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Expanding the narrow window of profitability for the food & beverage sector

The temporary shutdown of a manufacturing plant to improve equipment and processes require advanced planning and coordination to achieve the desired engineering and business objectives in a cost-efficient manner

Halting production, even for a planned shutdown, results in decreased short-term revenue, but planned shutdowns targeting cooling, chilling and dehumidification systems are nevertheless undertaken because ultimately, they are good for business.

The objective is to improve overall plant performance while also adjusting to market driven changes. Indeed, the way the food and beverage industry processes and packages food is constantly changing. Along with these changes, reliable electrical power to support cooling, freezing and humidity control is more critical than ever for the industry, which is why they must carefully consider who they will partner with when planning improvements to temperature and humidity control assets.

Food and beverages is one of the largest manufacturing sectors and one of the top five consumers of fuels and power in North American manufacturing, requiring significant quantities of thermal energy to convert raw materials to useful products.

This industry sector is highly diversified and produces thousands of different products. However, the efficiency of the processes and equipment used to produce foods and beverages is often constrained by thermodynamic limitations, depending on the process facility. These facilities range from small plants to large industrial units, and most plants produce more than one product. Major NAICS code subsectors for food and beverage plants are shown in the following table:

311	Food manufacturing
3112	Grain and oilseed milling
311221	Wet corn milling
31131	Sugar manufacturing
3114	Fruit and vegetable preserving and specialty foods
3115	Dairy products
3116	Animal slaughtering and processing
3121	Beverages

COMPLEXITY

Throughout these subsectors, restarting serviced and upgraded equipment is the most critical and time-consuming of all the turnaround phases. Contributing to the complexity is the need to prepare for how the temporary equipment, such as chillers, and support systems will be removed while the facility equipment that was worked on is returned to service. In many of these facilities, whether it involves packaging meat or deep freezing 2-ton containers of processed spinach to -20 ˚F, it is necessary to start up systems in a specific sequence. In addition, the maintenance and cleaning procedures require certain utilities (power, steam, etc.) to be operational for the cleaning processes to occur. Any confusion or breakdown in procedures has a domino effect that puts the schedule at risk.

High precision temperature control in food and beverage manufacturing needs to sustain productivity, ensuring that the product reaches each stage of the production process in precise and repeatable conditions. Adherence to precise temperature control coincides with increasing levels of sophistication and capital outlay. For example, in certain food and beverage processes, heat is an important part of the fermentation process, but so is timing. If heat enters the process at the wrong time, or is applied for too long, undesired flavors develop. This is just one example of how an industry typically requires a variety of cooling and heating modalities to reduce bacterial load at one end of the thermal optimization spectrum, to rapid freezing of pre-cooked frozen foods at the other end of the spectrum. This is particularly poignant during periods of high ambient temperatures occurring during peak operations, such as during the summer months.

EQUIPMENT MATTERS

Many food and beverage companies are steered by the seasons, so when peak production time only lasts three months, it's hard to justify paying out for generators, chillers and dryers that aren't needed in the off-season. Against this backdrop, a wide range of options exist when it comes to selecting the best heat exchange equipment. For example, Cérélia is a leading French pie dough manufacturer. When a flaw in the facility's heat exchanger halted production, the company had to act fast, so Aggreko was called in to assess the problem.

The carbon dioxide (CO_2) condensation loop had failed on the ammonia (NH_3) side of the high-pressure CO_2 /NH_3 loop. Only two of the three coils in the loop were being cooled. The urgency was to quickly work out a way to cool all three coils, so the entire CO_2 condensation loop was replaced with an 800 kW chiller and heat exchanger, using a glycol solution to cool the CO_2.

The system reached a very chilly minus 20˚C. Cérélia rented the cooling system for five months, providing plenty of time to test Aggreko's model and assess the optimum operating ranges for a permanent system. The pie dough facility was quickly up and running again. For Cérélia, the swift response ensured that minimal money was lost during the halt in production. The rental model also gave them the chance to test and validate the system before committing to a permanent investment.

