TGW FREEZER
WAREHOUSE
AUTOMATION
How a robot/shuttle-based automated storage and retrieval system for your frozen grocery distribution facility delivers both operational and financial benefits.
INTRODUCTION

The U.S. frozen foods market is built on delivering consumer convenience. With advantages ranging from ease and speed of frozen food preparation, to healthier eating trends, to easier portion control through pre-packaged, single-serve frozen novelty treats, consumers appreciate the variety of options they have across all categories. Those options and choices will only continue to grow as both established manufacturers and new players introduce more products and organic, natural and meatless offerings.

According to a report from Grand View Research, the U.S. frozen food market was nearly $52 billion in 2015, and is projected to grow to approximately $73 billion by 2024. The report, published in September 2016, attributes this growth to:

“Busy lifestyle, coupled with shifting preferences among consumers towards ready to cook meals owing to convenience and hygiene, is expected to remain a key driving factor for the overall industry. Compared to the fresh ones, these products contain maximum vitamins and minerals... because freezing preserves the products for extended periods without any preservatives and deters against any microbial growth that causes food spoilage.”

In addition to a profusion of stock keeping units (SKUs) and overall volume, there’s the current expansion of grocery shopping choices: in-store small and large formats, online order/at store pick up, home delivery, and more. That means retailers and distributors must deal with more frequent, smaller, split-case and varied orders both to stores and direct to consumers than ever before. But in an era where warehousing labor is already hard to find, hiring and retaining people to pick, pack and fill such complex orders manually inside a freezer is a particular challenge.

Further, freezer space is the most expensive space in logistics. Achieving and maintaining temperatures as low as -22 degrees Fahrenheit (-30 degrees Celsius) requires tremendous amounts of energy. And U.S. energy costs are expected to rise. According to the U.S. Energy Information Administration, commercial and industrial electricity costs are anticipated to increase by 8.3% and 11% respectively by 2030, while transportation costs will jump 35.7% in the same timeframe due to rising diesel fuel prices, as shown in the table below.²

Complicating matters, building and energy consumption standards are becoming more and more strict. Manual operations attempting to gain more space within the freezer can’t extend building height beyond the limitations of forklift reach, yet horizontal expansion may not be possible if a facility is landlocked. Further, the larger the footprint of a freezer, the more it costs to cool it.

While most ambient distribution center operators facing similar challenges (SKU proliferation, labor shortages, energy efficiency concerns, space constraints) have increasingly considered automated systems, freezer operators have not. That is frequently due to the two-fold misconception that automation cannot work in extreme cold environments, or must be extensively (and expensively) customized in order to do so.
In actuality, selecting, implementing and cost justifying freezer warehouse automation is not only possible, it’s been done—both in greenfield installations and brownfield facility retrofits, end-to-end or one area at a time. This white paper examines the key equipment and supplier characteristics to look for, as well as explains three ways to cost-justify the investment in the right automated material handling solution for a frozen product distribution application.

The Ideal Freezer Automation Solution: Built on Standardized Equipment

The ideal supplier of automated material handling equipment for a freezer facility is one that manufactures all of its components, products and systems to a freezer standard. In other words, all of the equipment offerings are rated to deliver high performance in any temperature, from -22° to 140° Fahrenheit (-30° to 40° Celsius).

The material handling components themselves should feature modular construction, enabling them to support a complete, end-to-end, fully automated system, or improve operations within a specific area.

They should also be easily adjusted with just a few minor modifications to adapt to an extremely cold environment—similar to putting snow tires on a car in winter. By incorporating features such as cables, seals, energy supply and lubricants specifically designed for the harsh freezer environment, pallet and case handling can be done inside the freezer without protective heating shrouds. That eliminates conveyors and ice build-up on the products while minimizing the handling of frozen goods by workers in sub-zero temperatures.
Additionally, the pre-designed modularity of such a solution means its components can be configured, commissioned and installed faster, with shorter lead times, for a quicker return on investment. Individual components should be part of a complete package of equipment that facilitates full, end-to-end automation of all frozen product handing, including:

- Inbound receiving, conveyance and crane-based storage of full pallets over several levels as reserve storage or for cross-docking
- Automated de-palletizing and routing of full cases into a shuttle-based storage and retrieval system for maximum density and throughput rates of more than 5,000 units per hour
- Fully automated order picking and sequencing of cases by the shuttle, combined with goods-to-person delivery of totes from the shuttle for manual split case order picking
- Automatic palletizing of volume-optimised, store-friendly mixed case pallet loads are built to pre-defined packing patterns
- Buffered consolidation prior to outbound shipping
Equipment modularity contributes to a total freezer handling system’s design flexibility. That’s because it allows multiple, standardized base components to be configured in a variety of ways that easily accommodate different SKU velocities and quantities, order types or frequencies, and seasonal peaks. It also enables the vast majority of products to be stored in a highly dense, compact footprint building reaching maximum heights of 70 feet.

Likewise, the same components that enable ice cream to be maintained in storage areas held at -20° Fahrenheit (-29° Celsius) — and other frozen foods at -10° Fahrenheit (-23° Celsius) — for product integrity, can also be used in areas kept at 23° Fahrenheit (-5° Celsius) for operations that implement one or more manual or automated processes, such as de-palletizing, order picking and/or palletizing.

Utilizing pre-engineered base components engineered to freezer standards supports system scalability, allowing it to be expanded as necessary to accommodate future changes while reducing the initial investment. Further, the ideal freezer automation system is intuitive to operate and simple to adjust in order to optimize its function to match available staffing and required throughput levels.

