Case Study: BHS Slashes Change-Out Time as Battery Fleet Doubles at High-Volume Distribution Center

Excellent equipment can only take a battery room so far. To really achieve production gains, operations also need innovative designs, a detailed plan, and smart, effective leadership.

These hidden factors made all the difference for a Fortune 200 company that was facing changes in a major American distribution center in late 2015.

The company's Georgia DC was set to renew its lease on a sizable lift truck fleet, and managers saw an opportunity to improve production in the battery room. They called in the team at Battery Handling Systems, Inc (BHS) to evaluate their current battery handling equipment.

When the conversation started, company managers assumed they would simply expand the existing battery handling infrastructure. After a site evaluation by the BHS Engineered Systems team, though, they were ready to go even further; healthy projections and an irresistible ROI compelled decision makers at the enterprise to follow a new plan, informed by BHS expertise.

"As we went through the process of our design, the project evolved," said the BHS project manager assigned to the case.

The Problem:

Company executives weren't entirely happy with the efficiency rates of their current lift truck fleet. They operated with a single spare battery per forklift, which led to fleet downtime and unacceptable losses.

A consultant recommended expanding the battery fleet to provide two spare batteries per truck. When BHS arrived on the scene, the DC had 45 batteries and 45 chargers. Under the new plan, they would expand to 108 batteries and 54 chargers, with two batteries assigned to each charger. It was up to BHS Engineered Systems specialists to equip the facility for the upcoming expansion, providing faster, more streamlined battery change-outs for the growing fleet.

At their first site visit, BHS analysts identified four unique challenges posed by this project:

1. The existing competitor battery stands included a curious design flaw. The systems were equipped with drip pans, but they were designed for vertical removal. In order to empty them, staff would have to remove multiple batteries and disassemble the roller beds for access. Not surprisingly, there was never time for this involved task. When the BHS team arrived on site, the drip pans were overflowing, with predictable acid damage to the floors.

2. Two batteries would be assigned to each charger. Battery room staff would need some indication that it's time to switch the charger cables from one battery to the next. That meant custom monitoring equipment.

3. This distribution center was on a 24/7/365 schedule. They couldn't afford to limit production for a long, involved installation. Whatever solution BHS came up with, it would have to include a building process that wouldn't reduce the facility's production, which continued across three shifts without rest.

BHS Products Discussed in This Case Study:

Single Level System Stands
- Reliable storage for forklift batteries and chargers
- Spark-proof, poly-sleeved rollers
- Durable steel construction
- Fully customizable

Single Level Battery Extractor
- Heavy duty all-steel frame
- No exposed components
- Vacuum extraction reduces battery wear
- Dual extractor arm travel shafts for greater strength and stability

BHS Battery Room Floors
- Meets or exceeds American Concrete Institute standards for flatness and levelness
- Four-layer construction
- Topcoat resists acid, chemicals, abrasions, and impact

Structural Barrier Rails
- Powerful steel construction resists impacts up to 10,000 pounds at 4 mph
- Easily adjusted drop-in rail installation
- Fully customizable

iBOS Intelligent Battery Organizing System
- Computerized battery management
- Tracks charges for optimal battery choice
- Generates detailed reports

4. The battery fleet was set to expand by almost 2.5 times, nearly tripling the system stands' footprint. That might create a lot of extra travel time for the battery changer, and the facility could scarcely afford delays in the battery room. Engineers would have to design out that bottleneck somehow, slashing change-out times to a fraction of their current duration.

Despite these limitations, the BHS Engineered System team remained undaunted. They started by analyzing the customer's projected motive power needs to come up with a plan that would provide for the extra batteries while also reducing change-out times to the absolute minimum.

Analysis:

Company management came to BHS in the hopes of refurbishing their existing competitor system. But as the BHS team deepened their evaluation, they realized that repairing and expanding old equipment, worn by years of electrolyte spillage from overflowing drip pans, would actually be more expensive than simply razing the room and starting from scratch.

When the BHS project manager showed the customer the numbers, the path forward became clear. They would need entirely new infrastructure, designed for a fleet that would continue to grow to the very limits of the DC's production capability. Everything would have to be replaced, down to the pitted concrete of the battery room floor.

The customer preferred a single-level system to tiered battery stands, which necessarily added to the footprint of the infrastructure. Racking for the facility's collection of 45 batteries was close to 70 feet long; a system that holds 108 batteries and half as many chargers would need about 200 feet. That had serious implications for change-out efficiency.

The BHS Single-Level Operator Aboard Battery Extractor (BE-SL) travels at a maximum speed of 190 feet per minute. So grabbing a battery from the furthest end of the row would take close to two minutes, which would quickly add up over the course of an entire shift. The BHS team made it a priority to plan the room for faster changes.

Finally, the facility's electrical systems weren't prepared for an additional 63 batteries and a new set of chargers. Electricians would have to update the entire power system in the battery room, adding another voice to an already-crowded group of participants. To further complicate the situation, the team would have to shut down the facility's power during electrical work — while still keeping the forklifts running on schedule.

