Breaker factory of the future

Designing a world-class breaker factory in Pennsylvania

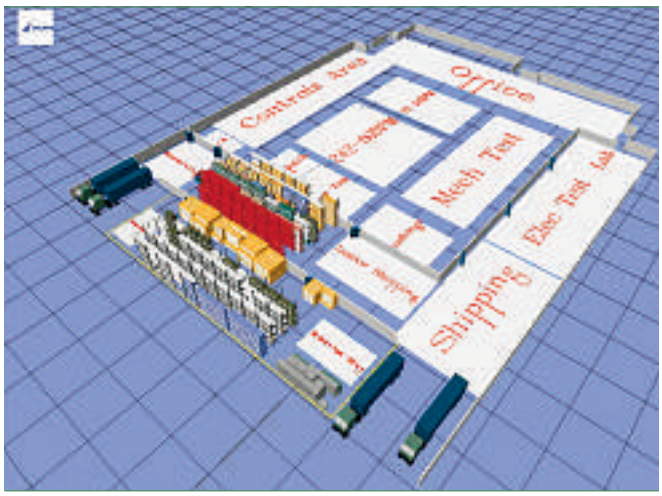
Gerald Lee

The world-class ABB high-voltage breaker facility in Mt. Pleasant, PA opened in April 2003 and serves as the US headquarters for high-voltage power technology products. This new facility has been designed to produce SF_6 dead-tank circuit breakers for use in applications from 38 kV to 800 kV. However, on a more impressive note, lead-times, floor space, capacity and productivity have all been greatly optimized. How this was done will be explained in the body of this article.

ABB's SF_6 dead-tank circuit breakers 1 were formerly produced at an ABB facility in Greensburg, PA, but as the HV breaker business was experiencing unprecedented demand leading to backlogs as long as 80 weeks for some products, it became clear that the business had outgrown its facility. In addition as demand and leadtimes grew ABB's competitors saw an ideal opportunity to enter these more lucrative markets.

1 A typical 145 kV dead-tank breaker

2 Simulation was used in the design and testing of the production processes. The results were instrumental in determining plant layouts, capacity, and material flow



Background

ABB Greensburg was located in the middle of a residential area, and this complicated shipping and delivery. The facility was housed in four separate buildings, some of which were over 100 years old, forcing people and materials to move between the buildings.

Breaker design had also changed over the years and the factory doors were no longer wide enough or tall enough to accommodate the new products. The factory floor was at different levels, thus requiring excess material handling. Some raw materials had to be stored out of the factory, a fair distance from where they were used. This inevitably led to unnecessary cleaning and handling.

The most impressive achievement by far is not any new technology but rather that a culture of continuous improvement has been sustained and nurtured at the new facility.

Analysis was undertaken to define an approach that would best resolve these production issues while reducing lead times on factory orders. The best option was found to be a new facility in a nearby technology park located outside of Mt. Pleasant, PA. A key factor which led to this decision was the proximity of several other breaker factories, meaning an abundance of qualified suppliers and a skilled workforce. Another very important factor included access to major highways.

World class design

The old Greensburg facility already made a top-quality product with lean production techniques. Even so, the move to the new facility was seen by management as an unparalleled opportunity to improve all aspects of the business and every effort was made to use it to its best advantage.

The management team identified opportunities to:

- Reduce lead times
- Increase capacity
- Improve productivity
- Improve on-time delivery
- Improve flexibility
- Reduce Work in Progress (WIP)[1)] and raw material inventories
- Reduce floor space
- Maintain a focus-factory concept

Primary targets for improvement were manufacturing and information flow. Agile manufacturing techniques were employed for product and process flexibility, shorter cycle times and quicker delivery. Several design techniques were employed to verify the factory lay-out and the factory flow: Simulation technology was used to design the layout and decide on square footage. The final design was almost a carbon copy of the 3D simulation model. In addition, the model proved to be instrumental in cost savings 2. Techniques such as Theory of Constraints (TOC)[2)] were employed to address bottlenecks in production. Using setup reduction techniques at the bottlenecks, throughput and boosted capacity at the constraint improved by 33 percent.

Many improvements were made in the handling of materials: Parts were brought to the point-of-use; bar codes were introduced to improve accuracy in inventory and eliminate lost parts; and parts were kitted prior to assem-

Footnote

1) See glossary on page 74.

1) See page 25.

bly to ensure that breakers could be finished with greater efficiency.

A wireless data-collection system was installed to eliminate the need for a paper trail with each breaker. Previously, reports could be as long as 80 pages. The new system now flags all errors and allows operators to electronically indicate that a critical step in production has been completed. Finished reports can be sent to the customer electronically and stored on the ABB network.

The move

It was determined early on that there could be no disruption of customer service when the move was made to the new state-of-the-art facility. The move had to be as seamless as possible.

Much attention was focused on coordinating the activities of contractors and vendors. This was necessary due to a number of systems that were new to the factory including improvements in leak testing, SF_6 gas handling, and material storage and retrieval systems.

In addition, a lot of attention was paid before the move to physical and personnel resources. This meant that processes were phased into the new facility in a logical order so that services were not disrupted. For a short time managers had to deal with running two separate factories.

Highlights

The first breakers were shipped on April 9, 2003 – after the first week of full production at the new facility 3.

3 The first 5 breakers were shipped from the new facility on April 9, 2003 – the first week of production

Customers feel ABB has taken breaker manufacturing to a new level. This is important considering there are three major breaker manufacturers in a 50-km radius of the Mt. Pleasant facility.

Several improvements have already been sustained over a three year period:

- Productivity is up 10 percent.
- Capacity has increased 37 percent, due to work removed from bottlenecks.
- The need for floor space is down by 15 percent.
- The need for storage space is down by 38 percent.
- WIP is down by 15 percent.
- Rework is reduced by 40 percent.
- Materials are now stored near point-of-use, inside the factory or under covered storage.
- Improved cleanliness has led to fewer flashovers.
- Improved flow has meant less product travel, increased velocity.

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But the most impressive achievement by far is not any new technology but rather that a culture of continuous improvement has been sustained and nurtured at the new facility.

The move to the new factory allowed the team to install new processes with the knowledge that there was no going back to the old way of doing things. This has not only helped the workforce to understand that change was inevitable but it has also allowed them to view further changes as something very positive.

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