

BOWERS & WILKINS LOUDSPEAKERS LTD

Five years ago premier loudspeaker manufacturer Bowers & Wilkins faced steep demand for its products. Lean production helped meet this challenge and drove continuous improvement through the business.

OBJECTIVES

The quality of Bowers & Wilkins's (B&W's) loudspeakers has to be above reproach. In 1999 B&W's Worthing factory found it difficult and costly to keep this quality promise and meet consumer demand for its new products. Build quality varied from operator to operator, and it was difficult to determine who did their job well and who did not. B&W found that lean manufacturing, especially adopting cells, more than met the challenge. But introducing the cells proved so difficult that the project came close to being abandoned.

SOLUTION

Introduction

B&W builds speakers in Worthing, Sussex, and Bradford, Yorkshire. Worthing makes all B&W's transducers – the low – and mid-frequency drive units and high frequency tweeters that convert audio signals into sound.

Five years ago Worthing made batches of transducers in tweeter and drive-unit areas and passed them to finished-product lines there and in Bradford for assembly into speakers. Each operator knew only one or two of the operations involved in building a tweeter. They worked independently, producing a batch of sub-assemblies for the next operation. The separation of coil winding, magnetising and assembly operations round the factory created significant work-in-progress (WIP).

B&W was profitable but rapid growth exposed these production weaknesses. Sales to September 1999 were 35 per cent up on 1998 and would grow another 20 per cent in the year ahead. Worthing transducer manufacture could not keep up with the quantities required by finished-product assembly.

Build quality varied because of poor process control and lack of operator training and, because of the excessive WIP resulting from batch production, quality problems were not detected until too late in the process. The lack of standardisation in the build process made it difficult to pinpoint the source of defects.

Best practice in:
Lean manufacturing

Sector:
Electronics

Size of firm:
300 employees

Location:
Worthing, West Sussex

Website:
www.bwspeakers.com



“If you are going on the lean journey, you have to be clear about what the journey is going to encompass.”

GEOFF EDWARDS – UK VICE PRESIDENT OF OPERATIONS

Thorough inspection and testing ensured that customers did not suffer, but the extra quality control and rework was costly.

In 1999, operations management decided that lean manufacturing would root out defects at the output rates the company had to match. B&W would start with the introduction of single-piece-flow cells.

Cell evolution

After an unsuccessful attempt to introduce cellular manufacture themselves, B&W brought in a lean consultant to implement lean production more expertly. The first step was to administer one-day lean training to all employees and key suppliers. In addition, those directly involved in the cell conversions also attended a week-long intensive training programme. The starting point for cellular manufacturing was one of the tweeter cells. B&W held a *kaikaku* ('major change') event in August 2000 in which selected operators helped design the new cell. The final design was a U-shaped single-piece-flow cell, where all the operations involved in making a tweeter were located together in the logical build sequence.


Learning curve

B&W thought cells would “expose and drive the resolution of their production problems” says materials control manager, Catherine Oehlers. But the problems unveiled exceeded B&W's worst expectations.

Lean cells only work if cell operators can do a variety of tasks and the right support is in place. Training operators on the various operations and equipment in tweeter production was time consuming and adversely effected productivity. Now learning is swifter because equipment is designed to be 'lean', operators are involved in the design and most importantly training systems are in place. Initially, machine breakdowns and insufficient support structures caused major disruption to production. Now each cell has a cell-support engineer permanently assigned to it. A similar problem existed with material availability at point-of-use. Today's systems ensure that materials are delivered to the point of use and replenished as required.

Based on the theoretical 'takt' time, B&W initially set output targets of 960 tweeters a day – 13 units per person per hour with a team of nine. For the operators, the new target – more than twice actual output – was impossibly high. This productivity hurdle caused B&W to question its lean strategy.





Then B&W's shop floor training manager Fiona Blythe introduced a 'best ever' scheme to motivate operators to do better. Rather than chase an 'impossible' target, the best output achieved to date became the new target. Best-ever figures crept up to eight units per labour hour and continued to climb. Today the figure is almost 16.

Team and people development

Over time the introduction of lean production broke down the traditional factory 'them and us' culture. As operator involvement and team working took hold, office and shopfloor staff grew used to working together to solve problems and make lean production a success.

Operators felt that Pat Sullivan, production-engineering manager, both listened to them and acted on what he heard. Blythe promoted learning, continuous improvement and, in particular, team development and leadership: "She made us feel as teams," says cell operator and trainer Jeannie Bradshaw. Management, meanwhile, found operators solving as many problems as managers did.


As 'best ever' figures rose, so did morale and, once the tweeter cell worked effectively, B&W used the experience to set up further cells.

When B&W moved to its present factory in January 2002, it divided the shopfloor into three product 'factories', one each for the 600, 700 and 800 products. Each factory has its own drive-unit, tweeter and finished-product assembly cells.

Training

Cellular production succeeds only if each cell member is efficient at a variety of tasks. The cell trainer role is key. In the first cells, operators continued to work as they always had, introducing variability into the process. The cell trainer was there to ensure people learned to work in a consistent, standard way.

Until 2001 training at B&W was 'sitting next to Nellie', with a high risk that bad habits would be passed on. Now every worker doing the same task is consistently trained to a training card for each operation. The cards are included in individual employees' training files and used to achieve a balance of skills for each cell.



As the training system was introduced, the company developed its performance management system. This tells employees what B&W wants and how they can achieve these standards. B&W rewards them accordingly for good performance. It altered appraisals to include general duties and operator-specific skills aligned to lean production goals and revamped pay to reflect scores achieved in the appraisals.

B&W also developed a personal development programme providing off-site workshops in 28 problem solving, management and career-development disciplines. One company aim is to identify a potential and turn it into a talent.

RESULTS

The adoption of lean techniques, and in particular cellular manufacturing, have led to dramatic improvements in quality, morale and manufacturing lead times and lower WIP. Every operation detects any fault in the operation before it. Operations are standard, consistent from one cell to the next, and constantly improving.

Cellular manufacturing designs waste out of production. In the tweeter cell, for example, WIP has fallen by almost 99 per cent (in value). Labour cost per unit halved and productivity has more than doubled. First time yield is up from 82 per cent to almost 100 per cent. The cell throughput time and hence worst case fault detection time is 20 minutes.

Since 2000 B&W has invested and continues to invest significantly in specialist lifting equipment, special gluing equipment, magnetising machines, and other equipment to take operator dependency and mistakes out of the process.

CHALLENGES

At first, new working methods can severely dent productivity and, in doing so, damage morale. B&W's solution to a severe productivity dip – replacing actual production targets with 'best ever' levels – solved a difficult problem.



THE LAST WORD

When B&W first introduced cellular production quality rose but volumes fell so far short of what assembly needed that it took conviction and courage to continue the project.

Geoff Edwards, B&W's UK vice president of operations, sums up: "If you are going on the lean journey, you have to be clear about what the journey is going to encompass. And don't over promise." Do those things, he says, and the journey is well worth the effort.

The journey continues at B&W today. Faced with an ever increasing and diverse product portfolio, the need for flexibility among operators and across the factories is now greater than ever. Continuous improvement is therefore focused on modularity and achieving standardisation across operations, machines, cells and factories. These reward B&W with the agility required to continue to meet its customers' needs.

This case study was sourced from the Cranfield School of Management.

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