

Case-study of  
**Competitive Manufacturing**

*Formula Cruisers*  
*Hobsonville, December 2010*



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## Case study reference

This case study must be read in conjunction with the combined NZ Marine ITO case study. The case studies can be found at [www.cmi.org.nz](http://www.cmi.org.nz) under the case study tab.

The case studies held within the NZ Marine ITO case study are;

- 7-1 NZ MARINE ITO Case study
- 7-2 Jucy by Design
- 7-3 Formula Cruisers
- 7-4 Black Pearl Fibreglass and Work & Play Trailers
- 7-5 Stabicraft

### Background

At the time of writing this case study Formula Cruisers was a 26 year old company with over 250 years of combined experience in customized boatbuilding. In 2010 the company employed 18 staff, but this fluctuated to meet build demand. The Formula Cruisers' flagship design and build was the 'ICON' boat series.

According to company management the business had built its ongoing success around the principle of absolute customer satisfaction. This apparently expressed itself in repeat-order customers who had become part of the growing "Formula Family."

The company's claims to excellent customer service included:

- A worldwide spare parts/service availability.
- A comprehensive 10 year warranty.
- Personalized customer service.
- Boats with advanced hull shape for great on-the-water performance.
- Boats with superbly detailed and finished interiors.
- Boats built by a company with both Best Practices and Continuous Improvement as core values.

### Situation

Formula Cruisers was the first marine company to start the journey of Competitive Manufacturing (CM) with the New Zealand Marine Industry Training Organisation and *QCDSystems* as coaches.

In 2007 the Formula Cruiser business plan had been revised to actively target offshore markets in order to grow sales and increase the number of build projects completed per year.

In order to achieve increased output, they identified the need to implement a controlled production system to enable closer monitoring of well controlled improvements across the board through reduction of waste.

To enable this journey top-tier management had to embrace and fully commit to the mantra of "*you cannot manage what you do not measure*".

Whilst the expected growth on build projects had not yet come to fruition when this case was written, the improvements through reduction of waste on individual projects had increased their overall gross profit and were a major factor in helping the company to weather the 2009 financial crisis.

### Focus on reducing waste<sup>1</sup> (= cost)

In an attempt to reduce cost the company first needed to understand where waste occurred within the business. Competitive manufacturers identify seven forms of waste that don't add any value to the final product. Identifying and eliminating waste was therefore synonymous with reducing cost.

In custom boat building the vast majority of all cost can be directly allocated to the final product as production-hours per boat. Therefore in simplified terms the total waste added up to the total number of hours it took to build a boat.<sup>1</sup> Reducing waste would result in reduced production time per boat.

The following sections illustrate how each of the seven forms of waste was tackled individually in a quest to reduce the total waste (or total build hours per boat).

From the first benchmark build Boat #1 (see Figure 1) with no formal continuous improvement process in place, a 22% reduction in man hours was achieved on Boat #2. On Boat 3 a further 11% was reduced, making a 33% reduction achievement overall.

