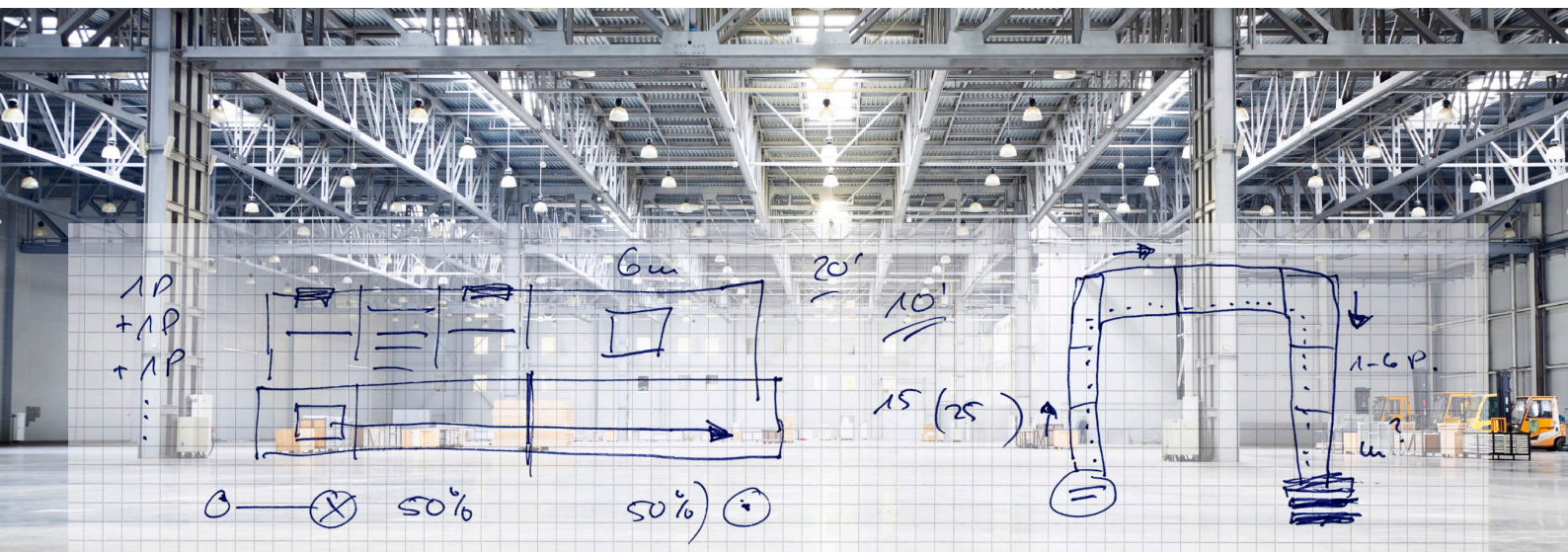


# LEAN PRODUCTION DRIVEN BY BEST PRACTICE



## CASE STUDY 1

## ONE PIECE FLOW WITH SMALL BATCH SIZES IN POWER PACK PRODUCTION

Structured material organisation is key.

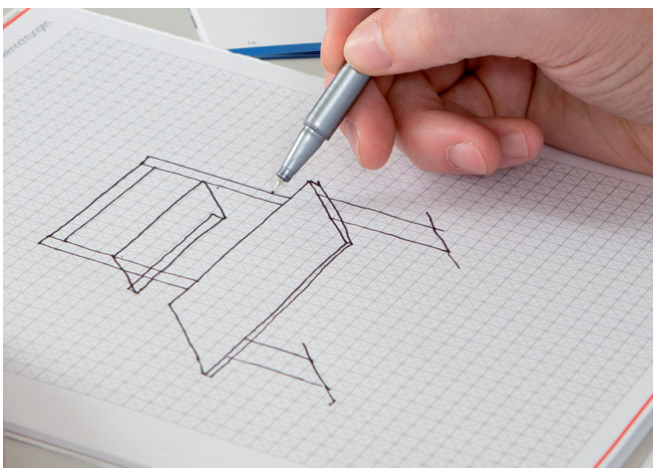
A company from the drive technology sector was planning to redesign its production area for power packs, in order to both improve material supply and reduce waiting and set-up times. The aim was also to ensure that output could be significantly increased at times of peak demand, without having to adjust the production facility every time. Last but not least, the facility had to be able to produce five variants of a power pack in alternating batch sizes of one to thirty upon the internal customer's request (see page 5).

## STARTING SITUATION – UNSTRUCTURED PRODUCTION

The situation in production was at first unclear, as there was no discernible material flow. Each power pack went through a total of seven individual workstations, where they were gradually assembled by two workers. The required material was not well structured, with workers having to first look for parts in unlabelled boxes. At the time, the surfaces, workbenches and equipment were not used sensibly.

