

## **FISH TO PLATE: “THE LEAN ROUTE”**

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### **ABSTRACT**

The economic viability of the fishery will be dependant on the ability of the processors to deliver desired products to their customers, when required. The ultimate goal must therefore be to identify what the customers want and then to optimise the process that delivers the final product.

Catching fish is only the first part of the process, and once caught, the fish have to proceed through numerous processes before the product reaches its final destination. We know these interlinked processes, which transform the raw material into the final product, as the value chain.

Modern manufacturing techniques, such as Lean / Six sigma applications, allow us to identify the value adding activities and non-value adding activities along the chain. Traditionally, each stage of the manufacturing process has been viewed and optimised in isolation to the remainder of the value chain, leading to an overall sub-optimal process. However, by removing the non-value adding activities we can allow the product to reach its final destination quicker, fresher, and at the right quality standards, in an optimised manner.

The UK Sea Fish Industry Authority is working with a number of processing companies to explore the application of Lean manufacturing techniques in the seafood industry.

This presentation identifies the opportunities of implementing Lean / Six sigma applications in the fish processing sector, in order to optimise the different stages of the value chain. Non-specific empirical examples are given.

### **INTRODUCTION**

Price, quality and source of supply are becoming a basic customer requirement for seafood products. Processors continue to source seafood globally, driven by price, availability and the need to comply with retailer specifications and sustainability requirements (Sea Fish Industry Authority).

The seafood processing sector in the UK is undergoing market consolidation resulting in fewer larger processing companies internationally owned or financed. The primary processing sector still consists of a large number of small enterprises requiring support and assistance. Profitability remains below food industry norms as processors battle to meet a static product specification and variable demand profile, with a seasonal wild catch.

Given the growing pressures on the processing sector Sea Fish and Scottish Enterprise launched a value chain project aimed at improving the efficiency of the value chain in 2004. The Food Chain Centre and Red Meat Industry forum have piloted Lean manufacturing techniques, which have led to efficiency improvements. Sea Fish began the project working with two fish processors, one

large and one small. The overall objective of the project was to pilot Lean / Six sigma tools and techniques in the seafood processing industry. Once the tools had been trailed in the processing factories then they would be trialled further along the chain. The ultimate objective being to roll out the tools and techniques to the rest of the seafood industry should the project be successful.

This paper reviews the use of both Lean and Six Sigma techniques in the seafood processing industry to determine if they are applicable business improvement techniques.

**LEAN MANUFACTURING**

Lean manufacturing is the relentless effort to systematically reduce waste whilst improving the flow of value to the customer (Pascal D). The principles of Lean manufacturing are not new, and they have developed over a number of years. Henry Ford was famous in 1914 for his version of Lean production.

Womack, Jones and Roos coined the term Lean in the 1990's; it came about as the result of a global benchmark project undertaken in the automotive sector. Factories in Japan and Europe were compared and the comparison highlighted huge gaps in performance between Toyota & other Japanese Lean producers and western mass producers (Womack J, Jones D, and Roos D).

As part of the knowledge transfer process, Womack, Jones and Roos renamed the Japanese manufacturing techniques as Lean Manufacturing. The term Lean has spread in popularity since the early 90's although the techniques are still not widely applied. Toyota itself, which employs Lean techniques, goes from strength to strength. Since its start up in 1948 after the Second World War Toyota has become one of the largest car manufacturers in the world. In 2004 it overtook Ford to become the second largest car producer in the world. By 2010 it plans to become the largest car producer in the world.

Womack, Jones and Roos identified significant business opportunities in the automotive sector (Table 1) through the implementation of Lean. Whether these savings can be made in all industries is still open to debate. The figures also assume a total Lean implementation within the company that can take several years to complete. In reality a Lean implementation is never complete because it is a never-ending journey.

