

From the Business Improvement
Navigators at



CTPM
Australasia

Why the Operations Capability Average for Australian Industry over the past 5 years has Flat Lined at only 50%

Based on a 5 year Study of the
Operations Capability of Australasian
Industry (2002 – 2006)

Author: Ross Kennedy - President & Managing Director
CTPM Australasia

**A Special Report for Corporate
Executives and Senior Managers**

Executive Summary

Internal Competitive Advantage tends to come from 3 key sources:

Unique Product / Service Features;
Unique Distribution / Delivery Capability; and
Superior Operations Capability.

Toyota Motor Company is currently demonstrating to the world that Superior Operations Capability can be the hardest to rapidly replicate by a competitor, as shown for example by the loss of market share that GM, Ford and Chrysler are currently going through. Yet, achieving Superior Operations Capability is often the competitive advantage area that Senior Management pay least attention to.

Operations Capability can be evaluated through 3 key areas:

Quality Performance;
Response Performance; and
Employee Engagement Performance.

This was the focus of our study which involved surveying some 700 delegates to our public workshops from 140 companies over a period of 5 years averaging 140 delegates from 40 leading Australian companies each year. The results highlight that in 2002 the average score for Australia compared to world's best was only 50%. More concerning is that over the 5 years the average Australian Industry score has made virtually no improvement as in 2006 the average score was still only around 50%.

In effect, Australian Industry's operations capability has Flat Lined at 50% over the past 5 years.

There is an urgent need to improve Operations Capability within Australian Industry and many companies are trying however from the results of the survey it appears we are not doing a very good job at it.

Operations Capability can be improved through 3 key focuses:

- Improved Technology & Automation;
- Project Focused Improvement; and
- Improved Practices & Behaviours

We have found improved Practices & Behaviours is critical to ensure the maximum benefit is achieved from the first 2 however we have also found during our research that improving Practices & Behaviours of the workforce is often given the least attention over Technology & Automation and Project Focused Improvements.

A process to improve Practices & Behaviours is outlined in this report along with 3 companies that have gone against this trend by focusing on improving Practices & Behaviours of their entire workforce through a formal operational improvement journey using the TPM³ – Australasian Lean methodology and achieved both an increase in their Operations Capability rating and significant bottom line benefits.

Contents

	Page
The Importance of Operations Capability	4
What Drives Operational Competitive Advantage	4
Operations Capability Rating Survey	5
Who Participated in the Survey	6
2002 Survey Results	7
2003 Survey Results	8
2004 Survey Results	9
2005 Survey Results	10
2006 Survey Results	11
Summary of the Results	12
The Respondents	12
The Companies	12
The Grouping of the Scores	13
The Variation in the Scores	13
What does this mean for Australian Industry?	14
Key Learnings	16
What differentiates companies that move ahead of the pack?	16
Good Measurement	16
Engaged Workforce through a Commitment to Formal Continuous Improvement	17
Having the right Improvement Scenario	18
Case Studies	19
Simplot Australia – Devonport	19
Juken New Zealand Limited – Northland Mill Kaitaia	19
Sugar Australia – Glebe Island	20
Identifying the Best Way Forward	21
TPM, the DNA of the Toyota Production System	22
About CTPM Australasia	24
About the Author	26
A Brief Overview of TPM ³ – Australasian Lean	28

The Importance of Operations Capability

Excluding external sources such as cheap finance, raw materials, infrastructure, etc, Competitive Advantage tends to come from three sources:

- Unique Product and / or Service Features;
- Unique Distribution and / or Delivery Capability;
- Superior Operations Capability.

In our rapidly changing world we should always be striving for unique and innovative Product and / or Service options along with unique and innovative Distribution and / or Delivery options however once such a competitive advantage is recognised in the market place, in this day and age it can often be rapidly copied by competitors.

As demonstrated by Toyota over recent years, Superior Operations Capability can be the hardest to rapidly replicate by a competitor. This offers great opportunity for Australian Industry to improve and lock in their competitive position in both the domestic and international market place. It is also one of the areas of business opportunity that is often only given cursory senior management attention.

What drives Operational Competitive Advantage?

Over the years we have seen different operational focuses as companies strive to achieve competitive advantage in the market place. Leading up to the mid 1970's the goal was to be the lowest cost producer. This is still important today however it alone no longer ensures competitive advantage. In the mid 1970's the Quality movement commenced and competitive advantage was about having a quality product to an approved standard that was the lowest cost. In the mid 1980's we saw Just-in-Time 'Response' become the new way to achieve competitive advantage when customers wanted to reduce their holding stocks and have high quality, lowest cost products delivered in the shortest time possible. In the mid 1990's Innovation became the new edge for companies. Having the product packaged differently or presented differently or with that special option was the way to increased competitive advantage. Now we are seeing a new competitive advantage emerging called the Learning Organisation where improvements are rapidly translated through the organisation with everyone contributing to making the company more efficient, more quality conscious at the source, more responsive, more able to take on innovation, and more able to rapidly take on new technology.

We have found organisations that engage all their employees to contribute and develop through regular formal continuous improvement activities are the ones that can best embrace Innovation and Learning.

In the early days of CTPM we developed through international benchmarking studies a simple but effective Operations Capability Rating Survey tool covering the specific areas of Quality Performance, Response Performance and Employee Engagement Performance to assist delegates at our workshops to evaluate how they perceived their site or region's operational performance.

During the first session of each two-day Introduction to TPM³ workshop we ask all the delegates to complete our Operations Capability Rating Survey and for the past 5 years we have been collecting the results.

Operations Capability Rating Survey used during the 5 Year Study

Operations Capability Survey

For each of the 3 categories, please score your site out of 10 using the words in each block as a guide to giving a rating ie if the words in the first block described your site you would rate your site somewhere between 0 and 3 depending on how close the words described your perception of the site. If the words in the second block better described your perception of your site then you would rate your site some where between 3 and 7 etc.