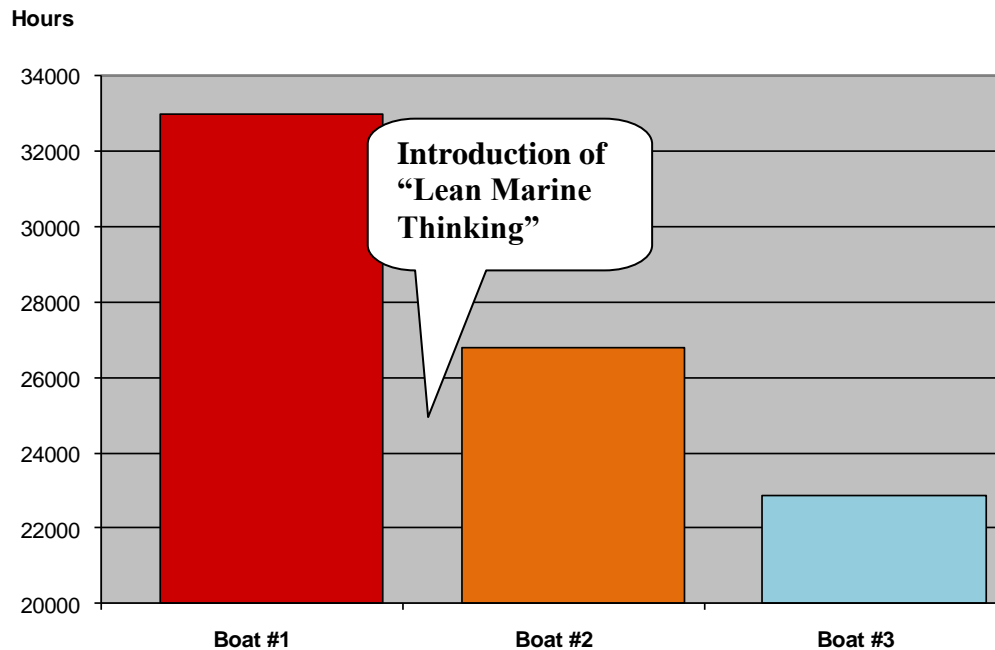


Figure 1: Build times per boat

<sup>1</sup> This view is neglecting the material cost and overheads, which are relatively small compared to the amount of direct labour cost.

## Waste #1: Defects

From experience the management at Formula Cruisers estimated approximately 10% of overall boat build time could be attributed to dealing with quality and material defects. In other words, Formula Cruisers could cut the cost of production of a boat by about 10% by eliminating defects, one of the seven forms of waste recognised by CM.

Reducing and eventually eliminating defects was therefore an important goal. However this could only be achieved by implementing a continuous system of defect identification, decision making, and defect remedy.

An important first step was to identify and record the defect and share it with the rest of the team. The objective was to find and apply a remedy as quickly as possible, preferably on the spot and preferably by the person who identified it or the supplier that supplied it.

Formula Cruisers Ltd					
Defect Report	101(RW) Plastic covers on locks on all doors fwd.				
Department	Install	Boat No:	18		
Date	01/10/10				
Operator	ROD				
Criticality	High	<input checked="" type="checkbox"/>	Medium	Low	
Summary Description	Used EASY OFF BAN ON CLEANING doors etc. discoloured all plastic.				
Detailed Description	- DISCOLOURATION ON ALL PLASTIC COVERS ON LOCKS INSIDE FWD UNIT DOORS. - USED CORROSIVE CLEANER. INSTEAD OF THE USUAL SPRAY & WIPE.				
Remedy	- REMOVE ALL COVERS AFFECTED. - SPRAY COVERS. - INSTALL AGAIN.				
Estimated Cost	Labour		Materials		
Reviewer					

At Formula Cruisers a simple A4 defect report template (see

Figure 2) was used for this process. It also contained the information to remedy most causes. During the team leaders meeting the concern was passed onto the supplier, be it internal or external, and recorded on their defects page. Allocating responsibility to remedy the issue was the other important success factor in the process.

As the team gained confidence with this approach, ideas to remedy defects started coming resulting in a significant reduction of rework. Often remedies had to be stored and were not applied until the next boat build.

Figure 2: Sample defect report

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### Waste #2: Overproduction

Formula Cruisers only built to customer order. This created a natural resistance to overproduction as a general rule.

General Manager Grant Senior found that he was constantly communicating with everyone regarding progress in their work. Team members spent a great deal of time supplying him with all kinds of information and details on the progress of the build.

As the QCDSM system<sup>2</sup> began to take hold, a number of systems were put in place that set targets and expectations but also created a coordinated feedback process closing the loop of information flow.

Grant found that as the systems improved and the quality of information recorded became more accurate, the amount of requests for information decreased. These systems ensured that Grant had all the information he needed at his finger tips. Writing weekly reports on progress was simple and better still accurate. Grant had now the right amount of information required for him to manage the business efficiently.

This however did not take Grant away from the reality of seeing the build take place on the shop floor. In fact the improved systems freed up some of his time which could be spent closer to the shop floor.

Grant realised that excessive chasing of information regarding production (in an attempt to avoid overproduction) was just as wasteful as overproduction itself. The improved systems to manage production and also communicate with production teams had led to an overall reduction of time per boat build.

### Waste #3: Excessive Inventory

For a typical NZ\$2.5m boat build Formula Cruisers had to order about \$1.3m of material. In the past, after completion of the build usually many thousands of dollars and sometimes tens of thousands of dollars were left over in the form of piles of spare parts, materials, valuable off-cuts, and left over consumables. This issue of excessive inventory at the end of every build was one the company got used to over the years.

The new thinking and focus on reducing waste prompted the team to try and do something about this reoccurring practice. As the team talked about the issue and tried to solve it they realised they were only scratching the symptoms and not addressing the cause.

The company had no formal process of ordering and stock control of materials in place that was known and practiced by everyone.

As a suitable ordering and stock tracking process was sketched out more problems were identified and solved and systematically the process was refined until the team was confident they had 'a system' that worked for them. (see Figure 3) The focus was to ensure they ordered what they needed just-in-time but with an added authority level to have control over the system.

