
FOOD PROCESSING

SPECIAL REPORT

Low Temps, High Performance

How Warehouse Transport Equipment Deals with Cold Storage



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■ To move products around refrigerated and frozen warehouses efficiently, you need to pay attention to some cold facts. And often some icy, drippy, clumsy ones too.

The cold chain is an enormous and crucial part of America's food supply. According to one estimate, up to 70 percent of all the food Americans consume pass through cold storage at some point. This includes:

- Frozen food, with U.S. sales of about \$22 billion. According to market-research firm Packaged Facts, about 75 percent of American households buy frozen vegetables, and 60 percent have both frozen pizza and potatoes.
- Fresh food, which includes categories like produce, dairy and deli. Unlike the frozen food market, fresh food is growing rapidly; according to an estimate from NPD Group, consumers ages 39 and younger have increased their consumption of fresh food by 23 percent from a decade ago.
- Foods that are retailed at ambient temperature but require cold storage. Fresh peanuts, for instance, are typically warehoused at between 31° and 43°F.

Cold and especially frozen storage presents many more challenges than ambient storage. Efficiency, always important in any warehouse, becomes crucial in cold and frozen



Toyota offers galvanized options, like those on this end-controlled rider, to protect equipment in cold storage operations and other hard-working environments.

storage because food can go bad if exposed to improper temperatures for too long. Frozen food often has a higher value than canned or other ambient food, either intrinsically (like many types of meat and seafood) or because it involves complex processing and assembly (like pizza and frozen meals). In addition, it often tends to be fragile, making accuracy in pickup and loading especially important.

Cold storage makes special demands on personnel and equipment as well. Both machines and people function less than optimally in low temperatures, making it important that both adapt effectively. This extends to the material-handling equipment used to move around pallets of products, including sit-down and stand-up

forklifts, reach trucks, pallet jacks and stackers.

CHILLED BATTERIES

Perhaps the biggest enhancement frozen storage demands of transportation equipment is on the batteries. As anyone who has ever tried to start a car in a Northern winter knows, you can't always get your vehicle going. Sustained cold reduces battery run time by half or more.

Frozen warehouses traditionally have had two options to adapt to shorter battery run time. One is to assign two or more batteries to a single truck, rotating them so that one is always charging while another is powering the truck. This is common for frozen warehouses that run for 16 or 24 hours a day.

The other is to increase the battery size, for longer life and more reliable operation.

But there are drawbacks to both those strategies, according to Martin Brenneman, electric product planning specialist with Toyota Material Handling USA. Rotating several batteries for a single truck increases both capital and ongoing labor costs. And increasing the battery size usually means increasing the width of the truck's chassis, which makes it harder to get into tight spaces. In cold and frozen warehouses, every cubic inch of storage space is needed.

"It's a cascade or a domino effect," Brenneman says. "You make the truck bigger, which means the aisles have to be bigger, which means less space for racking,

so now you start losing storage space. Everybody's trying to get the maximum storage in the smallest square footage, and now you have competing ideals there. You're trying to get maximum run time but you're trying to get maximum storage, and those two ideals tend to fight each other."

A third alternative is emerging: lithium-ion batteries. Although they have been around for years, their use to power forklifts and other material handling equipment is fairly new. So far, their use is limited to relatively few early adopters, Brenneman says, but those few are enthusiastic. "All the reports we're getting back, they're saying, 'Wow, this thing works so much better.'"

Lithium-ion batteries recharge faster, hold a charge longer and

last longer than standard lead-acid batteries, making them better able to withstand frozen environments. They're also maintenance-free; by contrast, almost all lead-acid batteries have cells whose water levels must be monitored and maintained. Navitas Systems, a lithium-ion battery provider based in Woodridge, Ill., estimates that its batteries can be fully charged in 60 minutes, a significant increase over the charging proficiency of lead-acid batteries. Navitas also claims that its lithium batteries run 40 percent longer in cold operations.

"It is a game-changer, specifically for cold storage in food processing," says Dave Morzella, warehouse product territory manager with Toyota Material Handling USA. "It's a revolutionary game-changer for material handling in general, but probably even more so for cold storage."

Price is the biggest obstacle: Lithium-ion batteries cost roughly three times as much as lead-acid ones. This premium means the return on investment for lithium-ion is quickest for facilities that run around the clock.

"Right now those early adopters were the ones using three batteries per truck because they work 24/7," Brenneman says. "So if they can buy lithium-ion with a fast charge and only buy one battery per truck, to them it's a wash, so it's easier to take that risk and try that new



The Toyota electric walkie pallet jack is a popular model used in cold storage operations because of its maneuverability in tight spaces.



technology. So far, those who have used it seem to be happy with it.”

WET WOES

The vehicle’s motor and other electronic components also face challenges in cold storage. In this case, the challenge comes not so much from low temperatures but from the condensation that arises during operations.

“An electric motor doesn’t tend to be affected if it gets cold,” Brenneman says. “What it doesn’t tolerate well is getting wet.”