0	1	2	3	4	5	6	7	8	9	10
Quality Performance										
Machines and processes unable to hold desired tolerances, high rate of 'off-spec'.			Good machine and process capability supported with Statistical Process Control monitoring and quality improvement tools training but with limited application.				Excellent machines and processes capability continuously monitored using Statistical Process Controls supported by the application of quality improvement tools with low process variability.			
Large and powerful inspection departments, 'off-spec' discovered by inspection and customers.			Strong quality assurance department with analytical capability and charged with primary quality responsibility.				Very low 'off spec' rate measured in parts per million.			
Low Skills training.			Good skills training.				Highly trained and versatile work force responsible for quality inspection and corrective action.			
Large discrepancy between documents and the actual practices, frequent non-conformances.			Few non-conformances.				High application of mistake - proof devices to ensure no non-conformances to specification.			
Large number of customers' complaints.			Low number of customer complaints, however problems do remain and are handled by QA department.				Virtually no problems with complaints and customer inputs solicited for continuous improvement.			

0	1	2	3	4	5	6	7	8	9	10
Response Performance										
Frequent replanning / rescheduling of production.			Relatively stable production schedule with limited expediting.				Production schedule directly coupled with market demand.			
'Fix it when it breaks' maintenance.			Established preventive maintenance, infrequent breakdowns.				TPM / TPM ³ as the key equipment management strategy.			
Low process flexibility, lengthy changeovers, set-ups, or transitions.			Faster changeovers, set-ups or transitions, however frequent bottlenecks.				Quick changeovers, set-ups or transitions (measured in minutes) and virtually no bottlenecks.			
Inventory levels between equipment or process high.			Inventory levels under control.				Inventory levels stable and low.			
Long Lead Times.			Relatively shorter Lead Times for selected products / outputs.				All Lead Times less than one-day			

0	1	2	3	4	5	6	7	8	9	10
Employee Engagement Performance (supporting Innovation & Learning)										
Adversarial labour management relations.			Stable labour management relations.				Labour management relations based on trust and continuous two-way communication.			
Little employee involvement (especially all operators) in formal improvements			Some formal employee involvement in formal improvement activities with main focus on Cross-functional teams.				All employees involved in formal improvement activities through both Cross-functional and Area Based Teams ensuring a high rate of implemented improvements.			
Leadership based on seniority rather than skills with many job classifications.			Structure is based on cascading team environment where each organisation layer is seen as a team of people.				Cascading team organisation structure is 'purpose' aligned and is capable of supporting continuous learning by all employees through well-led synergistic Area Based Teams along with dedicated support.			
High employee turnover or high use of casuals.			Stable work force with good employee morale.				High focus on learning by employees with low turnover and high morale.			
Highly demarcated work force resulting in high inefficiencies.			Skills training well developed to achieve both flexibility and expertise in well-defined areas.				Continuous training to achieve skill versatility and team problem solving skills.			

The three scores out of 10 are added to give a total score out of 30.

The results are captured during each workshop and displayed on the screen to allow the delegates to compare their rating to everyone else and the group average.

Who participated in the Surveys?

The respondents came from a wide spread of Australian companies. On average there were some 3-4 delegates from each site. The delegates ranged from Manufacturing Directors, General Managers, Site Managers, Manufacturing Managers, Production Managers, Maintenance Managers, Training Managers, Improvement Co-ordinators, Project Engineers, Supervisors, Tradespeople and Operators.

The majority of people attending the workshops either requested to attend because they were interested in learning how to improve the performance of their company, or were sent because they would play an important role in improving their company and hence demonstrated a reasonable feel for the current performance at their site.

We classified respondents into 5 types:

- Senior Management eg Site Manager, General Manager, Director etc
- Management eg Production Manager, Quality Manager, Maintenance Manager etc
- Support Staff eg Improvement Co-ordinator, Planner, Technician etc
- Supervision eg Superintendent, Supervisor, Team Leader etc
- Shopfloor eg Operator, Fitter, Electrician etc

We classified their companies into 5 Industry Groups:

- Manufacturing – Discrete
- Manufacturing – Food & Pharmaceutical
- Manufacturing – Process
- Mining & Resources
- Utilities & Service

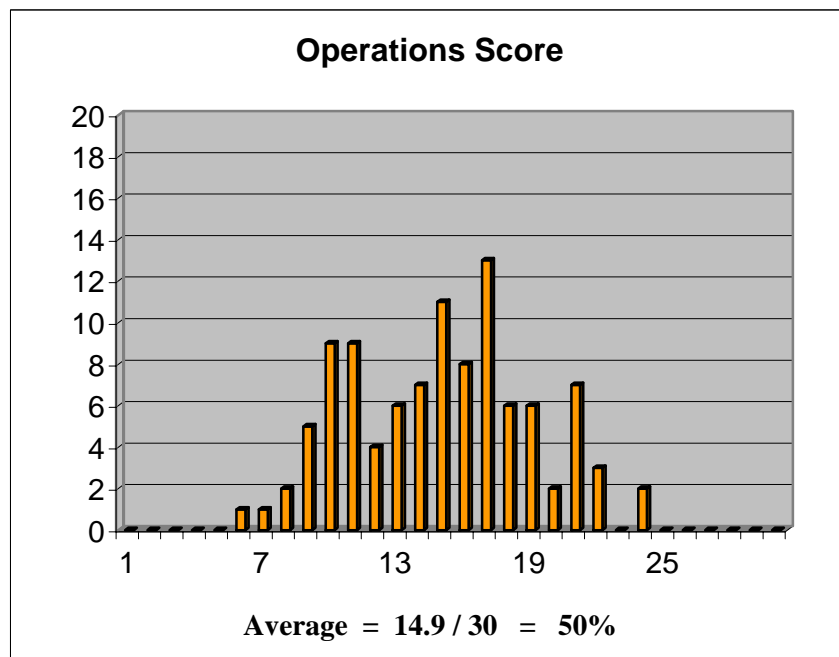
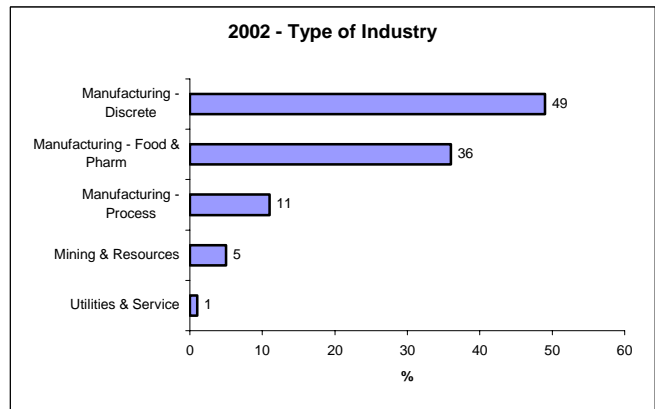
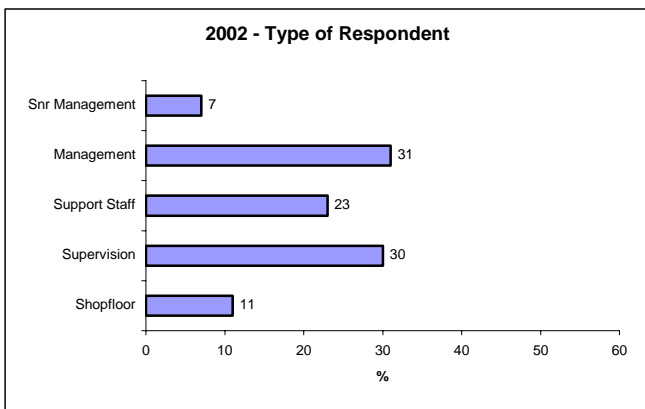
We provided the following summary to explain what the scores mean:

