There is a general perception that Lean Manufacturing and related continuous improvement businesses do not lend themselves to easy application in industries that have large batch processes, like the food and beverage industries. Typically these business types sell their product from large distribution or product mixing centers, and are not make to order businesses. They manufacture to a forecast, and usually the forecast lead time to production is long, resulting in large differences between the forecast that drives production levels, and actual demand.

The net result of this gap is large levels of inventory holdings, typically in finished goods; however, some food products also have extraordinary long procurement lead times. Many agricultural products have long growing and maturing cycles, and others very short cycles between picking and sale to the end user. Shelf life for many products can be extremely short, and for other products, procurement cycles are well over a year, with procurement being executed through large scale commodity markets. Food processing lead times, that is from the time a machine is turned on to make, to the final packaging can however be quite short. These many variable combinations of lead times, growing cycle times and production lead times add complexity to an already complex business. We shall examine some of the issues that food and beverage manufacturers face.

The biggest obstacles for food and beverage processors in terms of adopting Lean manufacturing approaches to improvement.

Notwithstanding the many differences to other industries, the food and beverage industry has many similarities to other industries. Not the least of these is the fact that product is processed just like other forms of manufacturing. Health and safety considerations add to the complexity of processes, but do not alter the fact that they are still processes that can be improved. Also companies in this industry have the same cost, quality and delivery pressures as any other type of business. The biggest obstacles remain the same therefore, as any other type of business and are generally as follows;

- Lack of persistent and challenging leadership.
- Lack of a clear vision of the future and of what is possible to be achieved.
- Failure to link the processes in kaizen with normal work. It is often seen as a separate program and not part of everyone's formal work
- Lack of patience and follow through.
- Failure to perceive that lean is a viable strategy to help achieve competitive advantage.
- Failure to engage and involve employees at all levels in the process from an early stage.
- Lack of constant visibility by management on the shop floor or gemba.
• Holding to the presumption that lean methods cost a lot of money. This results in indecision and failure to act.
• Failure to see that management must use lean methods to change the culture. The usual view of lean is that it is a narrow technical means to save cost. It is a highly integrative socio/technical strategy.
• Failure of management to take a whole systems view of the business and to see the connections between all processes.
• Persistent focus only on demanding results without a balanced focus on improving the processes that achieve the results. The goal is to have a proper balance between these two facets.
• Perpetuating a blaming and judgmental culture.

**Muda that is inherent in a batch processing approach**

Muda (or waste or non-value added activities) can take various forms. The typical types of muda are as follows

- Muda of overproduction
- Muda of inventory
- Muda of transportation (of material)
- Muda of motion (of people)
- Muda of over-processing
- Muda of rework
- Muda of waiting

Typical examples of muda in large batch processing include muda of overproduction, inventory, waiting, and of course rework if what has been made has defects.

Muda of rework or poor quality is a constant issue, and the application of total quality or 6 sigma strategies to improve quality are most relevant. Some processes are by their very nature of the batch type, and the food processing industry has many of these. All bakeries, liquid processes such as breweries, wineries and canned soda drinks, the canning of foods, and many other food processing methods are of the large batch type.

The goal in sound inventory management is to produce just what the customer wants for delivery when he needs it. Muda of overproduction is the manufacture of product that has not been requested, typically driven by an outdated forecast, leading to excessive inventory, and in many cases inventory lying idle or waiting. This issue is true both in terms of finished goods produced and not consumed or sold, and for WIP or partially processed items waiting for further processing.

The application of Lean here is the same as for other industries, to remove all forms of waste in the production process, to ensure good quality, and reduced lead-time through the transformation processes. Many agricultural products are of course only harvested at specific times of the year, and are processed in large batches regardless of the spread and frequency of customer demand. Just in time production is therefore not possible, but the application of Lean to improve quality and some elements of cost and delivery remain present.
The Total Productive Maintenance/Lean fit

Kaizen is the overriding philosophy that has driven the implementation of World Class Manufacturing strategies. These strategies, which include Just in Time (JIT), Total Quality (TQC), Total Productive Maintenance (TPM) and Total Employee Involvement, all result in improved cost, quality and delivery to the customer.

The process of implementing kaizen, lean, or continuous improvement in the workplace, requires that these strategies be integrated. In the implementation of JIT, one result of extensive improvement activity is reduced inventories, but this requires extremely reliable production processes. Machine downtime cannot be tolerated as there are typically very low inventory levels between processes that can be used to keep other equipment running. TPM is an essential strategy to prevent equipment downtime, to improve the quality of the output and to ensure that JIT strategies actually work.

Total Employee Involvement in Kaizen or Continuous Improvement

There are typically two levels of involvement in kaizen practices that lead to the involvement of employees. The first can involve every employee relatively quickly and easily. One of the most basic kaizen practices is called 5S or workplace organization. 5S stands for the five steps of improving workplace organization, namely, Separate and Scrap, Straighten, Scrub (Clean), Standardize (the practices), and Systemize and Spread the methods. A plant wide 5S campaign can be started very easily and can involve every employee.

The second level is the focused improvement activity that is applied to work areas and would involve employees in those areas. This is typically called a kaizen event or blitz. The process involves doing a series of focused improvement sessions, usually three to five days, on a work process. Each time a session is held, a different improvement approach will be adopted, depending on the constraint or need. The employees learn lean practices as they are implementing them.