SECURING FOOD STORAGE

In another application, Grace Foods, one of Europe's leading suppliers of world foods, was running out of space in its cold storage facility as the business rapidly expanded. The company decided to relocate the freezer section of the warehouse to a larger area on the company's 120,000-square-foot site. They needed to move the existing chillers, compressors and pipework to the new area before 10,000 pounds of frozen food could be moved across. This relocation was slated to take about four weeks. The problem was that the frozen food at -25 ˚C ambient temp couldn't be allowed to thaw during the month-long move. A temporary chiller was needed, which is when Aggreko was called in to help. Two 750 kW chillers and two 500 kVA generators (one was for backup) were installed outside the old cold storage facility, with cooling and power fed into eight low-temperature air handler units in the cold room. And, because there were tons of food at stake in this project, APS specialist engineers were on call 24/7 to ensure that any issues were resolved fast.

With Aggreko's design feeding frigid air into the cold room, Grace Foods kept its tens of thousands of pounds of frozen food at a stable temperature. Nothing thawed; no food was ruined. Money was saved. Renting the temporary chillers and generators proved cost-effective and hassle-free for Grace Foods, too. That meant they could focus on fitting out the new freezer facility to cope with the growing demands of their business.

COOLING HIGH MARGINS HARVESTS

The value of a bountiful sugar beet could be extended further if the crop could be kept near-freezing until late spring. Extended seasonal freezing reduces waste caused by germination, infestation and other seasonal threats. After a couple of seasons of listening to the client's seasonal needs and demonstrating the value of freezing beets into late spring, they finally agreed to a test study. With demand increasing into the summer, they could foresee a higher margin of return-per-beet.

Only one of their three large sugar beet storage sheds were to be initially tested. They agreed to move forward with proving out project economics. If successful, all three sheds would be cooled/frozen in the future. However, in a turn of events immediately before chiller installation of the initial test shed, the client requested cooling of the second shed ASAP.

A good harvest and due diligence is why this producer decided to take on the risk of cooling the second shed for the test study.

By the end of February, two sheds were being cooled through Aggreko YCIV (ARM enabled) York 200T Chillers and 10 ton low temperate Aggreko / Krack AHUs. The low temperate AHUs provide 10 ˚F air through pillow tarps that lay on the beet piles with dimensions at roughly 800'L x 180' W x 35' H. With a good harvest, growers face significant challenges protecting crops from weeds, insects, diseases and the environment. It was under these circumstances that the client lost one of their outside piles to an infestation, resulting in a multi-million-dollar loss. Because insurance was involved, the underwriter was asked if they'd be willing to finance cooling down the third and final shed as part of a reimbursement for revenue loss associated with the infested pile. The insurer agreed but due to the nature and timing of this request, it wasn't feasible to get another large pillow tarp made and installed. Aggreko agreed to provide a similar setup, but with additional AHUs. In this instance, the shed's headspace was cooled to 32 ˚F with commissioning spanning across three days.

Rental revenue was a premium on these projects, which is why a contractual agreement was seen to be beneficial for both parties, based on an as-needed basis. This is because cooling beet sheds is so heavily influenced by the harvest going into the new year. Historically, no cooling is required during those years where harvests have been terrible.

CAPITAL AVOIDANCE

As revealed in these bespoke cases, planning out the need for cooling systems and related engineering support is the preferred route for food and beverage manufacturers. However, due to the realities of seasonal conditions, this can't always be the case. In fact, even well-planned cooling and chilling projects can encounter unexpected or supplemented requirements that need to be fulfilled because of changing market dynamics and environmental and weather-related events.

According to Brigit Mc Pherson, Aggreko sales manager for all of Texas and Oklahoma, "Even if there's no immediate need, it's inevitable that a food or beverage manufacturer will need to upgrade its chillers and related cooling systems or pause to maintain the equipment at some point." Moreover, a planned turnaround to achieve improvements doesn't require having to shut down the entire plant if redundant temporary chillers and other thermal assets are available.

When the time comes to switch off part or all the facility's power or cooling, temporary generators and chillers can be deployed using first engineering principles to keep production running.