00-06 / 30	or	00% – 20%	In need of urgent attention
07-12 / 30	or	21% – 40%	Great opportunity for improvement
13-18 / 30	or	41% – 60%	On the right path but ways to go yet
19-24 / 30	or	61% – 80%	Well managed with further improvement potential
25-30 / 30	or	81% - 100%	World Class Performance

2002 Survey Results

Location of Workshops: Adelaide, Brisbane, Melbourne, Sydney and Edinburgh Park – SA
Respondents to Survey: 102 from 39 Companies covering 45 Sites

- | | | |
|-----------------------------|-----------------------------|-------------------------------------|
| ACI Closures Division | Coopers Brewery | Penrice Soda Products |
| ACI Plastics Packaging | Cooper Standard Automotive | River Sands |
| Adelaide Brighton Cement | CSL Bioplasma | Sola Optical |
| ADI Mulwala | Detmold Packaging | Speedibake |
| Agnew Gold Mine | Hills Industries | Telstra Regional Service Operations |
| AI Automotive | Holden | TI Automotive Systems |
| Air International | Ingal Civil Products | Tomago Aluminium |
| Alphapharm | Kennon & Melded Fabrics | Transitions Optical |
| Blue Circle Southern Cement | Kolotex Aust | Trend Laboratories |
| Boart Longyear | Kraft Foods | Tridon Australia |
| Bonlac Foods | Merisant Manufacturing Aust | Varian Australia |
| Boral Metro Quarries | Mitsubishi Motors | Vinindex |
| Boral Hancock Plywood | Pandrol | WMC – Olympic Dam Corporation |



2003 Survey Results

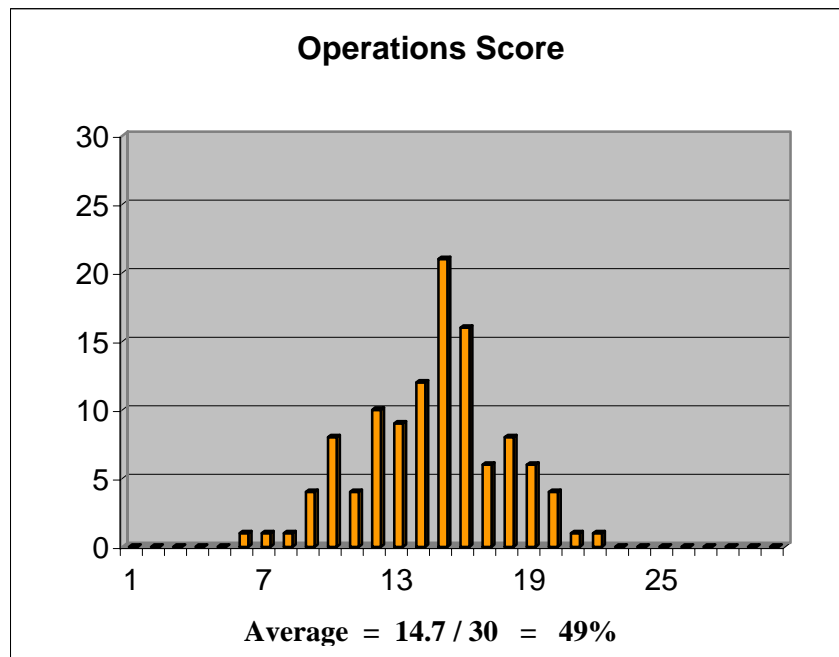
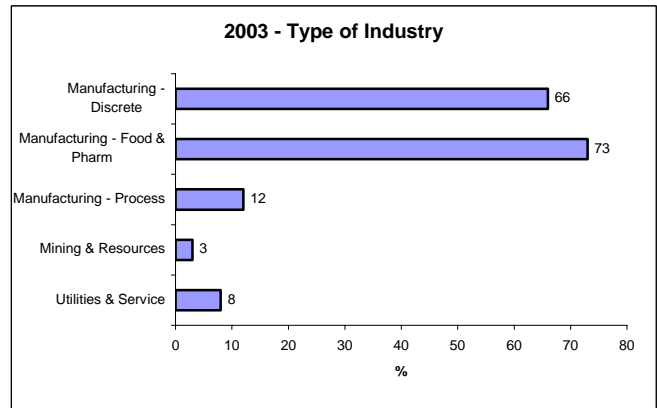
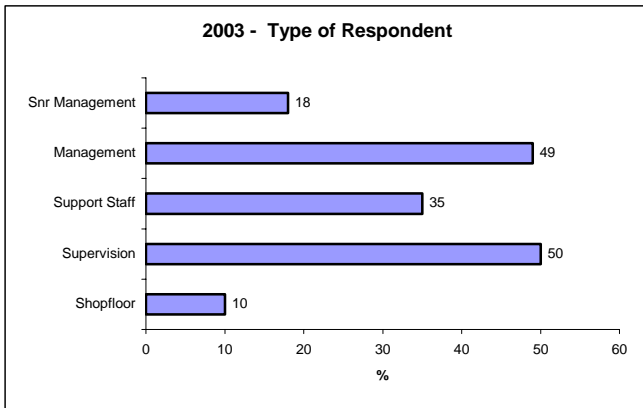
Location of Workshops: Adelaide, Brisbane, Melbourne, Sydney
Albury, Bathurst, Devonport, Broadmeadows – VIC, Clayton – VIC

