

On a high

Chart Industries is well placed to prosper in the booming legalized cannabis market

By Nick Parkinson



The cannabis supply chain is not about to go up in smoke any time soon if you listen to the commitment and hopes Chart has for it.

“For our specialty markets as a whole (which includes cannabis applications, hydrogen, lasers, space exploration, food and beverage), we expect over 10% growth year over year for the next three years,” Jill Evanko, Chart CEO, told *gasworld*.

At the time of going to press, recreational marijuana is now legal in 11 US states for adults over 21 years old; medical marijuana is legal in 33. Canada legalized marijuana federally in October last year, then in June Illinois passed a bill that legalizes the possession and commercial sale of marijuana in the state, joining the states of Washington, Alaska, Colorado, California, Maine, Massachusetts, Oregon, Vermont, Michigan and Nevada. Mexico and US

states New Jersey and New York are expected to follow suit in 2020. Also in June, Colorado – which legalized cannabis in 2014 – surpassed the \$1bn mark in state revenue. It’s unequivocally a boom industry for Colorado, which currently has nearly 3,000 licensed cannabis businesses, and over 40,000 people licensed to work in the industry. Look for this to be repeated in other states as the cannabis markets continue to develop and grow.

Were there initially any concerns about getting involved with legalized cannabis due to whether it is socially acceptable, or attracts bad publicity?

“There are continuous and regular discussions around everything we choose to do, as we have obligations to make thoughtful decisions for all of our shareholders and team members,” Evanko told *gasworld*.

“In this market we are very conscious of being responsible and only selling where the end product is legalized.”

CBD’s potential

Marijuana is a drug that is made from the buds and leaves of the cannabis plant, and is often used as a “recreational drug”. As marijuana can also be used to treat chronic pain and other conditions, the drug is also consumed for medicinal purposes. The business of getting people high for either recreational or medicinal purposes is only part of the cannabis market. Marijuana is still banned for recreational use across much of the US and the world, and even medical access is restricted in some states and many countries. As a result, many players in the global cannabis market are turning their attention to the less regulated type of cannabis, hemp, which is a strain of

cannabis that has recently been taken off the restricted substance list (RSL) in the US due to the fact that it is low in THC (less than 0.3%).

THC is the psychoactive ingredient found in much higher percentages in marijuana. The other defining characteristic of hemp is a higher concentration of cannabidiol (CBD), a non-psychoactive chemical that is currently at the center of a wellness trend spreading throughout the US and beyond. CBD is being marketed as an all-natural way to alleviate ailments including pain, inflammation, anxiety, and insomnia. A large number of analysts predict that the annual sales of CBD could potentially be larger than those of marijuana because of the large number of products in which it can be used.

Supply chain

Much like other agricultural products, cannabis starts with growers or cultivators. These companies strive to specialize in harvesting quality cannabis, which can be done indoors or outdoors. After harvest, growers will either process their crop themselves, or pass on the product to a wholesaler who will trim, dry, and cure their plants before creating a finished product.

Sometimes, the company who handles the production will also package, brand, and sell their product to retailers. It is also common for a brand to buy finished but unbranded products from a second company and add their own branding and packaging. Supply chain varies widely from state to state due to many different regulatory issues and constantly changing legislation. Experts predict consolidation and simplification of distribution models in the coming years.

Chart products are utilized in the first two stages to include both cultivation and production. For companies that grow cannabis plants indoors, concentrations of CO₂ (carbon dioxide) are kept at levels between 900 and 1,400 parts-per-million (ppm) to improve yields and shorten the growing season. The carbon dioxide is supplied by a variety of Chart CO₂ tanks

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to include beverage Carbo Series tanks, Perma-Max™ MicroBulk CO₂ Systems, and bulk tanks.