Members of a KAIZEN team

A typical Kaizen team would consist of the employees involved in the process to be improved, the supervisor or shop floor leader of that process, appropriate staff resources such as people from maintenance, quality, logistics, finance and human resources, engineering, product development and so on. The team should be between eight and twelve in size.

Company overstaffing

The fact that many companies are overstaffed by around 30% is based on the assumption that companies that have not pursued an aggressive lean strategy and will have large amounts of non value added processes in place. This will typically mean excessive people doing unnecessary work. When Kaizen events are run and improvements are made to both production and administrative processes by streamlining them, this typically results in less work being required to produce the same output, with fewer people.
This aspect would probably also apply to the food and beverage industry.

Overstaffing in production is most common in a component assembly environment. Capital intensive industries such as paper making would have a lower tendency for overstaffing at this level.

**Typical cost savings from a Lean approach**

Cost savings will occur from the implementation of kaizen strategies, but just what these are will depend very much on the nature of the improvement and the type of operation and company. It is easier to describe the nature of typical improvements in the following way. The data shown is typical of kaizen improvements and results emerge very quickly.

**JIT/Work cell Development/Flow improvement for manufacturing operations**

Creating one piece flow work cells results in:
- Reduced inventory in the work cell by 50 to 90%
- Reduced space taken up by 10 to 50%
- Reduced lead time of the product through the work cell by 50 to 90%
- Reduced labor allocated to the line by 10 to 35%
- Improved rate of output by 10 to 45%

**Changeover/Setup Reduction**

Here the speed of a changeover time from one production run to a new one is dramatically reduced. This results in improved equipment capacity, but also gives the operation improved flexibility. Inventory is reduced as lot sizes of production are reduced, sometimes by as much as 90%.

**Total Productive Maintenance**

Improving maintenance practices usually results in more equipment reliability, affecting uptime, quality and capacity. Improvements in uptime range anywhere from 30 - 75% depending on the extent of the downtime problems on equipment. This results in reduced material waste and lower maintenance costs, both of which are evident in the income statement. Equipment life is extended preventing new equipment purchase and the resulting higher depreciation charges.

**Total Quality Control**

As the focus here is improved product quality, the result of this type of kaizen effort is reduced material waste and of course reduced costs. Improved practices in production reduce inspection costs as well. Poor quality is often the result of too much variation in the process.

Variation has many causes, notable poor operating standards that come from no documented and implemented standards, poor operator skills, and old and run down equipment that cannot sustain operating tolerances. Improving standards by documenting them and training operators will reduce variation, however it is also appropriate to deploy sound measurement tracking processes...
and problem analysis and solving methods to reduce this variation. 6 Sigma improvement methods are part of this approach.

**Overall effect on financials.**

The improvements described will impact on the financial statements in a variety of ways. Much of it will be improved opportunity cost, in other words, future costs are prevented such as the building of new facilities to support manufacturing. Lean activity would save space and often avoid having to add new buildings and the depreciation charge that would be made that would affect costs. Better utilization of cash would also result.

Inventory reduction and higher inventory turnover will positively affect cash flow, and will allow for improved operating capital utilization. The effect will mainly be in the balance sheet and not in the income statement, although reduced inventories results in lower debt interest for debt used to fund inventory holdings.

Labor savings would directly affect the bottom line. Improved productivity would result in a better overhead or burden absorption, thus also reducing unit cost. Improved machine uptime as a result of TPM implementation usually results in improved capacity utilization, improving ROI/ROA calculations. Also additional capital expenditure can be avoided if capacity was a constraint, resulting in lower depreciation charges against margins. This also improves operating capital ratios.

Improvements in quality obviously result in less waste of material, and this directly affects material costs in the income statement.

**Food/Beverage industry examples and a typical improvement activity**

The first example is a large food canning operation. Typical processes included large batch raw food sorting and preparation, cooking and high speed, high volume canning. The typical improvements included improving the flow of certain operations, reducing space, distance traveled, improved equipment utilization and improved material handling methods. Production lines were shortened and in some cases the flow of material and the layout changed resulting in reduced labor being allocated to the line. Inventory reduction was the largest gain, mainly through improving production flow and equipment reliability. TPM practices were installed resulting in less reliance on inventory holdings to act as a buffer. Machine uptime also resulted in less waste of food.

The second example was a fresh fruit and fancy goods mail order business. The processes included sorting and packing fruit, canned goods, baked goods and confectionery in a variety of packaging types. The plant also had a bakery and confectionery kitchen. Due to the short shelf life of some of the produce, a fast turnaround of items was essential.

The improvements made included streamlining several packaging lines, improving the flow, reducing the lead time through the packaging process, reducing the number of people in the lines, reducing waste through improved food handling methods, and improving the changeover time
between different production runs on the same line.

**Resistance to change**

There are no secret or mysterious ways to prevent resistance to change. Hard work is required, mainly by management who must lead in a challenging and visionary way. They must set targets and goals and provide the resources to get it done. They should never accept current conditions as being acceptable. Employees and engineers should be shown how to make improvements through training, and exposure to other companies.

Management must ensure that no one suggests that their situation is so unique and that improvement practices or kaizen cannot be applied to them. Management should focus on using those people resources that support the notion that things can be improved, and not worry about those who resist. It is not productive to wait until everyone sees the light? Make the improvements and then people will come around.