Respondents to Survey: 162 from 41 Companies covering 49 Sites

ACI Plastics Packaging
Alphapharm
Australia Post
Australian Country Spinners
Blue Circle Southern Cement
Bridgestone TG
Calsonic Australia
Caroma Industries
Carter Holt Harvey Radius
Cobar Mining
Coca – Cola Amatil
Coopers Brewery
Cooper Standard Automotive
CSL Bioplasma

Exide Technologies
Gerard Industries
Hardy Wine Company
Hills Industries
Holden
Holden Engine Operations
Hydro Aluminium
Integral Energy
ION Automotive Systems
Johnson Controls
Kayser Hosiery
Kraft Foods
Mitsubishi Engine Plant
National Starch & Chemical

Nestle
Orica – Chemnet (ex Incitec)
Pacmetal Services
Park-Tec Engineering
Pioneer Building Products
QNI
Rheem Australia
Robert Bosch
Simplot Australia
Southcorp Wines
Tip Top Bakeries
Vinidex
Walker Australia

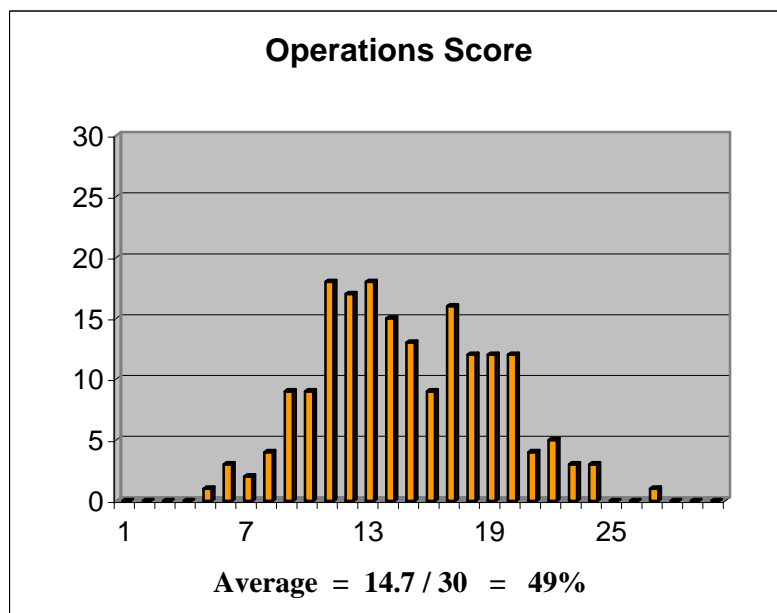
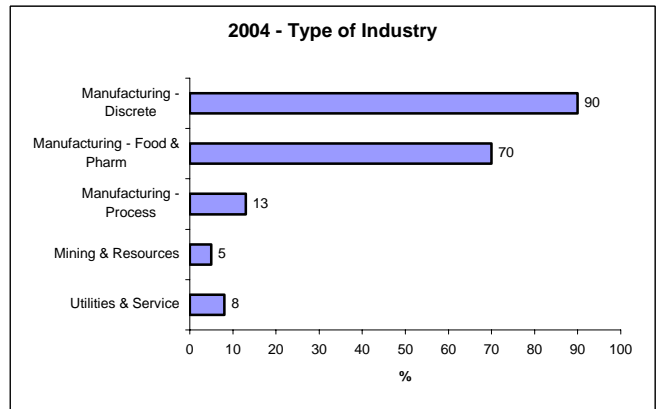
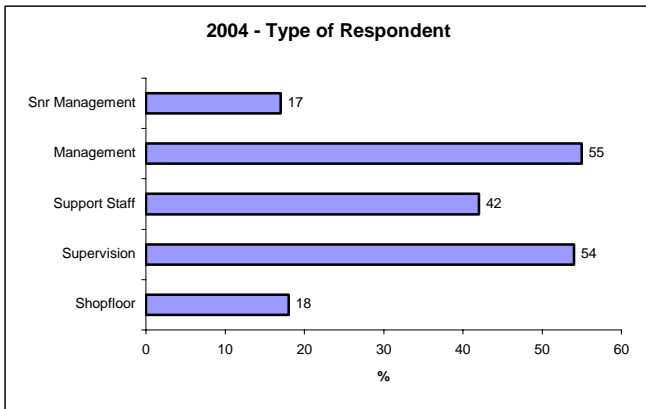


2004 Survey Results

Location of Workshops: Adelaide, Brisbane, Melbourne, Sydney, Devonport - TAS, Ulverstone - TAS, Berkeley Vale – NSW, Ingleburn – NSW, Woodville - SA

Respondents to Survey: 186 from 49 Companies covering 65 Sites

- | | | |
|--------------------------------|----------------------------|---------------------------------------|
| ACI Plastics Packaging | Bulla Dairy Foods | Pacmetal Services |
| Adelaide Brighton Cement | Caroma Industries | Pax Australia |
| Advance Metal Products | Coca Cola Amatil | Performance Plus Australia |
| aiAutomotive | Coopers Brewery | Pioneer Building Products |
| Air International | CSL Bioplasma | Rayonier – NZ |
| Alcan | CSR – Sugar Mills | Rheem Australia |
| Alpine MDF Industries | EGR | Sanitarium Health Food Company |
| APC Global | Energy Resources Australia | SCA Hygiene Australasia |
| Australia Post | Fort Dodge | Schefenacker Vision Systems Australia |
| BMA Blackwater Mine | Holden | Simplot Australia |
| Boart Longyear Asia Pacific | Holden Engine Operations | Southcorp Wines |
| Bonlac Foods | ION Automotive | Sunmetals Corporation |
| Boral Bricks | JCV Tooling | Tomago Aluminium Company |
| Boral Metro Quarries | Kraft Foods | Zinifex Century Limited |
| Botainical Resources Australia | Marsden & McGain | Zinifex Hobart Smelter |
| Boyne Smelters | Mitsubishi Motors | |
| | Monroe Springs | |