Bob Knight, Chart’s Application Development Manager, told *gasworld*, “The Perma-Max Series of tanks was first introduced in 2016 to address a growing craft beer market and provide for a specific microbulk solution for CO₂ storage. The tanks come in storage sizes of 2,200, 3,300, 4,400, 6,000 and 12,000 pounds. Improvements included much faster fill times, CO₂ specific components, and higher flow rates. They are basically an extension of our popular Carbo-Max® Bulk CO₂ System tanks with capacities up to 1,000 pounds of CO₂. For even larger users, Chart offers CO₂ bulk tanks in standard sizes of 6, 14, 30, and 50 ton.”

There are also competing technologies where CO₂ is generated from the combustion of natural gas. In the production stage, Chart products are used for both the extraction of oils and for packaging of the product. Extraction is performed using several different technologies and is dependent on what ingredients of the cannabis plant need to be removed. Current methods include supercritical CO₂, hydrocarbon, or ethanol. Chart dosers are used in packaging to extend

the shelf life of the cannabis flower and allow for extended distribution distances.

Chart manufactures equipment that can be used to feed most extractors that use supercritical CO₂ for extraction. The supercritical CO₂ extraction process creates phase changes in carbon dioxide utilizing temperature and pressure. In the supercritical state, CO₂ makes an excellent “tunable solvent” for creating a multitude of end products by controlling temperature and pressure to drop out various components of the plant material. In addition, there is no need for further processing to drop out the solvents, which is an additional requirement when using butane or ethanol.

The Perma-Max 1400 XHP System has a MAWP of 800 psig and can provide liquid CO₂ at operating pressures up to 750 psig. This is the minimum pressure that numerous extraction machines require to feed the on-board pump that will then boost the CO₂ pressures into the supercritical regions above 1,100 psig. Many of these processes require CO₂ ▶



© Chart | Perma-Max™ 1400 XHP MicroBulk CO₂ System



► pressures in excess of 2,500 psig.

“We first designed the Perma-Max 1400 tank at the request of a customer who needed a source of high pressure liquid CO₂ for special effects,” Knight said. “About that same time, we started getting requests for these tanks from extractor manufacturers and gas suppliers. This opened our eyes to the cannabis market.”

The Perma-Max 1400 XHP tank, which is made in Ball Ground, Georgia, replaces the need for high pressure liquid CO₂ cylinders that are supplied in both 50 and 100 pound sizes. As the CO₂ extracting business continues to grow, the Perma-Max 1400 XHP tank offers a lot of advantages to include safety, dollar savings on losses incurred from returning residual product left in the high pressure cylinders, and labor savings from eliminating the need to constantly move and change out cylinders.

The Perma-Max 1400 tank continues to perform well for Chart. “We continue to see inbound inquiries and demand from the major gas suppliers, distributors, and end-use customers for our Perma-Max 1400 XHP tank as well as dosers for

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packaging,” Evanko said.

Applications

Chart is involved throughout the cannabis supply chain. “A lot of the Chart Carbo-Max and Perma-Max tanks are being used for CO₂ enrichment in the grow houses,” Knight told *gasworld*.

“We fit into the cannabis supply chain in several areas. First of all, there’s an enrichment application. Anywhere they are raising cannabis in greenhouses requires CO₂ enrichment and a lot of the major gas suppliers and distributors, especially in Canada, have been selling our storage tanks into this market for at least 2-3 years. Extracting through the use of supercritical CO₂ is also a growing market, especially for the production of CBD oils

from hemp, which has now been legalized in most states.

“Finally, we are also selling Chart liquid nitrogen dosers, typically used in bottling and canning operations, into the cannabis industry for packaging product into small containers. Basically, a small drop of liquid nitrogen is dosed into the container before it is sealed. This not only provides a positive pressure in the container, but it displaces the oxygen, thus increasing shelf life of the product.”

Knight also mentioned nitrogen freezing applications for processing cannabis that Chart currently does not have an equipment offering for.

“Cannabis is a relatively new and growing industry,” Knight said.

“There are new applications that continue to be developed as the industry grows and matures. Chart is an equipment manufacturer, and we want to be the first to recognize the need for specialized equipment and then turn the design requirements over to our new product development group in order to address the need and get equipment into the field as early as possible.”