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<sup>2</sup> Quality, Cost, Delivery, Safety and Morale (QCDSM) is an approach to business operations that empowers workers to take ownership of their productivity and output and work as a dynamic team to continuously improve their processes and performance. Results of this approach include reduced need for external management and supervision, improved quality and delivery, reduced costs and high team morale. (Source: <http://qcdsm.com/>)

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Systematically they worked through their stores and used up any excess inventory left over from previous boats, without compromising quality. On build #3 the production teams had a mere \$100 worth of inventory left over after completion.

ORDERING AND STOCK TRACKING FLOW CHART

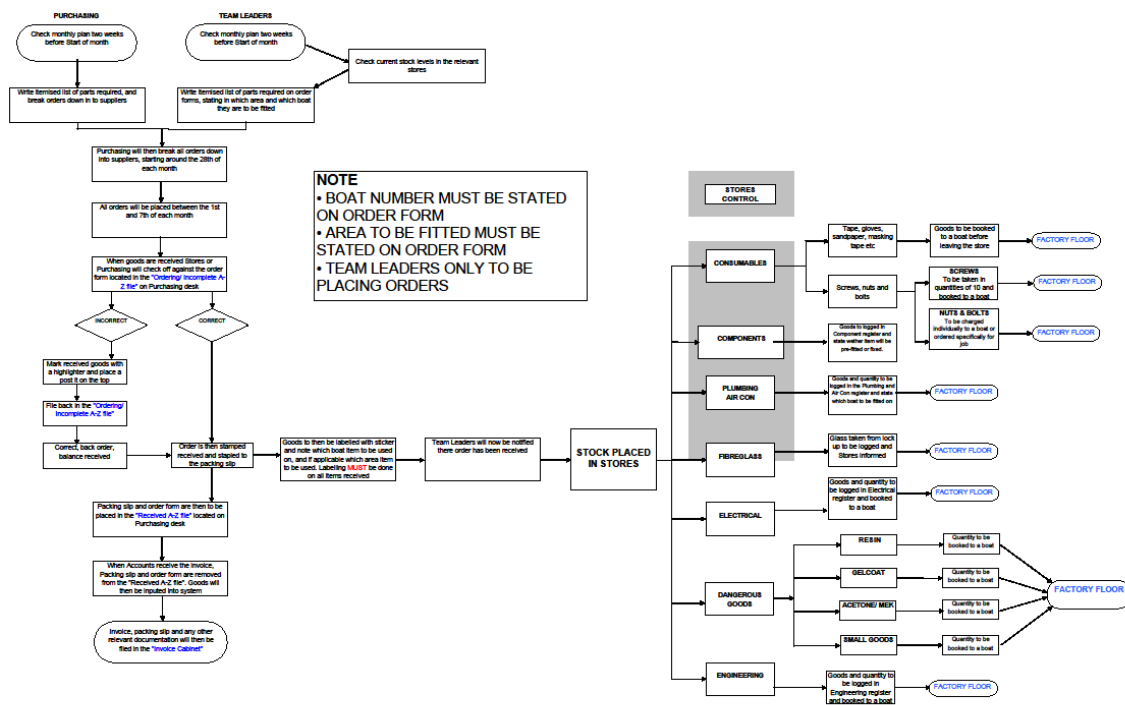


Figure 3: A detailed process map is at the heart of the system that has made significant impact in reducing both the waste through excessive inventory and transporting materials.

## Waste #4: Transporting

A model of the 'ICON' series was made up of thousands of parts and many different 'raw' materials. Large quantities of some materials had to be on hand at the right time to ensure the smooth flow of the build, whilst specific items had to be sequenced for the build to flow smoothly.

In the past the material flow was ad hoc for a number of materials and parts and often caused delays. Hidden in this process were courier charges which could be equated to poor planning of the material supply. On boat #1 the courier fees were around \$15,000.

The process was analysed (see Figure 3) and the new system began to manage the Just-in-Time supply of materials and parts. All materials were now ordered to optimise the transport to the site in Hobsonville.

Boat #3 created a reduced bill of courier fees of around \$6,000. This 60% reduction in transport cost could be attributed to a lean thinking system of order and supply.

### Waste #5: Waiting

It took around 11 months to build a model of the ‘ICON’ series of boats. Many boat building companies, as is the case in any industry dealing with long-term projects, often suffered from an inability to meet the distant delivery date. Despite computerised project management systems deadlines were still difficult to meet.

The root cause of this issue is everyone (every team/ every process step) built within their own ‘time-buffers’. Although the timeline of the total build project was seen by most, their individual input into the process was not optimised.

