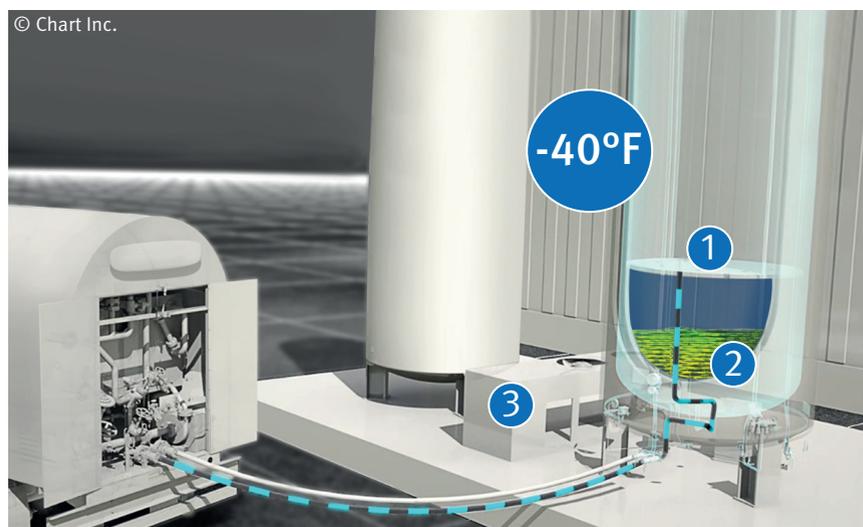
According to Chart, annual net savings for using a ChillZilla system amount to \$60,000 based on one typical trailer load of 20 tons at 250 psig at a usage rate of not less than 16 hrs/day continuous for peak efficiency (26 days per month at 16 hrs per day).

"The more expensive the CO₂ and the greater the delivered pressure of the CO₂, the greater the savings," Rosik said.

"The ChillZilla system coupled with our Python® Vacuum Insulated Pipe shows on average 15% to 20% savings in liquid CO₂ from foam jacketed tanks. This is because we are not only able to deliver much colder product, but we are able to retain that sub-zero temperature because of our Chart Vacuum Technology®."

Customers

Chart's first installation of a 50-ton ChillZilla CO₂ system was at Indianapolis-based Sutton-Garten Co, an independent industrial gas supplier in 2017. Sutton-Garten wanted to expand its dry ice pellet, spaghetti and block manufacturing. The ChillZilla system helped improve ▶



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1
BOTTOM FILL PIPED ABOVE THE
BAFFLE TO NOT INTERFERE WITH
CONDITIONED LIQUID BELOW

2
REFRIGERATION COILS
COOLS THE LIQUID CO₂ WITH
SUB-ZERO REFRIGERANT
TEMPERATURES AS LOW AS -80°F

3
HIGH-END REFRIGERATION UNIT
USED TO CIRCULATE SUB-ZERO
REFRIGERANT THROUGH LIQUID

▶ pellet production costs, as it lowers the temperature of the liquid in the tank prior to dispensing to the pellet machine for improved dry ice yield. The liquid supply system improved Sutton-Garten's dry ice yield from 3.13:1 to 1.9:1 (liquid to dry ice ratio by weight), a 39% increase, and reduced their overall dry ice production costs by 38%.

"We have seen a good increase in yield and it's definitely helped grow our business," Jake Maynard, Sales Manager at Sutton-Garten told *gasworld*.

"We're the only ones in Indiana that make fresh dry ice. Our customers have dry ice from us within 24 hours of it being made."

Memphis, TN-based nexAir, one of the largest distributors of atmospheric gases and welding supplies in the US, is another company which has utilized the ChillZilla system. On its LinkedIn page, nexAir says, "By introducing the Chart Industries ChillZilla to our process, we're using less liquid to make the same amount of product, allowing us to stay competitive in the market."

From results at a recent installation, Chart says with CO₂ pelletizing the liquid supply system can greatly reduce the time required to create pellets versus a foam tank system. For example, 1700lbs of dry ice can be made in <1hr where a foam tank system can take >1.5hrs or more.

"This means that the ChillZilla system with its super low saturated pressure can allow for the pellet machine to decrease its cycle time, ultimately increasing throughput in a single working day," Rosik said.

