TPM, SIX SIGMA, LEAN AND LEAN SIX SIGMA – Q&A

AXEL G. KRISTIANSEN, DIRECTOR OF SSB, E-MAIL: AGK@BREWINGSCHOOL.DK

In our breweries, we nowadays don't move far before meeting evidence of modern Continuous Improvement (CI) activities like TPM, Lean or Six Sigma. The following pages provide a short guide. SSB has, for some years, taught those CI concepts to prepare brewery students and managers for modern demands. It could be interesting to discuss whether it makes sense and where it makes sense to employ any of these methodologies in the brewery industry. To get the discussion started, we therefore strongly encourage you to contribute with hands-on experience.

Q: What is TPM?

A: Total Productive Maintenance (TPM) is a maintenance process developed for productivity improvements. TPM is a Japanese idea that can be traced back to 1951 when preventive maintenance was introduced into Japan from the USA. TPM focuses primarily on manufacturing and is the first methodology Toyota used to improve its global position (1950s). After TPM, the focus was stretched, and also supplier and customer were involved, this next methodology was called lean manufacturing. One way to think of TPM is 'deterioration prevention' and 'maintenance reduction', not fixing machines.

Q: What is OEE?

A: Overall Equipment Efficiency (OEE) is the main factor that may be used to meter the return on the TPM efforts. OEE is the ratio of the facility's actual output compared to the theoretical output that would be possible if the machinery was run at full speed every minute, without break-downs, lack of raw material, quality losses or set-ups. An example: A plant produces 10,000 units per year with an OEE-ratio of 50 per cent. After improvement, the project team estimates that it will be possible to reach an OEE-ratio of 80 per cent. This means that they will be capable to produce 10,000*80/50 = 16,000 units in the same facility without investments and with the same manning as before.

Q: What is Six Sigma?

A: Six Sigma is a problem-solving methodology developed in 1986 based on the work of pioneers such as Shewhart, Deming, Juran and Ishikawa by Motorola, who came to Six Sigma because it was being consistently beaten in the competitive marketplace by foreign firms that were able to produce higher quality products at a lower cost. Six Sigma uses Define–Measure–Analyse–Improve–Control (DMAIC) as its chief problem-solving methodology and a wide range of statistical, behavioural and managerial methods to improve business processes so that they reliably and predictably meet operations profitably.

Q: Should all problems become Six Sigma projects? Is Six Sigma always our preferred problem-solving tool?

A: 'No' to both questions. Examples of problems that should not involve Six Sigma include strategic moves, such as acquisitions, or what we call 'Just Do It' Projects, where the answer is already known and the solution can simply be implemented.

Q: What are the central concepts of Six Sigma?

A: Businesses achieve significant and lasting results by first improving business processes and then managing them as processes. This differs sharply from earlier practices that focus on managing departments or functions. Defects defined by customers are the basis for measuring the effectiveness of a process. Defects defined by the business (e.g. financial standards, legal requirements, etc.) are the basis for measuring the efficiency of a process. 'Sigma' is a measure of the statistical likelihood that a process will have a defect.
A process performing at six sigma will have only 3.4 defects out of every million defect opportunities.

Q: How does Six Sigma fit into other initiatives? Is a specific leadership style required to drive Six Sigma (i.e., do we need a Jack Welch)?

A: We have seen many leadership styles that make Six Sigma a success like GE's Jack Welch's role as a proponent and major motivator of Six Sigma.

Q: What is Lean?

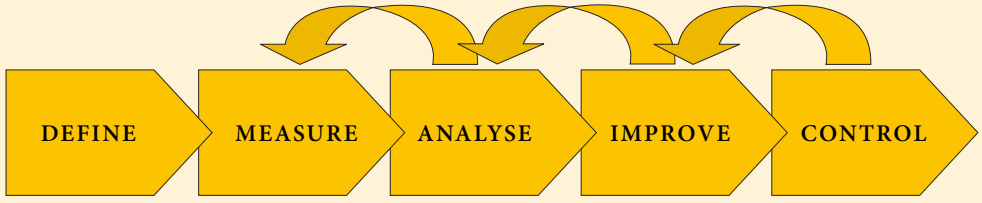
A: The Toyota Production System created since the 1940s, TPS, which is a management philosophy described by James Womack and Daniel Jones from MIT in 'The Machine That Changed the World'. Womack and Jones called TPS 'Lean'.

Lean helped the company focus on the reduction of Toyota's seven wastes, which improved the overall customer value.

The terms lean manufacturing and Six Sigma are often used interchangeably because both processes focus on a reduction of process variation. Toyota's lean manufacturing philosophy has helped them grow into one of the biggest car companies in the world.

There are only five LEAN principles from the book 'Lean Thinking' by James Womack and Daniel Jones:

1. Specify value from the standpoint of the customer.
2. Identify the value stream for each product and remove the wasted activities.