Productivity	+200%
Production lead time	-90%
Inventory	-90%
Errors reaching customers	-50%
Scrap in progress	-50%
Job related injuries	-50%
Time to market (NPI)	-50%

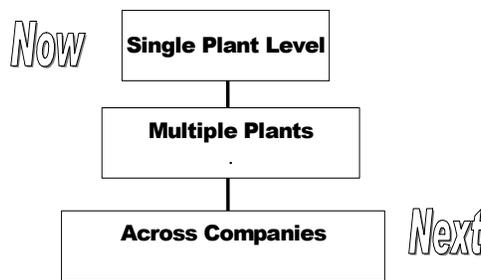
**Table 1. The Benefits of becoming Lean**

**THE VALUE STREAM**

Lean is about specifying value from the final products point of view. Ultimately it is about identifying the products value stream, the steps it travels through from start to end of the process and then defining the steps as value adding or non value added from a customer’s point of view. Once the non value adding steps have been identified then projects can be undertaken to reduce / eliminate the non value adding steps. The result is to make the product flow through the process. The next stage in the improvement process is to only make the products when the customers require them and constantly strive towards process perfection.

**VALUE STREAM MAPPING**

Value stream mapping (VSM) is a Lean tool traditionally used to drive out waste - non value adding activities - in a process. Rother and Shook advise that the best place to start mapping the process is inside the company and then expand out along the value stream to suppliers and customers (Figure 1).



**Figure 1. Mapping the value stream.**

VSM has been used successfully as part of a Lean transformation in a number of industries; medical device manufacture, building, automotive manufacture, agriculture and some NHS applications.

The power of the VSM tool is its ability to identify the non-value adding activities or waste along the value chain. Waste comes in several forms. Traditionally waste has been viewed as scrap, or rejects from a process but the Japanese took the concept of waste further, they expanded the definition of waste and came up with 7 different types of waste (Table 2).

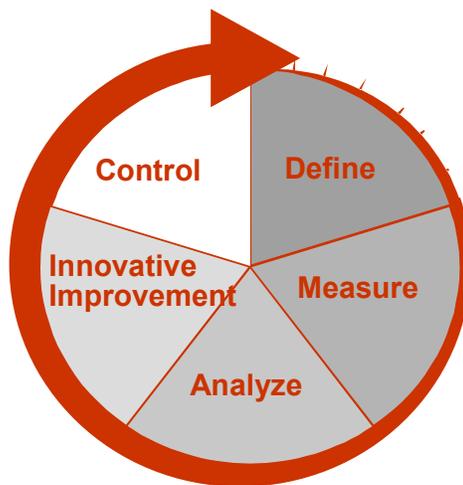
<b>The seven wastes (Non value adding activity)</b>
Overproduction
Defects
Unnecessary motion
Unnecessary inventory
Inappropriate Processing
Transporting
Waiting

**Table 2. The seven forms of waste**

**SIX SIGMA**

The ultimate goal of Lean manufacturing techniques is to systematically reduce waste whilst improving the flow of value to the customer. Six sigma techniques can complement Lean techniques by identifying and eliminating variation in a process.

Six sigma tools and techniques have been widely used across manufacturing and service industries and is sweeping the globe (Eckes G). Six Sigma methodology involves a series of steps to improve a business process. Define, Measure, Analyse, and Innovatively Improve and Control (DMAIC) each step involves the following activities (Figure 2).



**Figure 2. The relentless effort to systematically reduce variation and eliminate defects.**

- **Define** The scope of the project, who is involved, the time scales, the expected outcomes of the project and who are the key stakeholders
- **Measure** The performance of the existing process and the monitoring system that is used. Identify available data and data gaps.
- **Analyse** From the data that was collected are there any patterns in the data that allow us to hypothesise which inputs of the process directly affect the outputs of the process.
- **Innovatively** Improve the process and demonstrate that improvements have taken place.
- **Control Implement** The new improved process and ensure that controls are put into place to ensure that the process does not drift back to the way it was.

**FISH PROCESSING AND VALUE STREAM MAPPING**

As described previously VSM is a key Lean technique and works particularly well no matter what size of processor as it maps the flow of a single product through the factory. The approach works well in identifying non-value adding activities. This in turn allows the whole process to be reviewed and projects set up to remove the non-value adding activities.

A distinctive feature of the fish processing industry compared to other manufacturers is that the raw material supplies and products demanded can be seasonal. The result is that processors have to buy the product when it is available and freeze it so that product is available for the final customer all year round. This can lead to high inventory levels.

Through the use of VSM a current state map can be drawn (Figure 3). The map identifies the current process in terms of the manufacturing process, the data flow process and the timeline.

