

Case-study of  
**Competitive Manufacturing**  
*Stabicraft*  
*Invercargill, December 2010*



## Table of Contents

Case study reference.....	2
Background.....	3
Situation.....	3
Focus on the five 'Lean' Principles.....	4
Principle #1: Value.....	4
Principle #2: Value Stream.....	6
Principle #3: Flow.....	7
Principle #5: Perfection.....	12
Conclusion.....	13
A final word from those who experience 'adventure with confidence'.....	13
Appendix.....	15
Acknowledgements.....	16

## 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

*Stabcraft Marine* pioneered positive buoyancy boats, manufacturing the first rigid hulled aluminium pontoon boat from a back street workshop in Invercargill, New Zealand, in 1987. That original design was a compilation of the wish list of local paua divers. It resulted in a practical rather than pretty boat.

Since then the range has expanded to more than 20 standard models all retaining the safety and positive buoyancy features that had made the boats a household name in New Zealand. In 2005 Stabcraft opened its new \$1.7 million factory where boat manufacture at time of writing was divided into five separate processing units, compared to a two-man operation in 1987.

In 2010 Stabcraft could be found in waters worldwide. In Australia's Northern Territory, a boat was employed in the relocation of man-eating crocodiles. In Asia, a Stabcraft flotilla was at work for the United Nations, rescuing refugees and transporting food to stricken areas. In the US Stabcraft had a growing number of customers on the Eastern seaboard.

Named 2006 Exporter of the Year by the Southland Chamber of Commerce Export Forum, Stabcraft had earned an array of accolades over the years but it was the endorsement of its clients that ultimately counted the most.

*“It’s about a journey and sometimes you never quite know how well you are doing – if you don’t keep up you get left behind. “As a business Stabcraft Marine struggled to cope with phenomenal growth in the two years leading into the recession. We want to use the opportunity presented by a market slow-down to be poised to cope with not just what went on before, but what happens next. The recession has forced us to take stock of everything we do, and the way we do it. We were so busy filling orders in the boom years we weren’t taking the time to really think about what we were doing and whether there was a better way.”*

**Paul Adams, Owner Stabcraft**

### Situation

Stabcraft have built their own customised factory in Invercargill and at time of writing (2010) employed 48 staff. The team was made up of sales, marketing, administrative, and design specialists, complemented by a large manufacturing workforce.

Boats were only made to order. No boat or components were made for spare stock. The vast majority of components were fabricated in-house; however some components or trades were subcontracted to other companies, such as painting, fibreglass components and manufacture of boat trailers. All other components were purchased from bulk suppliers to manage tight inventory limits.

Stabcraft had as their slogan on their logo, ‘Adventure with confidence’. It underpinned the 23 year history of the company in designing and building a boat that was robust and gave the owner and occupants’ security so they could be confident of the boat’s ability to withstand the most punishing environments and situations.

Now a new and fresh look at the slogan, looking inwards, had been created through the introduction of Lean Marine Thinking. How inspiring could your everyday work be if you approached it as an ‘adventure with confidence?’

This was made possible by equipping their team with the skills commonly referred to as Competitive Manufacturing Qualifications.

## Competitive Manufacturing Initiative Case-study #7-5 Stabicraft

### Focus on the five 'Lean' Principles

According to Womack and Jones the five lean principles<sup>1</sup> follow the order of Value, The Value Stream, Flow, Pull and Perfection in an integrated system.

As the business had a long history of tinkering with the system and improving when necessary, the use of these five principles had not been formally known as such but had been practiced. Company owner Paul Adams believes this was intuitive in the way he thought about business, although he had never used the words as defined by CM experts or understood them to be the principles of Lean.

The five principles will be used in this case study to illustrate how the business and all of the team have combined their skills to make Stabicraft a leader in design and manufacture of robust aluminium boats.

### Principle #1: Value

'Value' by definition is only created through those processes for which the customer is prepared to pay. Everything else can be regarded as waste. As processes were scrutinised, identifying wasteful process steps (those 'gems' of fortune) were milestones along the way of achieving what the customer was prepared to pay for.