Define
- Clarify problem, business goal, process and customer served
- Set improvement target

Measure
- Establish measurement method
- Establish focus and extent of the problem (baseline)
- Identify key data for finding the root causes

Analyse
- Identify the vital few root causes through a fact-based problem solving process

Improve
- Generate improvement ideas, select/prioritise, and implement solutions, possibly in pilot form
- Plan for verification

Control
- Verify that the targets are reached and that the improvement is lasting
- Implement ongoing measures and actions to sustain improvement, including roll-out plan from pilot, if applicable

Six Sigma

3. Make value flow toward the customer as quickly as possible.
4. But only at the pull of the customer (= takt time)
5. Strive continually for perfection (= perfect value with zero waste.)

Q: Is Lean then the goal of the business?

A: No, Lean is the means of reaching a goal. The use of lean manufacturing works well for many companies today because it doesn't focus on just one aspect of the business; instead it looks at the whole business globally and helps to uncover areas of opportunity in waste reduction as well as business efficiency.

Q: What is Lean Six Sigma?

A: Lean Six Sigma is a business improvement methodology that maximises shareholder value by achieving the fastest rate of improvement in customer satisfaction, cost, quality, process speed and invested capital.

The earliest adopters of Lean Six Sigma arose in the service support functions of manufacturing organisations like GE Capital, Caterpillar Finance, US Defence, McKinsey and Lockheed Martin.

The fusion of Lean and Six Sigma improvement methods is required because:

Lean cannot bring a process under statistical control – Six Sigma alone cannot dramatically improve process speed or reduce invested capital – both enable the reduction of the cost of complexity.

Q: Which CI-tools are found in our breweries?

A: In TPM, Lean and Six Sigma several tools are shared, i.e.:

SMED: A tool for shortening change – over times at packaging lines.

5 S: A tool for organising the work place, bringer order, cleanliness and simplicity.

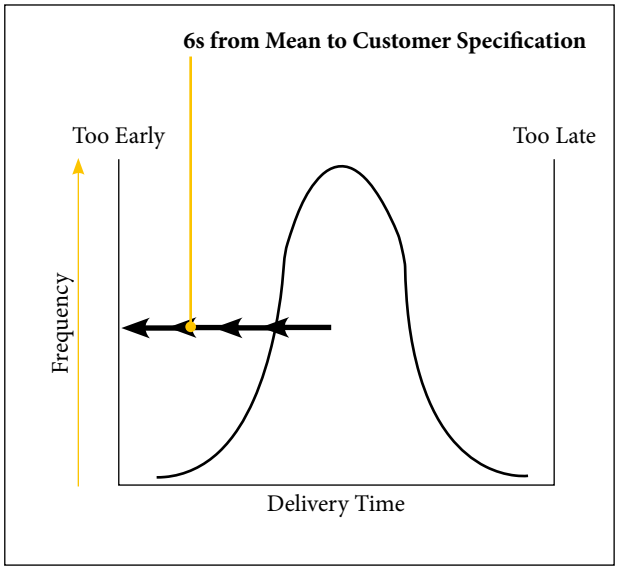
Flow: Obtaining flow instead of step movements in the manufacturing.

Takt: Is the maximum time per unit allowed to produce a product in order to meet demand.

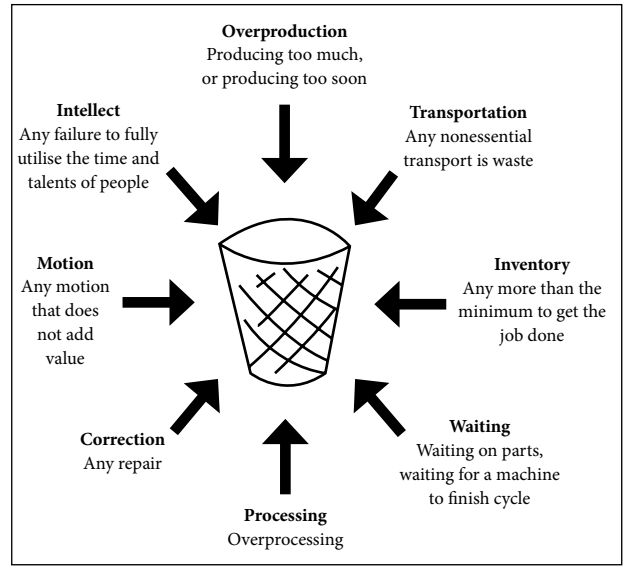
Kaizen: Japanese for Continous Improvement (CI).

Muda: Japanese for waste in a wider concept, as 8 types of wastes are identified.

PDCA: 'Plan, Do, Check, Act', a CI circle popularised by British Dr. Edward Deming in 1950s.



A Six Sigma Process



8 types of 'Muda' or Waste