Rosik is confident the ChillZilla system will become an increasingly popular solution in the food industry. "Rising costs in CO₂ have had many manufacturers start to be cognizant of their current equipment to start looking at ways to be more cost effective in their process," Rosik added.

"With CO₂ prices rising each year, it'll become a necessity for manufacturers to at least evaluate the cost savings the ChillZilla system can bring."

Opportunity for Chart

The ChillZilla liquid supply system is an integral part of Chart's growing business in the food and beverage segment.

Chart CEO Jill Evanko told *gasworld*, "For our specialty markets as a whole (which includes cannabis applications, hydrogen, lasers, space exploration,

"We are definitely seeing the benefits of the ChillZilla system as we are providing a much colder product"

food & beverage), we expect over 10% growth year over year for the next three years. In some cases, it will be over 20%, depending on the application. The market size potentials are significant – so far we have commented that food & beverage is over \$500m of opportunity for us in the next few years."

In the second quarter of 2019, Chart booked a \$1.5m ChillZilla order for a new food and beverage end customer that makes beef patties for a large fast food operation.

"Typically CO₂ is used to cool the beef and sausage through a mixer," Rosik said.

"Snow" is introduced into the mixing process. The reason snow is used is because it is easily mixed into the meat as it is much finer than dry ice pellets and rice. Liquid nitrogen can then be used for a quick solid freeze so the meat portions do not stick to each other during the bagging/boxing process and removal at the restaurant."

Has Chart seen, or expecting, any uptick in purchases of the ChillZilla system due to demand to store more pork, in result of African Swine Fever?

"We are expecting that facilities will need to upgrade to larger storage on their CO₂. Our strategy is to get in front of these manufacturers and show them the potential savings to upgrade to a

ChillZilla system," Rosik said.

The ChillZilla liquid supply system is also available for liquid nitrogen, and is suited for individually quick frozen, immersion freezers and cryo-biological storage freezers.

Are people switching from the CO₂ ChillZilla to liquid nitrogen ChillZilla system? "It really depends on the product," Rosik said.

"Liquid nitrogen is ideal if you're looking to quickly deep freeze foods such as vegetables and fruits. However, liquid CO₂ is ideal for foods where you want to chill it but not necessarily deep freeze it. Typically, liquid CO₂ is ideal for foods where you're looking to get it just cold enough for extended transportation or shelf life. For example: cookies, ravioli, breads.

"The liquid nitrogen ChillZilla system is ideal for food freezing applications where pressure is critical. It is specifically designed to provide consistent outlet pressure regardless of the saturated pressure and head pressure inside of the tank. The more consistent the pressure is to the freezer, the more consistent the food throughput from full to refill cycles of the liquid nitrogen supply tank.

"Also with the extended legs and extended bottom withdrawal line, it allows for greater head pressure to feed the liquid without molecule inventory. This feature aids in achieving a consistent flow of liquid nitrogen (refrigeration content) to the application." [sw](#)



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“Chart has been a dependable partner for Sutton-Garten in building both our dry ice and CO₂ business. The ChillZilla system has helped us increase efficiencies and reduce costs for our entire dry ice production facility. It’s been a great investment.”

Pat Garten
Sutton-Garten Co.
Indianapolis, IN

Sutton-Garten turns to Chart to improve dry ice yield.

Bulk CO₂ Dry Ice Production System

The ChillZilla® bulk CO₂ Liquid Supply System for food freezing and dry ice production increases the refrigeration capacity of liquid CO₂ by as much as **24%** over traditional bulk tanks. Its internal refrigeration coil effectively lowers the saturation pressure of the liquid output without reducing the delivery pressure, yielding more dry ice.

Sutton-Garten Co. ChillZilla CO₂ Installation

- First system installed in the world
- Dry ice production in pellets, spaghetti and block
- Increased liquid to dry ice yield ratio by weight from 3.1:1 to 1.9:1
- Net savings of 38% after electricity operational costs factored in
- Net savings of \$380K per year
- Lowered production costs by 20% (not included in net savings)
- Higher quality dry ice pellets (more dense)

Upgrade today with the ChillZilla system, and improve your dry ice yield.



ChillZilla system – 50 Ton Receiver, Chiller and Python® Vacuum Insulated Pipe
Patent no. 9,939,109 B2



Learn more @
ChillZillaCO2.com