During the introductory process to the QCDSM system<sup>2</sup> the team members were given the opportunity to take part in a 'TRY-Z'<sup>3</sup> experiential learning workshop. First all types of waste were defined, then identified, and systematically eliminated through various ideas that were tested. Finally these ideas were implemented where they had been found to add value.

Therefore early on during Stabicraft's Competitive Manufacturing (CM) journey an ideas and suggestions system had been introduced. From the beginning this process was embraced enthusiastically and improvement ideas started flowing. In a period of 10 months 48 employees have implemented a total of 470 ideas. (See Figure 1)

The time and effort that was spent on implementing improvement ideas was definitely an activity the customer would be prepared to pay for. These activities include for example making workplaces safer. The customer is not prepared to pay for accidents, but is prepared to pay for preventing them. The ideas and suggestions were managed visually on a board onsite (see Figure 1).

There were also other activities practiced within the business that constantly sought out, identified, and systematically eliminated waste, and therefore added to the 'value' principle. Examples for this were the implementation of several simple ideas effectively halving shelf space, inventory, and transport.

---

<sup>1</sup> Lean Thinking (2003) by J P Womack & D T Jones; ISBN 0-7432-4927-5

<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/>)

<sup>3</sup> Try-Z (or 'Trial Zero') is a three-step procedure. It refers to a method whereby model changes for production are made. When changes to a current model unit or to a new model unit at preproduction stage are imminent, the model unit is laid out in an assembly hall separate from normal production. All concerned with the development of that model unit, including production personnel, begin to assemble the unit from scratch, documenting their activities. (Source: qcdsm.com)

# Competitive Manufacturing Initiative Case-study #7-5 Stabicraft



Figure 1: Stabicraft is keeping track of all improvement ideas; The numbers given here suggest the business is implementing ideas at a rate of almost one per month and per employee.

### Principle #2: Value Stream

The value stream is defined as a process sequence that completes the total transaction from the first contact until the final conclusion of the transaction between customer and company. The value stream may also include after sales services.

Many companies tackled 'value stream' by drawing up elaborate maps with sophisticated metrics to characterise their processes. Stabicraft had taken a rather different approach to developing and improving their value stream.

The key to understanding the value stream at Stabicraft was centred on communication.

A very effective three tier communication system had been put in place and at time of writing has been operating for over a year. So called Green Room meetings<sup>4</sup> were held at team level every morning followed by a set of second tier management meetings on a daily basis. The third tier meeting was held once a week between the Managing Director and all direct reports and where appropriate other invited members.

Another newly discovered value stream gem was 'good communication' leading up to every sale. The level of interaction between teams was heightened when customisation of a boat had been requested by the future owner. In the case where a boat has to be customised the design team first developed a 'blue-print' for the new build. This could take considerable time. A new process was introduced to make communication at this early design stage more effective.

Every customised component was first developed in concept by the designers and a lead-time to develop the complete build with all its components was visibly displayed on a white board. At this early stage both the sales and manufacturing team meet with design enabling a workable solution to evolve. The teams managed to reduce design time by about 20% as common ground and consensus were reached earlier.

Apart from improved internal communication, Stabicraft have also endeavoured to develop four of their subcontractors by introducing them to the improvement methodology. Effective communication (and benefits from it) do not have to stop at the boundaries of a business.