## ONE PIECE FLOW FOR BATCH SIZES 1 TO 30

Treston's solution for these challenges was a one piece flow system, with material supplied via FIFO gravity flow racks with three levels in an I-shaped production line measuring approx. three metres in length. In this kind of restructuring, it is common to point to the small batch sizes of 1 to 30, as well as the different variants, as a counterargument. In short: "It's not worth it for us. We can carry on assembling at each workstation." This is mistaken, as the critical factor is suitably organising the material supply. Even for small batch sizes and frequent variant changes, the one piece flow system can generate added value for the business.



## SEPARATING ASSEMBLY AND STORAGE WORK

Another important factor is separating the material supply from assembly, i.e. the assembly worker can concentrate entirely on assembly, while the storage worker takes care of material supply. The parts are now loaded from behind into labelled containers at the corresponding points in the shelving system. The system's incline means the parts drop forward to the assembly worker. The parts that are loaded into the shelf are also fitted first, a principle known as "first in, first out". A simple visual inspection takes care of refilling. Empty boxes are sent back on a track running in the opposite direction. Once they arrive back in the warehouse, they are refilled according to the label. This material flow system is known as "twin-bin kanban". This means that material is taken from the first bin, with the second bin acting as a reserve behind it. Once the first bin is empty, it triggers an order for new material. This ensures a constant flow of material, preventing production standstills.

## I-SHAPED PRODUCTION LINE – MAKING BEST USE OF SPACE

The decision to use an I-shaped production line resulted from the small amount of space available and the comparatively simple material feed from just one side. An I-shaped line requires two sides to be supplied, with the material feed in a U-shaped line coming from three sides. This requires significantly more space to accommodate transit routes, for example. The I-shaped production line features a single transfer line, consisting of roller strips and ball casters, also measuring three metres in length and 720 mm deep. A narrow profile divides the transfer line again into two separate workpiece carrier lines. The transfer line is fitted with three lifting stations, which fix the workpiece carrier on which the power pack is assembled if necessary. The workpiece carrier measures 350 x 350 mm. Any C parts that are needed in large numbers are stored in grab containers on the shelving system.

## WORKLOAD DOWN, OUTPUT UP

At normal demand levels, one member of staff works on the production line. This means that he completely assembles the power pack along the production line and sends it for testing. He then pushes the workpiece carrier back to the start in the front transfer line and begins working on the next power pack. When demand is higher, a second worker joins the work system so that each worker assembles around 50% of the power pack. Once worker 1 finishes his part of the assembly, he then parks the workpiece carrier in a buffer zone between the two workstations, from which it is then handled by worker 2. While worker 2 continues work, worker 1 starts on the next power pack. Once worker 2 finishes a power pack, he pushes the workpiece carrier back into the second transfer line and hands it back to the first worker on the left, who then pulls the workpiece carrier forward again for further processing. This production method ensures doubled output.

## LEAN – ORGANISING PEOPLE AND MATERIAL

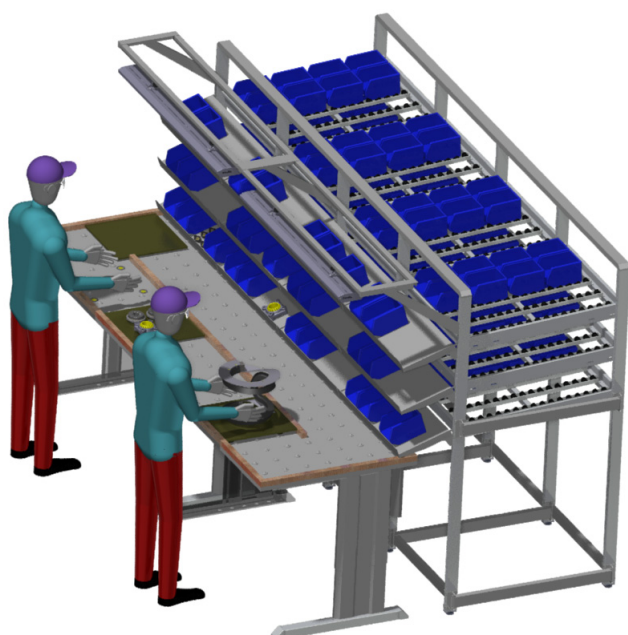
The production restructuring was successful, with production costs reduced by 17 percent. Previously, production was oriented around the equipment, i.e. workers had to move to the equipment in order to use it. This meant long distances and lost time. Now the material flow is very fast, as all the equipment required is directly next to the production line. The one piece flow principle also allows workers to completely assemble a product in a short space of time, before delivering it directly to the customer. This removes the need for large inventories, which also saves costs. Every business aims to purchase material, assemble it quickly and sell the finished product as quickly as possible. The lean approach helps achieve this goal, as the core of the lean philosophy is the best-possible organisation of people and material. This requires the precise planning of work processes from A to Z. Businesses often take fright at this initial planning workload. But it is absolutely worthwhile, providing you involve staff in the process from the start. Treston hosted a day-long workshop at the company and actively incorporated the assembly staff. They were able to contribute their ideas and practical experience, and help design the production line.