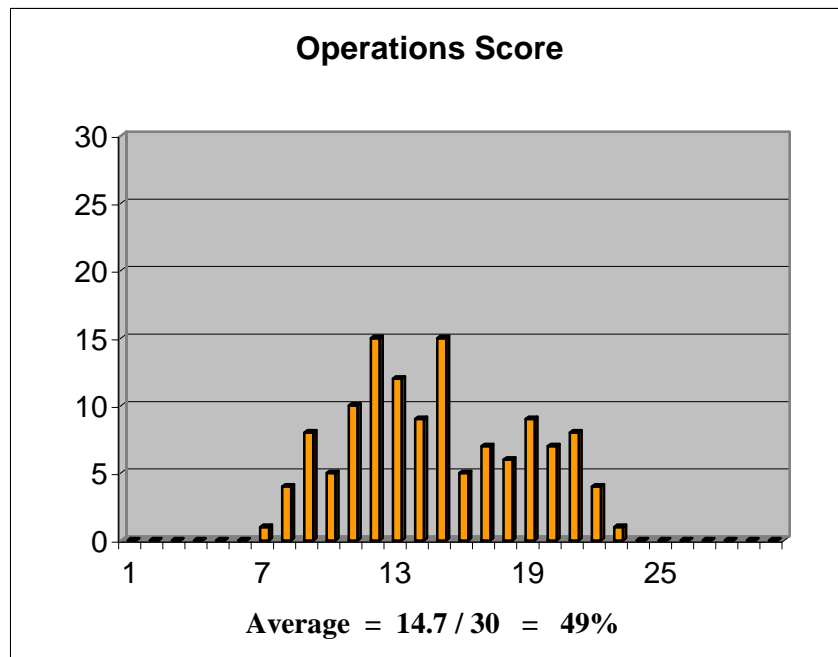
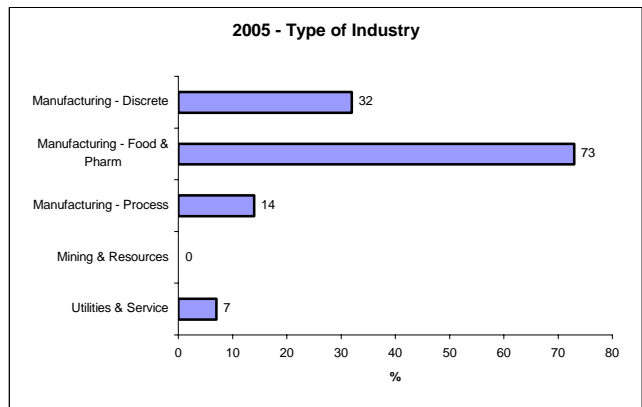
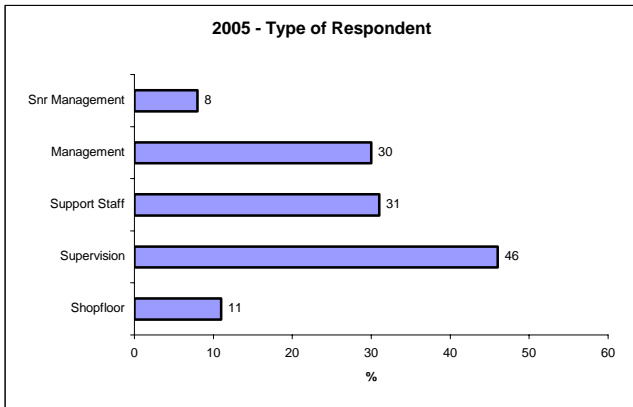


2005 Survey Results

Location of Workshops: Adelaide, Brisbane, Melbourne, Sydney, Launceston, Boyer - TAS, Colac - VIC, Cooranbong - NSW, Ulverstone - TAS

Respondents to Survey: 126 from 35 Companies covering 44 Sites

- | | | |
|-----------------------------|---------------------------------|--------------------------------|
| aiAutomotive | Cochlear | NCI Packaging |
| Air International | Coopers Brewery | Neumann Steel |
| APC Global | Hawker de Havilland | Norske Skog |
| Bega Cheese | Holden Engine Operations | Oberthur Gaming Technologies |
| Boart Longyear | Huhtamaki Australia | Quality Plastics |
| Bonlac Foods | J Boag & Son Brewing | Sanitarium Health Food Company |
| Boral Bricks | ION Automotive | Simplot Austrlia |
| Bradman's Windows and Doors | Kraft Foods | Sugar Australia |
| Carter Holt Harvey – Radius | Machinery Automation & Robotics | Sunmetals Corporation |
| Clipsal | McCormick Foods | Tasmanian Alkaloids |
| Coca Cola Amatil | MM Kembla | Tomago Aluminium Company |
| | Multinail Australia | Transitions Optical |