*"I have been working at Stabicraft for six months now, where I walked into the QCDSM System. This system has allowed me to bring about the dialogue around the value stream to ensure requirements according to customer specification, delivery according to resource management and reduced cost by reducing waste. Yes it is a great vehicle in design, as well as helping us achieve standards, and consistency in training. We are fortunate to have such a system that allows for good and improved communication between the different stakeholders."*

**Jamie Wilson, Industrial Design Manager**

---

<sup>4</sup> The QCDSM System is built around the simple concept of involving the people of an area who do the work in the day to day management of their area, not only by just working in the area but by actually taking control of their area. QCDSM does this by establishing a structure within the company known as the Green Room meeting process. The Green Room is designed to be the data centre for the group. They meet in this centre either daily at the beginning of each shift, weekly in service areas and management areas, for the sole purpose of examining how well they did during the period since their last meeting. (Source: qcdsm.com)

## Competitive Manufacturing Initiative Case-study #7-5 Stabicraft

Work centre 2 fabricated components for each boat, many of them custom designs. The team focused on doing this right the first time, but plenty of product variations meant it was difficult to put a 'standard practice' in place and to train all team members for it.

The team has therefore created their own standard practice, which follows a Plan-Do-Check-Act cycle (PDCA), to achieve sound results.

**Table 1: Standard practice how Work Station 2 approached the fabrication of custom boat components**

Plan	Discussion among the team about the nuances of design drawings and instructions as received.
Do	Fabricate the component.
Check	Team leader to check the results coupled with feedback on what went right or wrong, and how it was fixed.
Act	...on the outcomes of the 'check' stage.

Stabicraft regard the 'plan' and 'check' meetings mentioned above as value contribution to the process since they eliminated opportunities for defects.

*"The QCDSystem has given me the opportunity to have meaningful discussions in the team format in a highly structured way. The discussion happens every day in the Green Room meeting and we find great value in this 10 minute discussion. The visual board we use is a great way to see what and when boats flow through our work centre. We have collected a lot of data over the past year, have found it useful, but still have to analyse the trends and opportunities."*

**Owen Millar, Team leader Work centre 2**

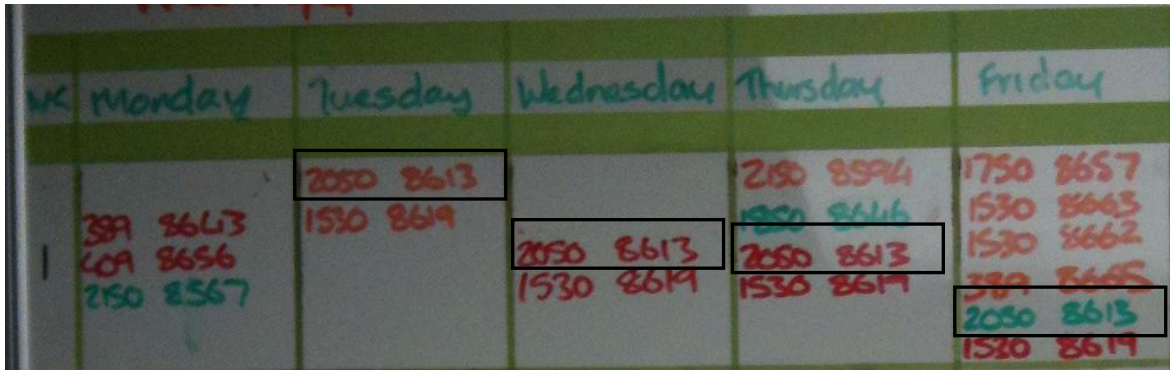
### Principle #3: Flow

Flow can best be described as that of a river at a steady pace without dams, rapids or waterfalls.

Flow is an elusive principle especially when working in a jobbing shop or on big projects such as boats that would stand in one place for quite some time. At Stabicraft, boats were fabricated in five distinct workstations on site and took some days to be moved from one station to the next. Flow in this regard could be seen in much longer time frames than that of an automobile assembly line.