The Green Room morning meetings and Quality, Cost, and Delivery measures visibly displayed vastly improved everyone’s input. The graph below (Figure 4) illustrates how build times across all main processes came down for the past three boats manufactured. This visual representation had an extremely motivating impact on everyone.

The team leaders and managers weekly meetings with good quality data managed to synchronise what everyone was doing and the greater team began functioning as one. Good visual communication coupled with good data systematically gnawed its way into these ‘time-buffers’ and an improved flow of processing reduced the time to build the end product.

At time of writing the build time for an ICON model was down to 9.5 months.

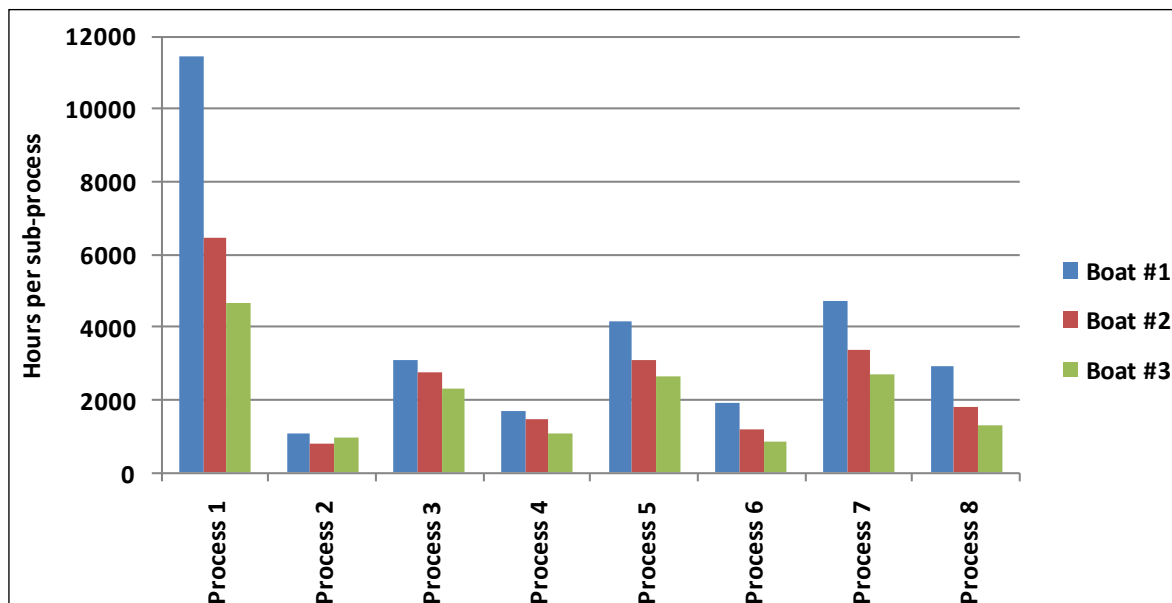


Figure 4: Build time by boat and sub-process; significant savings materialised in all processes due to reduction in waiting.

## Waste #6: Unnecessary processes/processing

Within a few weeks of starting the CM journey the visual management of important KPI's on a large board in the Green Room was introduced. The board and the QCDSM measures themselves also proved to be a journey of continuous improvement.

The measures and the accompanying ideas and suggestions took some time to sink in and be applied on a daily basis. A big challenge was the need to stay disciplined and keep recording on paper. Items and measures to be recorded were decided upon and the teams actively worked on using them.

As time went on teams realised that some of their recordings were not adding value and therefore they systematically reduced the paperwork<sup>3</sup> to the simple and effective set of papers seen below in Figure 5.

This proved the team had the ability to analyse what they did and identify unnecessary process waste, which didn't add any value.



**Figure 5: The whiteboard in the 'Green Room' where the team met for planning, checking their performance and activities, while adding ideas for continuous improvement.**

Thinking 'outside the square' to reduce processing came to the fore when the various 'tanks' that went on a boat were analysed by the Formula Cruiser teams. New boats would be built with tanks that were brought in from suppliers, as this would reduce the amount of processing, especially in rework, to complete the boats even quicker. In this case CM

<sup>3</sup> One other new paper-based tool is a diary of specific instructions, notes, and comments that is found on the table next to the board.

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thinking has helped Formula Cruisers to make a strategic decision for buying in certain parts rather than building the tanks themselves, which allowed them to focus on core activities.

### Waste #7: Excess Human Motion

Many people were familiar with the slogan, 'work smarter not harder' as part of management philosophy. For everyone to realise that the customer did normally not want to pay an employee's wages to sweat, was a paradigm shift.