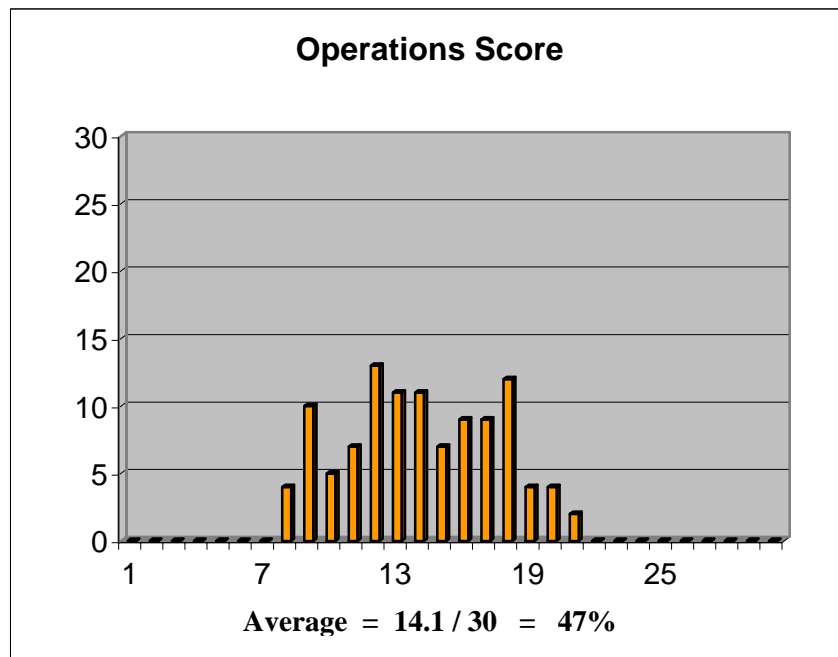
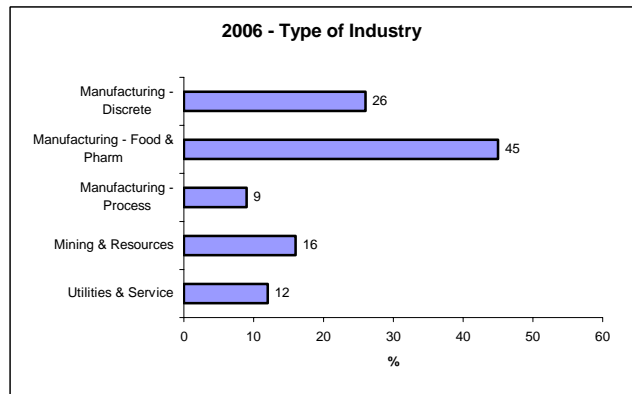
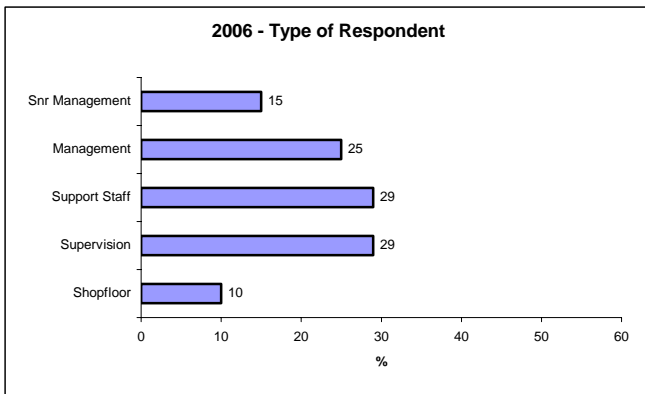


2006 Survey Results

Location of Workshops: Adelaide, Melbourne, Sydney, Albury – NSW, Bega - NSW, Burnie – TAS, Mt Isa - QLD, Newcastle – NSW, Whyalla - SA

Respondents to Survey: 108 from 33 Companies covering 42 Sites

ADI	Coopers Brewery	NCI Packaging
BAE Systems	Drivetrain Systems International	Newcrest Mining
Bega Cheese	Fonterra Australia	Onesteel
Boart Longyear	Fort Dodge	Rio Tinto Coal
Boeing Australia	Foster’s Australia	Roche Mining
Bonlac Foods	Kooka Brotha’s	SA Brewing Company
Boral Metro Quarries	Macquarie Textiles	Simplot Australia
Bradken	Merck Sharp & Dohme	Sugar Australia
Bush’s Pet Foods	Milspec Manufacturing	Willow Ware
Cochlear	Monroe Springs	Wilson Transformer Company
Comalco	Moore Business Systems	Xstrata Copper – Mt Isa Mine



Summary of the Survey Results

The Respondents

Year	2002	2003	2004	2005	2006	Total	Avg	Range
Number of Respondents	102	162	186	126	108	684	137	102-186
Senior Management	7%	11%	9%	6%	14%	65	9%	6-14%
Management	30%	30%	29%	24%	23%	190	28%	23-30%
Support Staff	23%	22%	23%	25%	27%	160	23%	22-27%
Supervision	29%	31%	29%	36%	27%	209	31%	27-36%
Shopfloor	11%	6%	10%	9%	9%	60	9%	6-11%

There does not appear to be any significant change in the type of respondent over the 5 years

The Companies

Year	2002	2003	2004	2005	2006	Total	Avg	Range
Number for Companies	39	41	49	35	33	197	39	33-49
Number of Sites	45	41	65	44	42	237	47	41-65
Manufacturing - Discrete	48%	41%	48%	25%	24%	263	39%	24-48%
Manufacturing – Food & Pharmaceutical	35%	45%	38%	58%	42%	297	43%	35-58%
Manufacturing - Process	11%	7%	7%	11%	8%	59	9%	7-11%
Mining & Resources	5%	2%	3%	0%	15%	29	4%	0-15%
Utilities & Service	1%	5%	4%	6%	11%	36	5%	1-11%

In 2006 we saw Total Manufacturing involvement in the study drop some 20% from the previous 4 year high levels of 94%, 93%, 93%, 94% to 74% due to a significant increase in Mining and to a smaller extent Utilities & Service. This could have contributed to the small drop in the average score in 2006.

The Grouping of the Scores

Score / 30	Description	% Score	2002	2003	2004	2005	2006	Total	Avg
			50%	49%	49%	49%	47%		
0 - 6	In need of urgent attention	0–20%	1	2	4	0	0	7	1%
7 - 12	Great opportunity for improvement	21–40%	30	39	59	43	39	210	31%
13 - 18	On the right path but ways to go yet	41–60%	51	98	83	54	59	345	50%
19 - 24	Well managed with further improvement potential	61–80%	20	23	39	29	10	121	18%
25 - 30	World Class Performance	81-100%	0	0	1	0	0	1	0%
Totals Respondents:			102	162	186	126	108	684	

There has been little change over the past 5 years

The Variation in the Scores

Score / 30	Description	% Score	2002	2003	2004	2005	2006	Range	Avg
			50%	49%	49%	49%	47%		
0 - 6	In need of urgent attention	0–20%	1%	1%	2%	0%	0%	0-2%	1%
7 - 12	Great opportunity for improvement	21–40%	29%	24%	32%	34%	36%	24-36%	31%
13 - 18	On the right path but ways to go yet	41–60%	50%	61%	45%	43%	55%	43-61%	50%
19 - 24	Well managed with further improvement potential	61–80%	20%	14%	21%	23%	9%	9-23%	18%
25 - 30	World Class Performance	81-100%	0%	0%	0%	0%	0%	0%	0%
Totals Respondents:			102	162	186	126	108	102-186	

In 2006 we see a significant 50% drop compared to the average in the number of respondents putting their sites in the 61-80% classification of ‘well managed with further improvement potential’ score

What does this mean for Australian Industry?