The teams had come up with a visual management board that allowed them to see and understand the production 'flow' during the 2nd tier meetings on a daily basis. (See Figure 2 below)

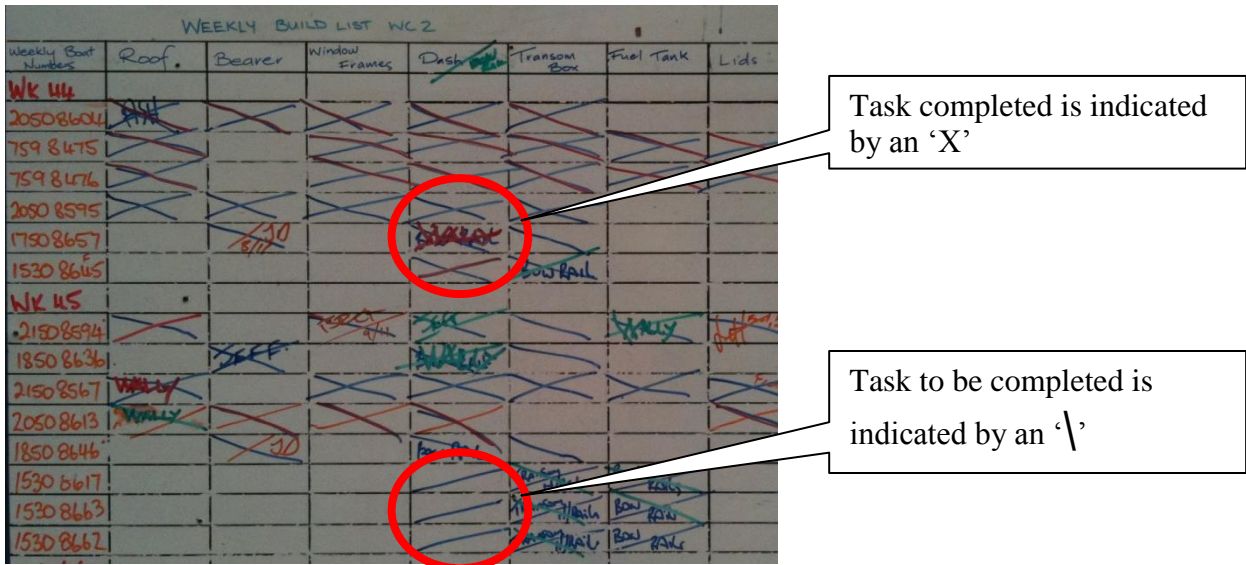
## Competitive Manufacturing Initiative Case-study #7-5 Stabcraft



**Figure 2: Small excerpt of the master scheduling board, managed at the second tier meeting by the respective team leaders and the production manager on a daily basis. (Note: Picture best viewed in colour)**

Each number shown (Figure 2) in red, orange, or green in the picture above identified a boat worked on and its status against a set deadline. Red indicates it was late, orange meant on schedule, and green colour meant it was delivered on time. Every day the respective team leaders updated the colours and workstations of the boats as they ‘flowed’ through the workshop.

This simple board gave everyone a visualisation of ‘flow’ despite the process taking many days. The challenge was for the teams to devise smart ways of ensuring flow was balanced (‘green’) by applying Competitive Manufacturing (CM) tools and methodologies.



**Figure 3: Weekly build matrix by boat number and component type**

The build matrix shown in Figure 43 breaks down a boat build into components and team members allocated to the build. Kanban<sup>5</sup> pallets hold a set of components ready for the next fabrication team and assisted in the flow of components for fabrication.

<sup>5</sup> Kanban, literally meaning "signboard" or "billboard", is a concept related to lean and just-in-time (JIT) production. Kanban is one means through which JIT is achieved. Kanban is not an inventory control system. Rather, it is a scheduling system that tells you what to produce, when to produce it, and how much to produce. (Source: Wikipedia)



**Figure 4: Kanban pallet; all components seen are for one specific boat. Each component carries an identification number linking it to a specific boat build.**

*“I had been practicing the lean thinking long before we started this journey at Stabicraft. What is great about the journey now is that everyone has a common understanding through the TRY-Z<sup>6</sup>, Green Room and all the other tools and methods we use.*

*To understand flow we have to understand all of the manufacturing processes, buffers, constraints and productivity levels. Our role is to piece together all the bits of information and synchronise these so smooth flow happens because we deliver the first parts of the boats to the line. If we get it wrong then smooth flow is impossible. To prove how effective this has become through all staff understanding the flow, we have effectively reduced our inventory of pulled parts from work centre 1 by 50%.”*