## EQUIPMENT USED

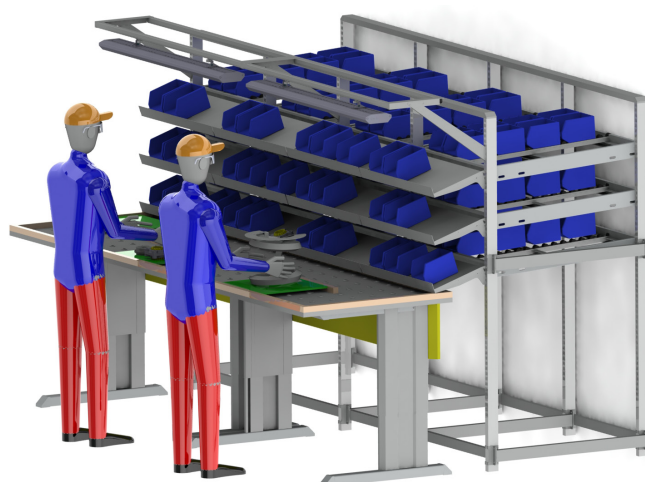
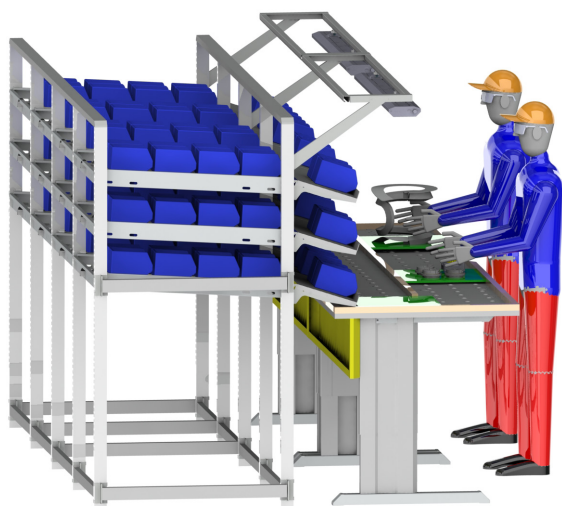
The lean philosophy aims to make best-possible use of space and equipment on a production line. That is why instead of finished workstations, all units were constructed individually.

- The base frame of the production line consists of height-adjustable table frames.
- ESD tabletops, fitted in certain areas with ball casters and roller strip profiles, enable the use of workpiece carriers.
- The pneumatic lifting stations raise the workpiece carriers when required in order to fix them.
- Swing arms, steel panels and material bins are used to supply parts.
- Lights and spring balancers for screwdrivers are secured to an overhead frame.
- The LED lights used measure 1,200 mm in length and have an illuminance of 1,800 lux at a distance of 1,000 mm to the work surface.
- The FIFO gravity flow rack consists of click-in tubes, cross and longitudinal connectors and roller strip frames. It allows different containers to be moved in two directions.

All components mentioned are standard items from the Treston product range. These enable perfect material storage and ergonomic supply for the workers on the production line.



Structured material flow via a FIFO gravity flow rack in an I-shaped production line, in which up to two workers can assemble power packs in a one piece flow system.



The FIFO gravity flow rack is filled from behind by the warehouse staff. The inclined base of the shelves means the parts fall into the material containers to the assembly workers on the production line, where they are fitted according to the "first in, first out" principle.

## EVERYTHING YOU NEED TO KNOW ABOUT LEAN

### Welcome, internal customer!

"Internal customer" is a term used in the lean philosophy that aims to influence corporate culture. If, for example, staff in the electronics production department assemble and deliver components for engine production, then the engine production department is their internal customer, and should therefore be treated just as promptly, attentively and to the same high level of quality as an external customer.

### "Ergonomics is too expensive"

This attitude is common in manufacturing businesses but is very short sighted, as it does not take account of the long-term effects of incorrect posture and movement among staff, which can include back pain, reduced output, illness and absences. A workspace that is ergonomically designed to fit the needs of employees allows them to work efficiently and produce high-quality results. Investing in ergonomics improves not only the working situation for staff, but also work results and production efficiency.

### What do the employees think?

In order for the lean approach to be successful in the company, all staff members need to understand the concept and support it. This is why it is best to involve staff in the planning stage early on. The company management decides WHETHER to go ahead with the restructuring and make the associated investments. But staff can actively contribute to the discussion on HOW to achieve it. Workshops are a good way of clarifying need and requirements. Tip: Bring in an external moderator, who can bring together the various ideas and suggestions from a neutral position.



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