Solution:

In designing the new battery room, the BHS project manager started with the question of efficiency. Was there a design solution that could cut down the potential two-minute travel time of the battery extractor? To answer that question, the team made a bold decision that flew in the face of conventional battery room design.

Most change-out systems position lift trucks at the end of the row, sending battery extractors all the way down the line to fetch the most remote batteries. But by placing the truck change area in the middle of the system, staff can effectively cut the maximum change-out time in half. A two-minute trip to the end of the row becomes just one minute, as the extractor only needs to travel half the distance in either direction to grab batteries from the furthest ends of the line.

BHS designed a system with two rows of stands, separated by a 30 foot gap. That gave them space for three lift trucks in the central change-out area, further increasing efficiency. This innovative design got the green light from company management, but there was much more work to do. As the project manager said, "That was the first hurdle."

Single Level Battery Extractor (BE-SL) provides speed and precision to every battery change-out operation.

The team studied lift truck traffic patterns at the facility and planned lanes that would control traffic flow in an organized, intuitive way. Under this plan, a drive lane terminates in a stop sign just outside the changing zone. This allows lift trucks to queue up for changes without delay or confusion. Structural Barrier Rails (SBR) ensure that lift truck operators stay safely in traffic lanes, and a guard rail at the battery change position protects equipment from even the most egregious accident.

To ensure the best choice of battery, the team also suggested replacing the customer's outdated first-in, first-out paper log with a computerized iBOS fleet management system. Company leaders loved the design, and with the plan in place, the team was ready to start construction, with one important caveat: they would have to keep the facility operating during every step of the upgrade.

Implementation:

To keep the DC on its production schedule, the BHS project manager organized the plan with military precision. He led a team of installation contractors, electricians, and company representatives to complete the job "on time, on target, and on budget," he said.

The BHS team handled every detail, from hiring to managing to coordinating the various participants. The project manager led conference calls at every step of the process and made sure that everyone involved was completely aware of the job's status.

The project manager created a three-phase install plan that would not disrupt the facility's day-to-day operations. But before it could begin, there was some preliminary work to get through.

- Phase 0 (Preliminary Work): The team started by hiring a skilled electrician to upgrade the battery room's power output. For the initial electrical work, they scheduled a day and time down to the minute to make sure that shutting down the power wouldn't disrupt the DC's productivity.

  While the power was out, the facility kept computers running with a backup generator, and employees worked by the light of lift truck head lamps. They made sure to change out any batteries with less than half a charge before the power went out.

  The team allotted four hours to complete the first step of the electrical upgrade. It was done in 20 minutes.

- Phase 1: The BHS team found the exact midway point where their new racking system would stand. Then they split the room in two along that line, roping off the work site. This would allow them to complete the installation in one half of the room while the other remained active, keeping lift trucks fully powered without interruption.

  The team built Single Level System Stands (BS-SL) in the active half of the room and removed all the batteries from their work zone. Then they tore out all the old equipment in the first half of the room. Flooring contractors ground the concrete until it met rigid specifications for flatness. They put down a layer of epoxy, a primer, and an acid-resistant topcoat.

  With the BHS Battery Room Floor complete, the team put in two rows of Single Level System Stands and a Single Level Operator Aboard Battery Extractor. The system was starting to take shape.

- Phase 2: Before they could repeat the process that completed the first half of the room in record time, the team had a lot of housekeeping to do. They transferred batteries and chargers to the completed side of the room, where they could keep powering the forklifts that ran the DC.

  After tearing out the old, damaged stands, the team repeated the whole installation process on the second half of the room, finally uniting the two rows of stands into a brand new, highly efficient battery handling system.

- Phase 3: In the final phase of this carefully planned installation, the battery room was equipped with all the minor details that make a major difference in day-to-day operation. BHS engineers created a custom iBOS battery management system to let staff know when charger cables need to be switched from one battery to another. All of the final electrical routing was completed and checked for effectiveness.

  Finally, the whole team went through a safety checklist, inspecting every nut, bolt, anchor, and cable clamp. When they finished training the DC's staff on the new equipment, only two and a half weeks had passed since first breaking ground.

Results:

Six months after the completion of the new battery room, the BHS project manager visited the facility to see how the plan was playing out. It surpassed his expectations.

The traffic lanes were a total success. Trucks line up to the stop sign outside the change-out area. As one forklift drives away, complete with its fresh battery, the Battery Extractor zips down the line. In the time that it takes another lift truck to pull into the changing zone, the BE is back with a new battery. The BE can fetch a battery from the stands in only 30-45 seconds.

Back at the lift truck, a skilled operator can complete the change-out in less than twenty seconds.

The customer was thrilled with the new system. Not only did it enable them to grow their battery fleet, it drastically reduced the time it takes to change a battery. The BHS team has already visited three more of the company's distribution centers. Soon, electric forklifts at distribution centers all over the world may be running with BHS-level efficiency.

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