



Changing CO2 demands in the food business

By [Sam A. Rushing](#) on Mar 05, 2014

The US carbon dioxide (CO₂) industry maintains a heavy and probably predominant use over most other applications for the product in the food industry at large, particularly in large manufacturing areas and places such as the Great Plains, Midwest, and Southeast and Southwest.

These regions are home to major food processors such as the poultry and beef operations of Tyson Foods, Cargill Fresh Meats and other major plants which process from the live animal to the individually quick frozen (IQF) food product and frozen specialties, often made ready for today's families who have limited time to prepare meals.

Most of the CO₂ applications for food processing have been essentially the same over time, often representing cooling, crust freezing and through to core freezing, which in many ways has remained the same. However, the equipment for these applications is upgraded over time, often by trial and error; largely nuances in the application hardware. Often this is a matter of improved valves, electronic controls, and process flow design.

The development goals, of course, are to increase efficiency, speed, and ease of operation – and yield improved efficiency and value.

Packaging is also key to a potential growing market for CO₂, including MAP (modified atmosphere packaging) and packaging materials preparation via CO₂ lasers. Further, on CO₂ storage vessels and CO₂ application technology, the use of improved refrigerants may lower the temperature of CO₂ in the storage vessel which in turn raises the cooling capabilities of CO₂; this

represents better refrigeration of the food product and greater efficiency as a refrigerant.

An ever evolving industry

It is interesting to note the status of food freezing and refrigeration in the developing world.

During my recent work in a developing country, larger meat processors had no current day CO2 applications. From stunning to MAP, and chilling to snow and freezing – none of this exists due to issues surrounding the dissemination of knowledge of applications to the meat industry, as well as a lack of marketing and promotion of available technologies.

Further, logical applications exist in many of these markets with current-day labour intensive and time consuming means of achieving an end; such as manually pushing fully loaded carts and dollies with formed and fabricated product into the slow mechanical refrigeration units.

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The industries are often ripe for implementation of the processes as well. Quite often these plants have a limited number of staff who formerly worked in the developed world, and are familiar with some of the technologies. In any event, such companies and suppliers are following an ever-growing trend in improved automation, via examining and working on the implementation of cryogenic freezing, CO2 snow applications in blending, and perhaps stunning livestock and MAP applications.

Since many of today's business opportunities exist in the so-called BRICS countries, the trend to see more growth via CO2 applications in the food processing sector will continue to expand at a rate beyond that of the developed world. This experience tells me, on a global scale, that the CO2 industry in the food sector has a long way to go in terms of spreading the value of the wide variety of applications available. These are good growth opportunities for all sizes of gas manufacturer and equipment provider in these markets, while there is also a need for both major and independent gas suppliers to be aware of the wide range of applications available – and how to implement these to work optimally.

Given that much of the CO2-related food processing sector is very mature, such as IQF freezers, and dry ice production equipment, beyond following new possible applications for the product in this sector, it is also essential to maximise on developing greater efficiency. In the end this represents more gas sales and greater customer recognition, and is applicable to all levels of gas manufacturers and suppliers.

Developing trends and potential widespread applications for CO2 in the food sector include taking another look at the basics surrounding CO2 refrigeration capabilities from an applications point of view, as well as with storage operations. I am thinking of taking another look at improved refrigerants in storage tank refrigeration that lower the liquid CO2 temperature to perhaps -45°C, which represents increasing the CO2 cooling capacity – which represents improved cooling and freezing capabilities. Of course this is for those systems which have refrigeration systems associated with storage vessels or possible in-line mechanical cooling. However, many of today's storage vessels are vacuum systems, without refrigeration systems.

Another interesting application which has the potential to grow in the food industry is in the food packaging industry, which is the use of sealed compact CO2 lasers. These lasers are involved in the so-called converting of paper, plastic film and other flexible materials into pre-formed packaging. More specifically, converting involves cutting, scoring and micro-perforating these materials. The fine-tuned process of scoring, or cutting to a finite depth of the packaging material, makes for so-called 'easy open' packages.

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Further, the manufacturers of these laser devices indicate that the cost is very competitive with traditional methods of 'tooling' these perforations, as well as offering greater precision.



Source: Messer Group

This is interesting as a food-related development for small laser systems, a development in a mature laser market, and is relevant to food processors requiring expert packaging materials which the consumer can readily handle; again facilitating so-called 'convenience foods'. In the end, this laser application is interesting and useful for the gas suppliers to expand their markets, whether the packaging scoring occurs in the food plant or in a packaging materials manufacturing facility.

Whether the form of CO₂ is a liquid, for IQF applications in a freezer, or as 'snow' for a blending or grinding application, or as a gaseous application, incremental improvements in efficiency via changes in freezer design and controls and even the use of a colder liquid can achieve a better application for the markets at large.

When thinking of a gaseous CO₂ product, everything from laser applications to MAP and pneumatic uses throughout the plant, all have great benefits for the food product, the plant, the consumer, and the gas supplier. In the end, even minor tweaks can modify a system enough to enjoy both greater efficiency and bottom line.



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.