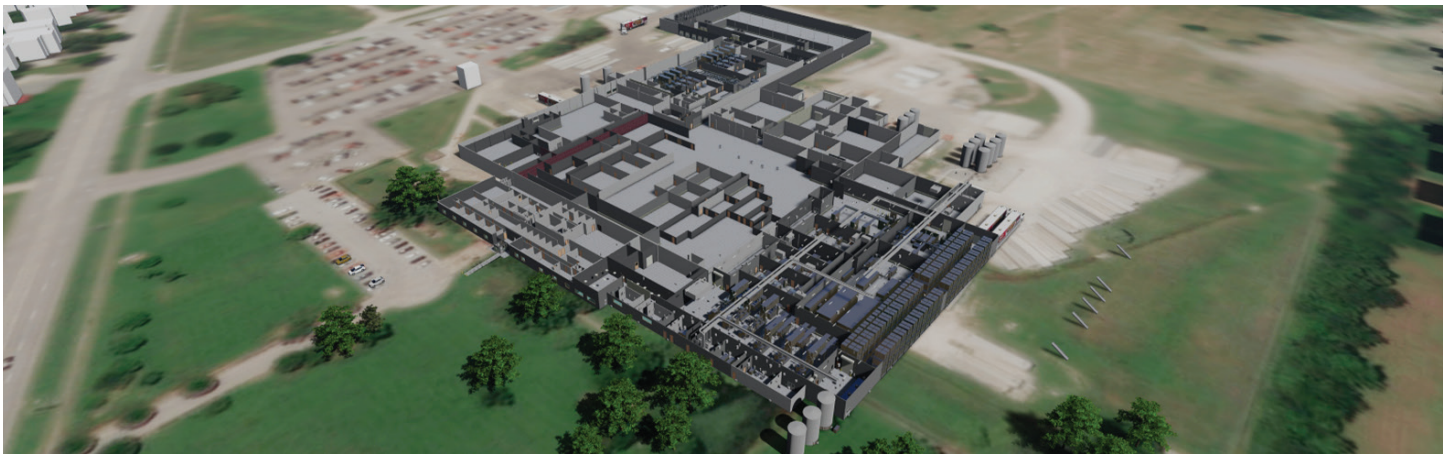
BURNS McDONNELL

CASE STUDY

Facility Renovation Improves Processes for Production and People

Reimagining constrained space leads to increased plant capacity, improved production processes and overall better manufacturing efficiency for Tyson Foods in the Midwest.



Challenge

To continue to meet an increase in demand, and as the world's second-largest processor and marketer of chicken, beef and pork, Tyson Foods, needed a solution to maintain product supply.

Tyson successfully acquired a freezer with enhanced capacity, yet a significant obstacle loomed: The new 40-cubic-foot freezer dwarfed its predecessor in size. Placing it at the core of the production facility posed a logistical dilemma, as the limited space couldn't accommodate its bulk.

Additionally, accommodating the larger freezer and additional equipment demanded a surge in electrical power. However, the existing space fell short in housing the necessary sub panels, switchgear and supplementary components to support the heightened electrical load.

Project Stats

Client
Tyson Foods

Location
Midwest

300T
INCREASED AMMONIA SUPPLY

50%
IMPROVED PRODUCTION CAPACITY

15%
INCREASED ELECTRICAL CAPACITY

Solution

The Burns & McDonnell design team was selected by Tyson to create innovative solutions for the facility that would accommodate the growth in production.

After reviewing production data and forecasted growth, our team suggested an expansion that involved a total process floor reconfiguration. The initial design showed a required footprint expansion of 18,000 square feet. Because the physical space for growth was limited, the expansion was accomplished mostly by building a process up instead of just out.

Working with an initial 4,800 square feet of floor space, our team had to install a new process line — a project that involved blenders and stuffers, grinders, ovens, scales, baggers and conveyors. Of special note, a 40-cubic-foot spiral freezer, three refrigeration compressors and multiple evaporators were added. In total, ammonia refrigeration was increased by 300 tons to support the new equipment.

Modifications to the existing building were required to create space for the larger spiral freezer. Adjustments included removing a section of the roof, then building a penthouse to contain the drives and motors that controlled the new equipment.

Our process allowed Tyson to continue operations without disruption. To address the additional refrigeration process load, the design incorporated evaporators that hang from the ceiling and blow onto the floor to maintain the required low temperatures. The engineering team designed specialty stainless steel blast deflectors to redirect cold air flow from the evaporators and away from the mezzanine level where employees would be working, 15 feet above ground. The engineering team also oriented equipment so that it wasn't blowing directly on any of the line workers, maximizing employee comfort.

Expanding Electrical and Domestic Water

All key utilities were upgraded as a result of the renovation. During this facility upgrade, the impact of new equipment on utility needs and costs was evaluated. The utility team measured the existing electrical load of the facility and compared that to the load that would be needed for the new equipment. It was determined that the new equipment would require much more amperage to operate. Approximately 1,800 amps for the ammonia refrigeration system and an additional 1,000 amps for the process equipment were added, requiring a new electrical power service entrance. The increased power boosts electrical capacity at the facility by 15%.

Our team had to calculate how Tyson could split the existing electrical infrastructure and establish new lines, feeds and panels for new switchgear, which would take up quite a bit of space. The team knew there would be a significant variance in cost depending on where the switchgear and lines would be installed. To minimize costs, an abandoned utility room was used for the upgraded electrical installation.

The new processing line that made twice the product also made twice the waste. As a result, the team made significant updates to the domestic water system. Both hot and cold water for washdown and drains were affected. Floors were demolished and rebuilt, drain piping was redone and drains were relocated so they would be closer to the new equipment.

Laser Scanning Saves Time

On-site 3D scans of the entire process area were taken from floor to roof. Collecting high-density images with millions of coordinates, the team's 3D scans were then translated via software into a 360-degree virtual reality that was accurate within 2 millimeters. Designers then viewed the plant virtually to help identify alternative locations for the equipment and supporting infrastructure. The team used software like Revit and Navisworks to relocate equipment and walls to envision how different process floor layouts would affect equipment, utilities and structures.

Creating virtual configurations shaved time off the project schedule. The laser scans were critical because the team overlayed them into design software. This allowed engineers to functionally program the space and avoid major obstructions while creating the most effective and efficient layout. As a part of this process, the scans enabled the group to identify systems (utilities or conveyors) that needed to be modified to facilitate the installation. Without the scans, this would have been done by trial and error, and the entire process would have taken much longer.

While 3D scanning technology and the design team provided optimized layout scenarios to fit the new machinery, lines, feeds, panels for switches, and switches themselves, there were additional practical aspects that had to be reviewed and verified as workable by the end users. Our project team facilitated a virtual design review that included both Tyson corporate owners and the plant production team. Incorporating end-user perspectives helped identify problems, such as production bottlenecks, early in the design process.

Results

The renovated space will help Tyson meet its increased production needs as consumer demand continues to grow, well into the future. The new equipment and optimized layout resulted in increased production, efficiency and safety, with production capacity growing by 50%.

For this project, problems were identified early and hundreds of hours were saved in planning time and site visits, allowing the project to be constructed ahead of schedule. The innovative 3D scanning process, the resulting 360-degree virtual reality schematics, and collective wisdom gathered through ongoing stakeholder engagement resulted in several positive outcomes, including time and cost savings.

About Burns & McDonnell

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