There has been little change over the past 5 years, which means we have a challenge ahead of us.

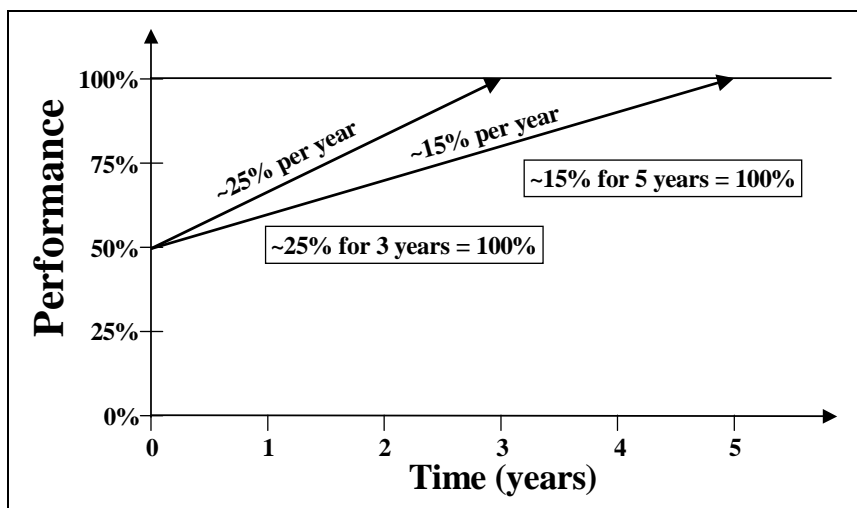
From the distribution of scores we can see that only 18% of the delegates rated their site above 60% with only 1 out of 684 respondents rating their site above 80%.

At the other end of the scale 32% (1% + 31%) of the respondents rated their site below 40%.

If we keep the analysis simple and assume:

- what is described as 100% today will still be 100% in the future; and
- the required rate of improvement will be linear, then

the average rating will need to improve by at least 25% per year for the next 3 years or 15% per year for 5 years to reach a score of 100%.



However, from both our research and experience we have found that the improvement line is more of an exponential curve requiring greater input as we get closer to the top. In fact we have found when you first start the formal improvement journey the site on average may only be spending about 1% of the total work hours available on formal improvement activities. By the time you are striving for the last 20% of the 100%, this ratio will more than likely be closer to 10% of the total work hours available.

Our research and experience also highlights that there are three broad approaches to operations improvement:

1. Improve Technology & Automation
eg replace old equipment with enhanced technology
2. Project Focused Improvement
eg address specific losses with focused Cross-functional Improvement Teams
3. Improve Practices & Behaviours
eg engage all employees through Area Based Team formal continuous improvement

We have often found that the Technology & Automation and Project Focused Improvement approaches are the most common approaches taken by companies. These are very important, however we have found **it is the people engagement that distinguishes the average performer from the best.**

In the book, *The Toyota Way: 14 Management Principles of the World's Greatest Manufacturer* by Jeffrey K Liker, principle 10 states: 'Develop exceptional people and teams who follow your company's philosophy', however as outlined below, all the principles create an environment that promotes people engagement.

The 14 Management Principles, which create the 'Toyota Way':

Long Term Philosophy

1. Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals

The Right Process will Produce the Right Results

2. Create continuous process flow to bring problems to the surface
3. Use 'pull' systems to avoid over production
4. Level out the workload (*Heijunka*)
5. Build a culture of stopping to fix the problems, to get quality right the first time
6. Standardised tasks are the foundation for continuous improvement and employee empowerment
7. Use visual controls so no problems are hidden
8. Use only reliable, thoroughly tested technology that serves your people and processes

Add Value to the Organisation by Developing your People and Partners

9. Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others
10. Develop exceptional people and teams who follow your company's philosophy
11. Respect your extended network of partners and suppliers by challenging them and helping them improve

Continuously Solving Root Problems Drives Organisational Learning

12. Go and see for yourself to thoroughly understand the situation (*Genchi Genbutsu*)
13. Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly (*Nemawashi*)
14. Become a learning organisation through relentless reflection (*Hansei*) and continuous improvement (*Kaizen*)

Key Learnings

Option 1 (Improve Technology & Automation), provided we have the capital to spend and the technology is proven, is an important path to take, however our research highlights that this path alone will only get you about half way along your journey to Operations Excellence.

Option 2 (Project Focused Improvement) is very popular as it is the improvement path of least resistance, as you only have to engage a select, and often elitist, group within the company to get some improvement results. Provided a proven scientific approach is taken, this path will provide results however it often neglects to recognise the many people issues within our organisations and without the frontline support of all our people who add the value, many good project solutions fail to achieve their full potential or fail to sustain.

Option 3 (Improve Practices & Behaviours) is about the systematic engagement of the entire workforce to help identify and solve problems at the source (frontline) and more importantly avoid problems. It is about the development of the right behaviours of all employees so there is a strong sense of desire to understand how to identify problems at the source and take the necessary care to avoid the problems occurring in the workplace. We have found that option 3 is critical to support the Technology & Automation, and Project Focused Improvement approaches, and to take you to Operations Excellence.

To maximise the improvement journey, all 3 options need to be integrated to ensure each supports each other thus producing a synergistic outcome.

What differentiates companies that move ahead of the pack?

1. Good Measurement

A key measure used by many companies trying to drive their operations improvement activities is Overall Equipment Effectiveness (OEE). This measure is a combination of the 3 elements that are required for equipment and people to work effectively: Availability; Rate; and Quality. If your equipment is not available when required, running at the ideal speed without any minor stoppages or operator interventions, and producing first pass, top quality output, then the equipment is not effective.

A simple way of measuring Overall Equipment Effectiveness (OEE) is:

$$\text{OEE} = \frac{\text{Good Output Produced}}{\text{Required Production Time} \times \text{Ideal Speed}}$$

The Overall Equipment Effectiveness (OEE = A x R x Q) measure is a great tool for easily monitoring our ability to produce good output first time however it needs to be supported by a suite of Goal Aligned Performance Measures such as:

- Safety & Environment (accidents and incidents);
- Asset Performance (equipment and inventories);
- Quality Performance (yield, scrap and rework);

5 Year Study of the Operations Capability of Australian Industry

- Customer Satisfaction Performance (delivery in full, on time and to spec);
- Supplier Performance (quality and delivery);
- Human Resources Performance (productivity and morale); which all lead to
- Financial Performance (costs)

to ensure improvements are taking your company in the correct direction.