When a vehicle passes from a low-temperature, low-moisture storage space into an area of higher temperature and humidity, condensation can form on the vehicle’s metal surfaces, and the moisture

Electric forklifts with specialized attachments often find their way into cold storage sites as a standard for high volume operations.

is potentially harmful. This can happen in a docking area kept at or near ambient temperature because it’s partially open to the outside. It also can occur in warehouses that store both frozen and refrigerated goods in separate areas.

“You’ll see a forklift come out of a freezer into a cooler area, but it’s not as cold as the freezer, and all of a sudden the whole truck is glistening,” Brenneman says. “And what you see on the outside is also happening underneath the cover panels.”

There are various ways to handle condensation, depending on what is being protected. A connection can be completely sealed or coated with dielectric (non-conductive)

grease. If a component gives off heat that needs to dissipate, it can be shielded with a drip or splash guard that allows air to move around it.

Tires are another component that requires special attention. Cold temperatures don’t make much difference to tires directly, but floor conditions do. These can vary considerably between cold-storage plants — or even within them.

Rolling over ice spots, going from a wet to a dry floor, or operating on a concrete floor designed with a rough surface for better traction are all things that can put different demands on forklift tires, Brenneman says. A good supplier

should be willing to match the tires to the application.

“Our dealers know that applications like cold storage are like snowflakes: No two are alike,” Brenneman says. “They follow an important Toyota company value: ‘Don’t use a rule of thumb. Go and look, find out what the solution is for that customer.’”

especially vulnerable to corrosion, like brined products such as pickles and mozzarella cheese, or meats whose residue requires wash-downs with harsh cleaning chemicals. Even the air in certain locations can cause corrosion.

“If you’re handling packaged fish down by a dock next to a salty breeze, it doesn’t have to be

HARD AS ICE

The operator’s ability to operate in a cold environment is just as important as the truck’s. Working in a freezer is one of the toughest jobs in the food business — so tough that exposure must be limited.

“Typically, they’re going in for 20 minutes, doing their work, and they’re coming out on a rotation,” Morzella says. “It’s challenging to even find people to work in that environment. It’s a special breed. It’s like finding someone who is willing to go up and wash windows on a high-rise building.”

Workers must be bundled up and wear thick gloves, which present challenges for controlling the machinery. A typical forklift will have a button at the top of the control handle to make the forks shift and tilt. This button can be hard to control properly when wearing gloves. To replace this common setup, Toyota offers a raised, pyramid-shaped fork control button that’s in effect a miniature joystick, easily manipulated by a gloved thumb.

For applications where truck operators are expected to spend long stretches in freezers, an enclosed and heated cabin is an option. For an additional cost, this obviously increases the operator’s comfort and the time he or she can spend in the freezer.

Frozen warehouses often use tall racks that store pallets several units



Having easy-to-use equipment optimized for workers in cold storage operations is an important consideration when exploring forklift options.

Oils, lubricants and fluids, especially hydraulic fluid, also need to be adapted to the cold. Just as a car needs thinner motor oil during a cold winter, a vehicle working in cold storage needs fluids that will flow adequately in low temperatures.

Some foods are processed and stored in facilities that are

direct contact, it can just be in the atmosphere. That’s why we offer galvanized products for cold storage,” Morzella says. To protect against corrosion in such instances, equipment is available with certain parts made of stainless steel or galvanized material, including fork frames or underbody transmission components like links, pull rods, and bumpers.

high. Getting at the highest pallets often means using a reach truck. It can be tricky to line up the fork tines with slots on a pallet high overhead, especially for someone sitting in a heated cabin. Getting it wrong could mean wrecking a load of expensive frozen product, or worse.

Toyota offers the Acculaser fork guide for such applications. The Acculaser projects a red line forward to indicate where the tines will touch the pallet if they project from their present position.

“They’re not feathering up and down trying to get lined up and taking a lot of time,” Brenneman says. “They can still move quickly, but they can do it without going in too low or too high and accidentally putting a fork into the product.”

Toyota has “environmental conditioning” packages on many



In order to avoid being in warm spaces too long, cold operations need equipment that can quickly, efficiently and safely move products from one cold storage space to the next.

models, matched to the needs of both the vehicle and the environment it will operate in. For example, the environmental conditioning package for reach trucks includes transmission and hydraulic fluids formulated to operate in the

cold, a drip guard installed above the controllers and a heater strip added to the control handle to prevent condensation. Other features available in the various packages include sealed limit switches; silicon-coated electrical connections; galvanized fork frames, linkages and bumpers; and much more.

Cold-storage users who are interested in improving the capabilities and efficiency of their warehouses can call on suppliers like Toyota for a comprehensive facility audit. These audits often include suggestions for structural or operational aspects beyond the goods and material handling products that the supplier provides. For more information about Toyota audits and about Toyota material handling equipment in general, visit www.toyotaforklift.com. ■



When considering ways to improve your cold storage operations, having a warehouse specialist audit current practices can be a big win for most companies.