

The *Express Line*

Transformer manufacturing in the fast lane

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ABB Components manufactures tap-changers and bushings for transformer factories at its plant in Ludvika, Sweden. The market trend is towards shorter delivery times, and for many transformer factories, component deliveries are time critical. If the suppliers to those transformer factories cannot shorten their delivery times, opportunities may be lost.

ABB has risen to this challenge and introduced an *Express Line*. The Supply Chain process has been redefined to deliver transformers faster than previously thought possible.



Demand driven manufacturing

As a supplier, ABB Components needs to meet short delivery times. To meet this demand, the *Express Line* was created through the PICSEL project (see textbox on page 35). The main target of the project is to facilitate the delivery of custom-made tap-changers and Bushings in 4 weeks.

The project was formed as a CP3¹⁾ (Common Pull Production Practices) project in December 2003. The CP3 concept was developed by ABB Corporate research in Finland. Being a CP3 project, the backbone is the ABB Gate model¹⁾. The Gate model gives structure and support for all parties involved in the project.

During the analysis phase the order-delivery process was analyzed with VSM. It was recognized that even if everything went smoothly and without disturbances, ABB would still not be able to meet the target of four weeks delivery time. The order-delivery process was simply too long. In PICSEL the VSM¹⁾ was utilized in two steps. First it was used for mapping the current process, and then to create a vision of the future process. The vision included CP3 tools such as, Continuous flow, PULL-production, replenish-based supply.

Pull arrangements work with less WIP than traditional Push arrangements and this improves the TPT (throughput time). A short TPT is necessary for the *Express Line*.

The *Express Line*

When analyzing its process, ABB found that it could save a week by avoiding manual order design and possibly another week through some careful Supply Chain Management (SCM)¹⁾. In order to do this, standardization was necessary. ABB Components are delivered to customers all over the world; hence the company needs to be able to meet a broad

range of different standards. Creating an *express line* that can be automated to handle ordered designs, fulfils set short delivery times and that suits as many customers as possible is quite a challenge. All products from this factory are custom-built, so a standard “one-size-fits-all” solution was definitely out of the question.

By analysing customers buying pattern from the past two years, ABB formed a base of what could be a suitable platform. The goal was to form a set of “building blocks” that would fit as many projects as possible.

Supply Chain Management (SCM)

Perhaps the biggest challenge when developing the *Express line* was the SCM work. The tasks were to secure all *Express Line* material for production within 5 days from order date and reduce total inventories.

The chosen method for many volume articles was a replenish-based two-bin approach. The strength of this system lies in its simplicity both for ABB and its suppliers. As it is a “pull” system it helps reduce inventories, is insensitive to changes in demand and is easy to maintain.

Some items are order specific, and are needed within 5 days. This calls for more advanced SCM strategies. An example is the tank for the UZ-type tap-changers. Before PICSEL the supply lead-time was three weeks. The supplier had to manufacture these from scratch as far as cutting, welding and painting in the customer specific colour are concerned. In order to cut the lead-time to a third, ABB entered a two-bin arrangement with the supplier, who now stores tanks ready for painting. When ABB orders a tank, the supplier sends the correct type directly to the paint shop and ABB receives the finished tank when needed. This is a win-win situation: ABB gets a short delivery time, better OTD (on-time delivery) and the supplier can plan their work better.

The *Express Line* may be a prerequisite for four-week deliveries, but the promise of fast delivery time is worth nothing if it cannot be met. This calls for a robust order-delivery process. In order to deliver on time to customers,



Footnote

¹⁾ See glossary of page 74.

Demand driven manufacturing

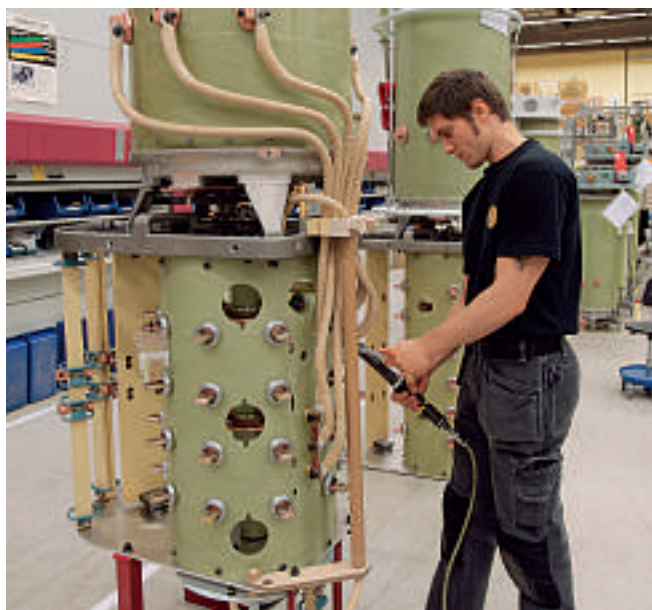


ABB must receive all internal and external deliveries on time. For external suppliers these routines are clear, but internal customer-supplier relations need support. The development of PICSEL Gateways created a backbone for the whole order-delivery process.

PULL production

In order to reach the set targets, the production also needed improvement. The essence of CP3 is Pull. Pull arrangements work with less WIP¹⁾ than traditional Push arrangements and this improves the TPT¹⁾ (throughput time). A short TPT is necessary for the Express Line.

Results

The *Express Line* was inaugurated in Spring 2005 for UBB and UZ type tap-changes. The latest addition to the *Express Line* is the UCG products and the new UBB, UC and UZ ordering data sheets have now been prepared. More and more customers are taking advantage of what the *Express Line* has to offer.

Change Management

Due to lack of proper change management, many fine efforts have ended up in nothing. When working with change, the toughest issue is often to make the changes sustainable. Unfortunately there is no general recipe on how to achieve this. In PICSEL, a communication plan was set up; lack of communication definitely makes changes harder to achieve. Communication must be of high quality, not necessarily in terms of spectacular Power Points but in it's essence. As many people as possible must feel why the change is important for the company and them. In order to get a better common understanding in the power of PULL approaches, the project implementers played a PULL game with all affected personnel. The game played is called Process Samba and simulates a factory. The result of the game was astonishing!

Shop floor related TPT was reduced 25 to 60 percent and WIP dropped 35 to 65 percent.

The Ludvika plant uses CONWIP as a production control method. CONWIP is a WIP-limiting tools and is utilized in four of the production lines. There are many advantages in limiting WIP: Production can focus more on more important issues, it is easier to keep the workplace orderly, inventories are kept low and TPT gets shorter.

On one of these production lines, CONWIP was not found to be suitable, as several production flows merged within this line. It was still necessary to keep WIP limited and the method chosen was a TPT constraining detailed planning in conjunction with clear production rules. This detailed planning is made from the bottleneck (the testing area). The resulting plan authorizes work from all upstream cells and synchronizes the flow.

Besides a working *Express Line*, the plant enjoys other improvements as its processes have become leaner. Shop floor related TPT was reduced 25 to 60 percent and WIP dropped 35 to 65 percent. Supply OTD improved from 88 to 95 percent at the same time as supply lead-times reduced to 50 percent in average. The TTPT dropped to four weeks for the products on the *Express Line* and "Confirmed order on time requested" and OTD improved dramatically.

ABB will continuously improve this process and make the *Express Line* broader to suit customers' needs even better.

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