**Steven Gilbert, Team leader Work-centre 1**

---

<sup>6</sup> Try-Z (or 'Trial Zero') is a three-step procedure. The name TRY Z is derived from a process common to the automobile industry. It refers to a method whereby model changes for production are made. When changes to a current model unit or to a new model unit at preproduction stage are imminent, the model unit is laid out in an assembly hall separate from normal production. All concerned with the development of that model unit, including production personnel, begin to assemble the unit from scratch, documenting their activities. (Source: qcdsm.com)

### Principle #4: Pull

Pull is the mechanism that enables upstream to send a product or service downstream. However the mechanism and all requirements are known to both customer and supplier and they have consensus on these arrangements.

Stabicraft had attempted in the past to implement a Kanban system for components within the fabrication process, however the Kanban system had not yet been established as standard practice. As wastes have been eliminated and communication between work centres has improved (see Principle #2: Value Stream) all teams were able to revisit their inventory levels.

At the heart of the pull system was the ‘boat plan’ (see Figure 2), the master schedule to successfully make a boat and deliver it on time. The boat manufacturing process was carefully scheduled and informed by discussions between teams to try and meet an ambitious but realistic delivery date. The boat plan was initiated by the pull from the prospective customer and the sales team.

Work Centre 1 then cut and folded sheet metal components. Even though from the outside it appeared as if this work station ‘pushed’ material, it was actually actuated by a pull system, a dedicated rack ahead of it. Effectively an empty rack pulled the next set of components from Work Station 1. The ‘boat plan’ effectively pulled the fabrication through the work centres.

A complete build typically took between 10 and 20 full working days. This implied all staff, machines, and work spaces were carefully synchronised in a system of pull and fill.

In 2010 Stabicraft built a variety of models and to meet the ever increasing complexity of the boats (because of increased levels of customisation) concurrent scheduling and loading of work centres became even more important.

The first and second tier Green Room meetings have been instrumental ensuring smoother flow through improved communication between teams. Problem solving and root cause analyses were a regular tool employed to ensure reliable pull could be achieved.



**Figure 5: Kanban pallets containing components for specific boat builds. Identification numbers link each pallet to a specific build and work station.**

## Competitive Manufacturing Initiative Case-study #7-5 Stabcraft

Each pallet on the racks shown in Figure 5 must first be removed (pulled) by the receiver of the parts before another set could fill the rack. Stabcraft managed to reduce the rack shown in the picture by 50% simply by improving the common understanding of the 'pull' concept.

Kanban Card	
Part No:	75048
Description:	759 KEEL DRAW
Production Authorization	
From: WC	3
To:	STORE
Used At:	WC3
Kanban Lot Size:	1
Maximum Quantity:	4
Comment:	

Figure 6: Stocked items were managed by a Kanban card to control inventory levels.



Figure 7: Kanban cards are placed into this bin and collected once a day by the store man for restocking.

*"I have been in the business since March and walked into the QCDS system. Fortunately the system gave me a head start to understand how production was pulled and what flow meant for the Stabcraft models. The measurements all around have been most useful as they highlight where issues are. More importantly though are the hundreds of ideas implemented to solve the problems we have. This means the whole production team is solving problems and not only the team leaders. All of this work combined improves flow of work and cash-flow to the business."*

**Clinton Aitken, Production Manager**

## Competitive Manufacturing Initiative Case-study #7-5 Stabicraft

### Principle #5: Perfection

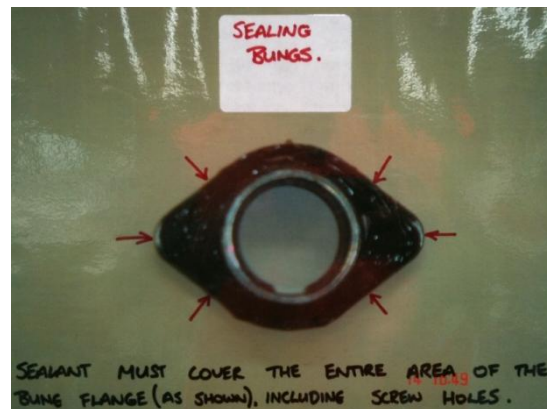
Perfection meets but does not exceed the customer's requirements as agreed to by consensus for Quality, Cost and Delivery.