Most employees would want 'tools' to help them work smarter not harder, however staff had a natural tendency to be creative and come up with ideas to achieve 'smarter not harder' in the workplace.

Formula Cruisers had introduced many new jigs that greatly reduce the amount of motion out of the tasks. The process that captured this was called the Detail Process Sheet<sup>4</sup>, another name for standard practice, which feeds into a continuous improvement process that could be measured and sustained.



**Figure 6: Improved application of resin on the foam through use of long handled roller reduces time and repetitive awkward movements.**

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<sup>4</sup> A Detailed Process Sheet is a living document in that once it is implemented as the 'standard' for the result; it becomes the basis on which gradual and continuous improvement is built. In the Green Room meeting there is a scrutiny of the document against the results, which will allow for the improvements through ideas, suggestions and problem solving activity to be written into the document, retrained and monitored. (Source: qcsm.com)

## The Result of a combined team effort



**Figure 7: Boat 3# was delivered on time, in specification and with 33% less build time, thanks to Lean Marine Thinking by the team.**

*“Somewhat surprisingly, but pleasing to us is the uptake in the process by our staff on the floor. To have structured and monitored processes giving them clear targets, identifying internal defects and allowing them to be part of the improvement process has been welcomed and embraced by all. The Lean Marine Thinking has not only improved our bottom line per boat, it has brought our team together to further improve our processes and ‘own’ both our decisions and results.”*

**Troy Woods, Sales and Marketing Manager**

*“The benefits of the training, embraced company-wide by everyone from me to the newest apprentice have been widespread. Not only has it helped us weather the current financial crisis and improved our Gross Profit, it has also brought our staff closer together, enhanced teamwork and helped us improve all of our internal processes. When we decided to adopt Lean Marine Thinking, we quickly realised that we need a ‘whole of company’ approach and that this would have to be led from the top. As we were the first company to start Lean Marine Thinking and use the QCDSystems approach in New Zealand, we therefore put all of our top management, including myself, through the programme before introducing it to the shop floor. Now everyone is on board, there is superb uptake in the process by all staff and we are enjoying the benefits of having a well managed, thoroughly monitored, and controlled production system right throughout the company.”*

**Grant Senior, General Manger**

*“We now have apprentices who call me over to take photos of the quality of their work. Now you know to achieve that level of engagement is what you dream of. I have now a brilliant team and I have achieved my personal goals within a few years. The communication on the floor is so good that we solve most of the problems right here, quickly. All of this came together for me and all of the team when we experienced the TRY-Z, as we could all see where we could use this thinking in building our boats. We have used this knowledge to achieve the results the customers receive.”*

**Leon Ford, Production Team Leader**

## **A final word from a happy customer**

*“I am in total awe at what you have crafted for me. (see Figure 7 above) This has blown away all of my expectations. Your attention to micro details and fine tuning is exceptional.”*

### **Training focussed on specific unit standards**

8087 – Use core quality tools, 21501 – Apply CM practices, 21502 – Sustain Process Improvements, 21503 – Manage Change, 21504 – Apply quick changeover, 21505 – apply Just in Time, 21506 – Apply cost factors, 21507 Interpret product costs, 21515 Root cause analysis, 21332 – establish improvements and 21333 – Basic workflow. These enabled all members of the team to actively participate in identifying and initiating improvement actions.

**Specific skills and tools used were:** QCDSM measures, check-sheets, Internal external changeovers, Project management, customers and suppliers, workplace improvement, visual management, recording data effectively, brain storming, capturing ideas, improvement sheets, photos as records, seven wastes, role of leaders and recording of standard practice by a DPS.

## Appendix

The following table lists the full detail of the unit standards referred to in this case study. Further detail can be obtained from the NZQA website at [www.nzqa.govt.nz](http://www.nzqa.govt.nz).

NZQA ID	Title	Level	Credit
8087	Use core quality management tools	3	5
21501	Apply competitive manufacturing practices in a competitive manufacturing organisation	2	5
21502	Sustain process improvements in a competitive manufacturing organisation	3	3
21503	Manage the impact of change on own work in a competitive manufacturing organisation	3	3
21504	Apply quick changeover procedures in a competitive manufacturing organisation	2	5
21505	Apply Just in time procedures in a competitive manufacturing organisation	2	5
21507	Interpret product costs in a competitive manufacturing organisation	3	5
21515	Undertake root cause analysis in a competitive manufacturing organisation	3	5
21332	Demonstrate basic knowledge of establishing improvements in a manufacturing environment	3	2
21333	Demonstrate basic knowledge of workflow management in a manufacturing environment	3	4

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