

DESIGN-BUILD

Solutions

ESI specializes in food processing and distribution center design and construction.

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PROJECT FEATURE



The Automated Facility Experts

New plant design can be quite a bear. Site selection, layout, structural systems, construction materials, timelines and more all play into successfully building a cold storage facility. But, for design-build firms like ESI Group USA, the use of automation makes such challenges seem less challenging.

That's because the Hartland, Wis.-based company works with AS/RS (automatic storage and retrieval systems), manual and automated picking systems and robotic order fulfillment systems to help automate certain processes.

"We have built both rack-supported and conventional automated AS/RS warehouses and freezers—single, double-deep and deep-lane pallet storage AS/RS up to 12 pallets deep on either side of the storage retrieval machine (SRM) aisle," says Mark Livesay, VP Automated Warehousing. "Currently, we are

building a -31°F AS/RS freezer with three SRM aisles. The system utilizes two single satellite S/R machines each operating in the two outside aisles and one tandem S/R machine operating in the center aisle to store and retrieve the frozen inventory. The storage area is configured to a 3-5-5-3 pallets storage depth configuration, nine levels high for a building height of 75 feet to the underside of the refrigeration penthouse. The product will be sorted and robotically palletized."

Benefits of automation

Incorporating automated equipment into food manufacturing processes can offer a wealth of benefits. Depending on the AS/RS system, there can be good payback scenarios to be realized, according to Livesay.

"By going up and not out, your warehouse becomes more compact and efficient with less

unused conditioned aisle space and more efficient product cooling," he adds. "These automated systems are highly reliable. They don't show up late or sick to work, workplace injuries are reduced and also repetitive injuries can be eliminated with automation. [Plus,] there are no additional real estate costs associated with relocation or costs incurred for offsite warehousing and transportation."

Other benefits include 100% complete inventory control, reduction in product damage and shrinkage, increased production output and lower labor costs, especially with difficulties in finding a labor pool that wants to work in these environments.

Controlling extreme temperatures

When working with extreme temperatures, it's important to keep certain factors in mind. ESI Group has built freezers utilizing ammonia, R507 and CO₂/ammonia cascade refrigeration systems.

"For the AS/RS freezer we are currently building, the customer is in the process of phasing out ammonia on their campus, and they required us to use a R507 refrigerant," says Livesay. "It was designed with a completely redundant backup system, and if those systems fail, there are coils in the rooftop evaporators that can utilize liquid nitrogen as a third level of redundancy if the need arises. This was done due to the fact that the inventory is so valuable that they could not afford the product loss due to a refrigeration failure. The product is quarantined for approximately six months, and it is very important that the tracking be 100% accurate and completely validated. There is also a 41°F 2-story receiving and processing area, which added to the building complexity since it adjoins and interfaces with the

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rack-supported structure and needed to be isolated for differential building movement as well as the temperature differential to mitigate any potential condensation issues.”

Other materials such as steel and cables don't have the same characteristics at lower temperatures than they do at refrigerated temperatures. For instance, cables that are flexible at -10°F are not necessarily flexible at -35°F.

“It is very important that the proper building materials be used and that the proper cold storage details are implemented to prevent future problems from developing,” adds Livesay.

Working from the ground up

According to ESI Group, it is extremely important to get the building correct from the ground up.

“We have encountered sites that did not have the most ideal ground conditions to support the buildings,” says Livesay. “It is extremely important to get a good geotechnical evaluation completed, so that the building's structural mat slab can be designed properly to accept all the forces due to the up lift and product loading of these high-density buildings. When the soil conditions dictate, we have built rack-supported buildings on deep-depth foundations (piles, caissons, micro piles, piers), which can add considerable costs. However, all options should be evaluated when looking into alternatives such as ram aggregate piers (*Geopiers*) or even surcharging the soil if schedule will permit, which could save a considerable amount of money.”

It's also important to use an experienced general contractor because there are so many areas that the details need to be well engineered and defined, especially when it comes to the concrete freezer slab design, refrigeration, sprinkler and insulated wall panel construction for AS/RS rack-supported buildings.

“Not all wall panels and contractors are equal, and contractors need to be qualified to be used for cold storage facilities let alone

What the Cold Food Industry Can Learn from Pharmaceutical Companies

On the surface, the cold food industry and pharmaceutical manufacturers don't have much in common. However, one aspect they do share is the need to operate under extreme temperatures.

For example, ESI Group USA, Hartland, Wis., is in the process of completing the construction of an 83,500-square-foot, state-of-the-art plasma logistics facility for the low-temperature storage, inspection and clearing of frozen human blood plasma for Grifols Worldwide Operations USA, Inc. in Clayton, N.C. The AS/RS accommodates over 5,000 pallet positions, and the refrigeration and double redundant power supplies are key to the operation, as supporting spaces include 12,000 square feet of office conference space, locker rooms and a 2-story entry lobby.

“Regulatory agencies require human blood plasma to be stored at -25°C or colder. To assure this requirement is met while handling boxes of plasma bottles, room temperature in the warehouse is kept at -35°C,” says Mike McCormick, senior project engineering manager for the Los Angeles-based pharmaceutical manufacturer. “Automated crane, conveying and robotics systems help minimize the time employees have to spend in the cold environment and track the location of pallets, cases and bottles while in the building. In addition, many levels of redundancy have been designed into the electrical and refrigeration systems to assure we protect the product in storage.”

What the cold food industry can learn from Grifols is that pharmaceutical plants use a “quality by design” philosophy, which ensures that a design operates right the first time.

“We chose ESI based on their experience with automation, rack-supported structures and construction of low-temperature freezer facilities,” says McCormick. “Additionally, we were impressed with the people ESI planned to assign to the project and their personal knowledge of the nuances of low-temperature construction.” ///



rack-supported buildings,” Livesay says. “We have re-built facilities where the details were not done correctly, and it is a lot easier and far less costly to get it correct the first time. You only get one chance to do it right.”

Whether it's new construction, a renovation or an expansion, building from the ground up every time is what makes ESI Group the experts of automated facilities. ///

— Authored by **Mark Livesay, VP**
Automated Warehousing for ESI Group USA.

ESI Launches Redesigned Website

In July, ESI Group launched a redesigned website, www.esigroupusa.com, and expanded their presence on social media. The new site offers a modern design, easy-to-navigate functionality and a more in-depth look at the many services ESI Group provides, including facility design, engineering and construction. Here, existing and prospective clients can peruse through a portfolio of projects, project details and videos, read client and sub-contractor testimonials and check out the client list entailing part of the 175 food industry leaders who have partnered with ESI Group. ///

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