*"We are making boats of high value for customers who want things right. Our thinking is it better to be done right, but we accept that humans don't always get things right. After the TRY-Z I realised that we needed to improve our quality checking of our work. We changed all our check sheets (see **Error! Reference source not found.**) so that the person that does the task checks and another person, usually me checks after wards. Two sets of eyes are better than one. Since then our quality has improved and we get far less internal customer concerns coming back to us."*

**Ken Stenton, Team leader work centre 3**

Tubes (All Models)	Check	
	T/L	2/IC
Check tig welding on all joints and end caps. i.e. Appearance, integrity and undercut.	✓	✓
Check mig welding on all tube to extrusion joints. i.e. Appearance, integrity and undercut.	✓	✓
Check for splatter, scratches, gouges and arc marks. <i>Painted outside</i> <i>+ Scratch Steel side under Tube (Mid ship)</i>	✓	✓
Check for steps in extrusion joints. Tolerance +/- 1mm.	✓	✓
Pressure Tested By <u>Pete</u>	✓	✓
Is Tube Frame Painted <small>(external + Tension)</small>	YES	NO
Inhouse Minometer Test + Report	YES	NO
Survey Tested & Off Set Baffles	YES	NO
Team Leader <u>[Signature]</u> Date <u>28-10-10</u>		
2.I.C <u>[Signature]</u> Date <u>2-11-10</u>		

Double row of checking for two people, the first normally being the person who completed the task



**Figure 8: New check sheet showing a simple set of requirements with two columns for cross-checking of quality by two team members.**

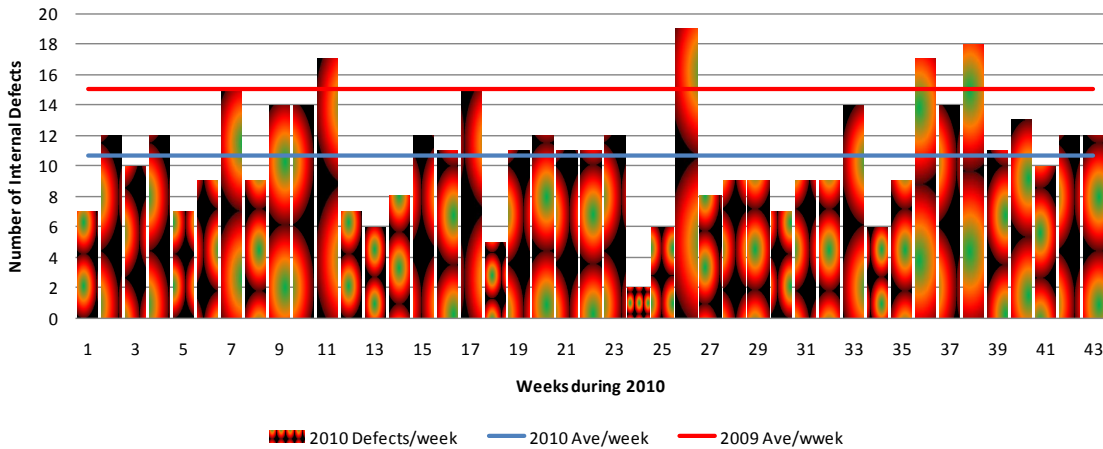
**Figure 8: Simple laminated visual management standards for clarity of quality**