Above all, the ideal freezer automation solution delivers three key areas of savings throughout its lifespan that minimize total cost of ownership and help cost-justify the initial capital investment.
Whether the automated freezer solution is installed throughout an entire facility or just within a specific area of the process, cost-justification of the investment can be found in three key ways: improved performance and safety, lower initial investment costs, and reduced operational costs:

### Improved Performance and Safety
The addition of any degree of automation will improve the overall throughput and productivity of an operation simply by increasing the speed and accuracy of the product handling. That’s because, by installing automation within the coldest storage areas, personnel no longer has to work inside the freezer to put away or pick product. Instead, the automation runs without human intervention, sending broken cases out a small opening to pickers stationed in warmer areas for goods-to-person picking for single-item e-commerce fulfilment. It can also send out full cases for manual or automated building of mixed pallet loads for retail store replenishment. Regardless of the type of orders being fulfilled, working outside the freezer reduces the physical demands on workers, increasing their comfort, ergonomics and productivity—and allowing them to pick more products in less time.

### Lower Initial Investment Costs
Utilizing automation within freezer storage areas means they can be constructed with tall, rack-supported roofs. This minimizes the overall footprint of the facility while increasing cubic density. Further, a small footprint means a small roof; since the roof is one of the places in an operation where air can escape, it pays to keep that area as small as possible. And, a fully automated freezer storage area eliminates the need for operators and their protective gear, forklifts (particularly ones that must be custom equipped for cold operations) and overhead lighting.
Additionally, automating a freezer facility enables the installation of an oxygen reduction fire suppression system within the storage and picking areas, which is more cost effective than traditional, water-based sprinklers. Fires do occur in cold storage areas, and can be more difficult to suppress. That’s because access to the freezer area is often limited, the space is often insulated with a plastic-based foam, and water-based sprinklers and hoses can overload the rack due to freezing. Instead, installing oxygen reduction fire suppression system that lowers oxygen levels to approximately 15% within the structure is a more affordable and effective solution.

**Reduced Operational Costs**

By implementing an automated system within a freezer, operational costs are minimized in multiple ways.

First, energy use is reduced, as product (and air) ingress and egress can be more tightly controlled through a small, automatically sealed opening—as opposed to a door sized to accommodate forklift access. This minimizes the entry of warmer outside air, and the escape of colder inside air.

Additionally, the compact construction, minimized footprint and higher vertical height of an automated freezer storage and retrieval system increases storage volume and density. That enables more products to be stored within a smaller facility footprint and greater energy efficiency—a key contributor to lowering total cost of ownership. The reduced footprint and increased cube utilization also maintains more consistent temperatures throughout the space, further reducing the amount of energy needed to keep it cool. And the smaller footprint enables better circulation of cold air within the area.

Further, simply by eliminating heat load factors such as operators, forklifts and lighting, automation reduces the amount of energy that must be expended in order to compensate for their presence within the freezer. Likewise, removing forklifts and operators from the freezer storage area frees them up for use in other areas of the facility and increased productivity in manual handling areas.

**Conclusion**

As the first automated logistics solution provider to offer an automated freezer handling system based on standardized products and components, TGW Logistics Group meets the challenges faced by cold and freezer chain warehouses and distribution centers while delivering the lowest total cost of ownership. Every TGW system, component and product can be used in temperatures from 104° to -22° Fahrenheit (40° to -30° Celsius).

The centerpiece of TGW’s automated freezer warehouse systems is the all-wheel-drive Stingray Shuttle automated storage and retrieval system. Flexible and scalable, the shuttle system can be designed to store totes, trays, cartons or other goods of varying sizes in single-, double- or multi-deep configurations. Equipped with a variable-load handling device, the system can store goods measuring 6 x 8 to 35 x 31 inches and weighing up to 110 pounds. For ease of maintenance and repairs, Stingray Shuttles can be removed from their aisles via a special lift, then serviced in an area with more ambient temperatures for faster and more reliable work.
For a completely automated frozen food handling system, a Stingray Shuttle installation can be enhanced with TGW’s Splitex de-palletizer and AutoStax palletizer. Like all of TGW’s automation equipment, these units can be integrated in extreme temperature applications with minor modifications. Their installation eliminates the strains and fatigue associated with manually unloading frozen cases for singulation into the automated storage system, and the complexities associated with building store-specific pallet loads for retail replenishment.

COOP’S FULLY AUTOMATIC, ENERGY EFFICIENT FREEZER WAREHOUSE

Click here to read about the fully automatic, energy-efficient freezer warehouse designed, engineered and installed by TGW for Swiss retail grocer Coop in Schafisheim, Switzerland as part of an extensive, multi-facility distribution center for store replenishment.

For more information about how an automated freezer warehouse can benefit your operations, please contact Andy Lockhart, Vice President of Integrated Systems Sales at TGW Systems, Inc. by calling 231.798.4547 or by email: andy.lockhart@tgw-group.com
TGW Logistics Group is a global leading systems provider of highly dynamic, automated and turnkey logistics solutions. Since 1969 the company has been implementing different internal logistics solutions, from small material handling applications to complex logistics centers.

With about 2,800 employees worldwide by now, the Group implements logistics solutions for leading companies in various industries. In the business year 2016/17, the TGW Logistics Group generated sales revenues of more than $670 million (more than 600 million Euros).