Speaking about Chart’s status in the legalized cannabis market, Evanko told *gasworld*, “One of the unique aspects of Chart is that we have products for these applications already developed, and being first to market in some cases is an advantage. Additionally, our engineering product development, and having a dedicated team to these markets helps us understand what the customers desire and then we can develop it and offer it to them to solve a challenge they may have.”

Growing profits

Big LNG (export terminal builds) is still Chart’s fastest growing segment based on where the company is in the cycle. The company has a breadth of projects, particularly with the global LNG infrastructure build-out. In backlog, Venture Global’s Calcasieu Pass LNG export terminal project is Chart’s largest, for \$135m. Chart also believes food and beverage is over \$500m of opportunity for them in the next few years.

But the cannabis supply chain is an area of particular interest for the US company, as Evanko explained, “While specialty markets are currently just under 10% of our total revenue, with continued innovation and further North American legalization of cannabis, we

expect this aspect of our D&S West business to grow over 10% in each of the next three years.”

Chart’s role in the cannabis sector is set to expand with the introduction of its CO₂ Trifecta® Gas Supply System, which will be capable of supplying a continuous flow of liquid CO₂ to

extractors at pressures between 750-950 psig for large extracting operations. This new Trifecta unit is scheduled to launch in the fourth quarter of 2019.

New product

“One of the big things we are working on right now that will have the biggest impact for Chart in the cannabis extracting market is the CO₂ Trifecta® Gas Supply System,” Knight said.

“This unit will be an extension of the current Trifecta line that has been primarily used for many years to provide high pressure nitrogen for lasers in the metal fabrication industry. The beauty of the new CO₂ Trifecta unit is that it will have a MAWP of 1000 psig and provide a continuous flow of high pressure CO₂.”

“This new Trifecta unit will allow customers to add significant extractor capacity with an economical solution for a source of high pressure CO₂. We are hoping it will be a key piece of equipment for the extractor manufacturers and processors. Currently, if more capacity is needed, racks of high pressure bottles are manifolded together and constantly changed out as product is consumed.”

“What the customers are asking for, and the Trifecta unit will provide, is a constant flow of high pressure CO₂ being fed by the appropriately sized bulk tank. With the addition of electric process vaporizers, the Trifecta unit can also provide high pressure gaseous CO₂.”

“Unlike other means of supply, this system requires no interruption in service while deliveries are being made to the bulk tank. In addition, this solution has no need for rotating equipment such as pumps and compressors, allowing for much lower annual maintenance costs and downtime.”

Knight is confident that CO₂ will maintain its key role in the cannabis production process. “The CBD market from now through 2022 is looking toward a big growth rate, and it requires the use of extraction equipment,” Knight said.

“Although there are other less expensive means of extraction using both butane, ethanol and other new emerging

technologies, CO₂ offers some unique advantages. The biggest advantage of CO₂ is safety. Unlike the other means of extracting, CO₂ is not flammable, nor does it leave any residual solvent that requires further processing for removal.”

Knight is excited about the future opportunities within the legalized cannabis market for Chart, but warned it could put more pressure on CO₂ supply.

Knight concluded, “We are excited about the opportunities for equipment sales as the cannabis industry continues to grow, and Chart is well positioned to provide both existing products and new products into this expanding market. The one wild card as the cannabis industry continues to grow, is the continued reliability of the supply of CO₂. In my opinion, CO₂ supply can become an issue.”

“As more and more high volume CO₂ applications come on line, the entire CO₂ supply chain will be stressed, especially in areas where production capacity is already limited. I am confident that the major gas suppliers recognize this and continue to look for additional sources of CO₂ to ensure that sufficient CO₂ will be available for years to come.” [GW](#)

© Chart | Prototype currently being built for the new Trifecta® CO₂ Gas Supply System



© Chart | The Carbo-Max® 750 Bulk CO₂ System