*"We are the last Stabicraft people to work on and inspect the boat before the customer receives it. We have to get it right or else Stabicraft get warranty claims from the customers. Our team's role is to add many of the components bought in from outside suppliers to the boat, plus complete the final inspection. This gives us a situation that we must both ensure quality and productivity simultaneously. What the QCDS system has given us is the measuring system so we can set priority focus areas of what we should pay more attention to. Previously it was dependant on the problem that 'shouted loudest', while now we can base our focus priority on data."* **Damian McNaught, team leader work centre 6**

## Conclusion

Overall, for the first year of applying Competitive Manufacturing, company management attributes a **Return on Investment (RoI) of 4:1**. This has been a great start and company management feel the real financial returns will be seen as time passes. So far the greatest return has been the engagement of all employees and the number of great ideas implemented.

Part of the RoI Stabicraft have experienced was achieved through a significant reduction of internal defects within the manufacturing team (see Figure 9). A reduction of 29% of internal defects in manufacturing compared to the previous year.



**Figure 9: Internal defects corrected in manufacturing, during week 1-43, in 2010**

An important factor which is not reflected in the above graph is the fact the size and complexity of boat builds during 2010 was considerably larger than during 2009. This in turn implies that a possibly more realistic measure for the reduction in internal defects would be closer to 50% factoring in the size and complexity of projects worked on.

## A final word from those who experience ‘adventure with confidence’

A Stabicraft Marine entry in the inaugural Australian Offshore Challenge was forced to turn from competitor to rescuer when the Bass Strait lived up to its treacherous reputation.

Michael Rozakis, of MY Marine, said conditions turned nasty on day six of the event, as the fleet crossed the strait to Port Welshpool in Victoria. Even the coastguard refused to venture out in the tempestuous sea. “We’ve now become the escort vessel and the rescue vessel,” he said. It was testament to Stabicraft’s stability and justified its reputation for safety, he said. “As far as the boat goes, it’s a fantastic vessel. I wouldn’t want to be out there in anything else.”

## Competitive Manufacturing Initiative Case-study #7-5 Stabicraft



**Figure 10: Another Fish'r Model on its way to a customer now built for 'Adventure with Confidence'.**

### 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, 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:** 7 quality methods, QCDSM measures, check-sheets, Internal external changeovers, Flow and pull authorisation, customers and suppliers, workplace improvement, visual management, recording data effectively, problem solving, brain storming, capturing ideas, improvement sheets, Plan-Do-Check-Act cycle, seven wastes, 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

## **Copyright notice**

© Copyright 2010 held by the Government of New Zealand through the Industry Training Organisations of the Competitive Manufacturing Initiative Jucy by Design, Formula Cruisers, Black Pearl and Stabicraft. This work is copyright. Apart from any use permitted under the New Zealand Copyright Act 1994, no part may be reproduced by any process without prior written permission from the owners.

## **Acknowledgements**

The author wish to recognise the assistance of the following:

The Tertiary Education Commission of the Ministry of Education of New Zealand for funding of this work.

Jucy by Design, Formula Cruisers, Black Pearl and Stabicraft for their openness and willingness to have their story told as an exemplar site in New Zealand. Specific thanks to Anita Ruhe-Hodge, Grant Senior, Robert Mclean and Paul Adams for their input into making this case study possible.

Chris van der Hor of NZ MARINE ITO edited and supported the case study. [chris@bia.org.nz](mailto:chris@bia.org.nz)

Peter Paola and Willem Botha of QCDSystems for staff coaching. [qcdpip@ix.netcom.com](mailto:qcdpip@ix.netcom.com) and [wilber@ix.netcom.com](mailto:wilber@ix.netcom.com)

Johann Betz edited the story. [johann.betz@googlemail.com](mailto:johann.betz@googlemail.com)

Allan McCracken for editing. [asmccracken@nettel.net.nz](mailto:asmccracken@nettel.net.nz)

Greg A. Ellis, Spirals Resultants, [greg@spirals.co.nz](mailto:greg@spirals.co.nz)

**For more information, go to Competitive Manufacturing Initiative website at:**  
[www.cmi.org.nz](http://www.cmi.org.nz)