## The Current State Map

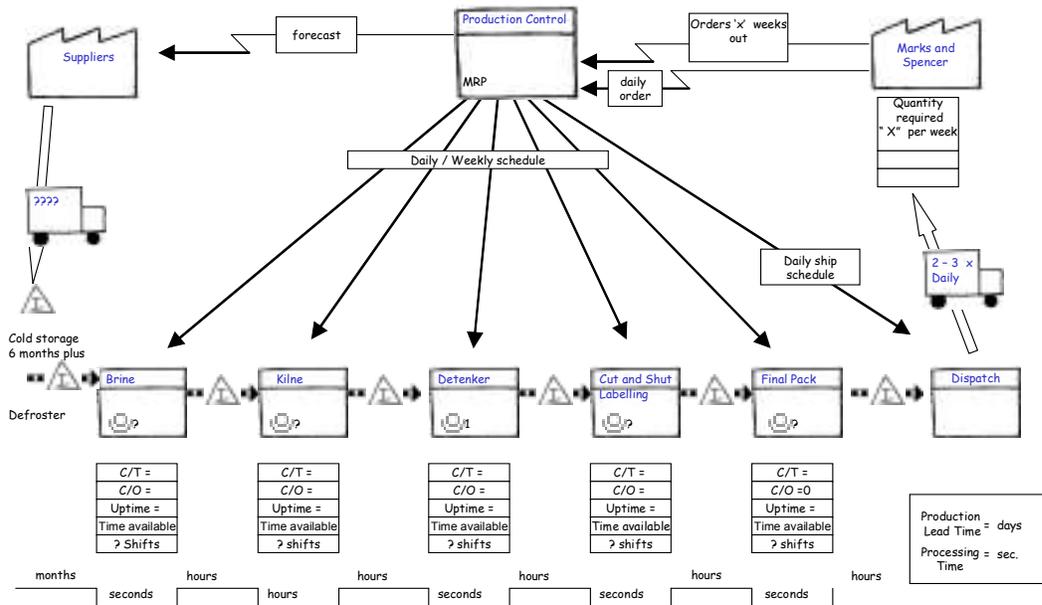


Figure 3. The current state map

The seven wastes framework proved useful in identifying sources of waste and potential improvement opportunities. The following observations were made during the project.

- Waiting. Operators waiting for product to arrive for them to process. Infrequent supply of defrosted raw materials.
- Overproduction. Large quantities of stock were produced with no final customer
- Defects. Defects are produced, identified and either rectified or scrapped.
- Unnecessary motion. Due to layouts of storage racks and operators travel large distances
- Unnecessary inventory. Large stocks of work in progress were kept in chills causing congestion in the process.
- Inappropriate processing. More work is performed on the product than is asked for in the specification.
- Transporting. Product is constantly pushed in and out of chills.

Projects were set up to reduce these areas of waste, which helped to improve the efficiencies of the production process and ultimately the profitability of the line.

### **FISH PROCESSING AND SIX SIGMA**

The systematic methodology of six sigma helps to identify process problems. Through the establishment of the existing process baseline, it has been possible to determine if true process improvements have been made. During the value chain project improvements have been made in the following areas.

- Reduced scrap
- Improved yield
- Improved process capability to meet the customer specification.
- Improved ability to compare processes
- Optimised equipment
- Reduced cost

### **OTHER ISSUES**

During the project it was observed that the tools and techniques themselves could not be used in isolation and other factors had to be taken into consideration.

- Senior management buy in and commitment.
- Spread of Lean / Six sigma thinking knowledge
- Buy in at all levels of the organisation.
- Training, availability of time to train people
- Team working. Many foreign nationals work within the processing industry and language can be a barrier to communication and team working.
- Supply chain issues. Not all retailers take a long-term view to supply chain improvements and switch supplier mainly on cost. Suppliers will be less willing to join a supply chain working group with some retailers.
- Size of the company Lean and Six sigma have worked well in large organisations roll out plans for small processors will be different for small and large companies.
- Individual company objectives. Do they want to become more efficient?

- Project timescales. Often tight deadlines with changing customer priorities cause project timescales to elongate due to the limited resources of companies.

## **CONCLUSION**

Results to date have shown that both Lean and Six sigma tools and techniques can be used extremely successfully in the industry with six figure savings being realised to date. Based on the success of the project, Sea Fish Industry Authority intends to roll out the value chain project to other fish processors within the UK.

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