When using the OEE measure to identify losses and potential improvement opportunities we find a very common pattern at most sites. Less than half the losses are caused by technical issues (eg the spring on the machine breaks due to being undersized for the job), whereas the people losses when identified as such (eg takes time to identify the problem with the machine output is that the spring is broken), play a much greater part in the challenge facing most companies as they try to improve performance.

2. Engaged Workforce through a Commitment to Formal Continuous Improvement

During our workshops we discuss how well companies engage their workforce, and to highlight the issues, we look specifically at the roles of operators. Our learning is that operators have 2 key roles: firstly to 'Achieve the Production Plan' in a safe, quality, cost effective and environmentally sound way; and secondly to Formally Improve the way they do this.

Unfortunately as shown below the 'Typical' ratio tends to correlate to the performance of the plant:

Key Roles of our Operators	Typical	WCP*
1. Achieve the Production Plan (in a Safe, Quality, Cost effective and Environmentally sound way)	99%	85%
2. Formally Improve (the way they achieve 1. above)	1%	15%
Plant Performance (OEE = A x R x Q):	50-60%	+ 85%

*WCP = World Class Performance

If this is the world class performance model, the challenge we have is to understand how we can achieve the 15% without impacting on the site's ability to achieve the production plan. To address this we first need to understand what the 15% is made up of and the impact this has on the ability to achieve the production plan:

Cross-functional Improvement Team Member	Area Based Team Improvement Activity	Discretionary Time (while doing job)
5%	5%	5%
Machine or Plant runs while one Area Based Team member is away for say 1-2 hrs	Machine or Plant may need to be stopped while all team members are involved for say 15-30 min meeting and 1-2 hrs improvement activity	Machine or Plant is running well

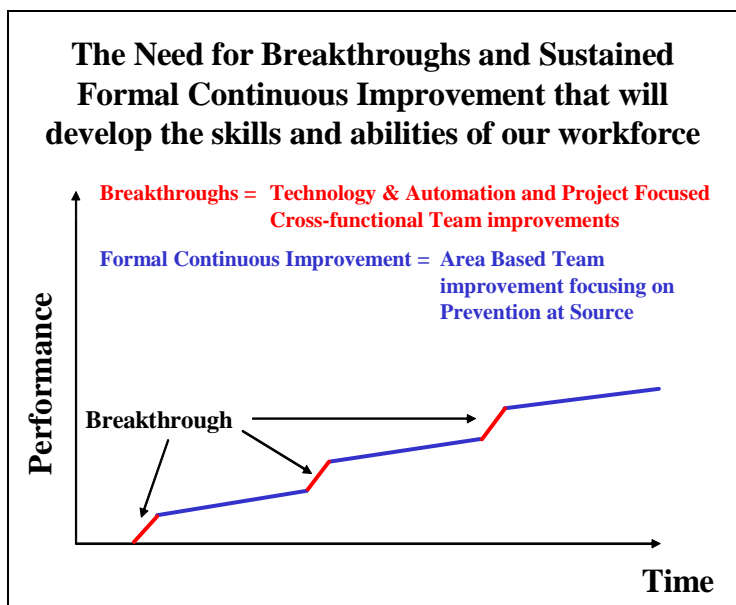
3. Having the Right Improvement Scenario

During our workshops we discuss the different ways companies approach improvement by calling on the experiences of the delegates. Three scenarios are often identified with the first 2 being the most common and also explaining why the majority of sites struggle on their improvement journey.

To engage employees we have found Scenario 3 is required where initially Cross-functional Team improvement will be conducted to raise the OEE then some of the gain will be re-invested back into the employees to allow Area Based Team improvement activities to commence.

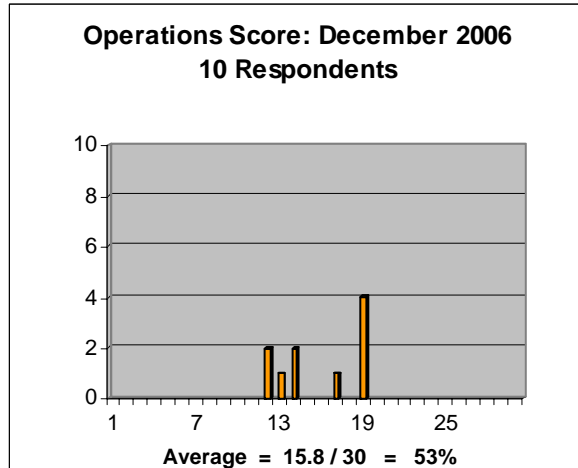
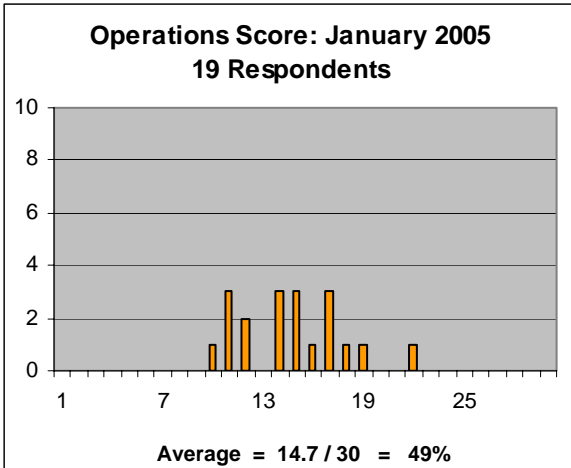
The Three Improvement Scenarios		
S1		<p>Scenario 1: Project team improves then moves on to next project</p>
S2		<p>Scenario 2: Project team improves then moves on to next project and 20% of resources reduced from area</p>
S3		<p>Scenario 3: TPM³ Improvement results in further engagement of employees to continue the improvement journey</p>
<p>OEE = Overall Equipment Effectiveness FCI = Formal Continuous Improvement</p>		

It is the development of our employees through their involvement in Cross-functional improvement activities to develop problem solving skills and Area Based Team activities to develop their ability to identify and address problems at the source that we develop capabilities to achieve Operational Excellence.



Case Studies

Simplot Australia - Devonport

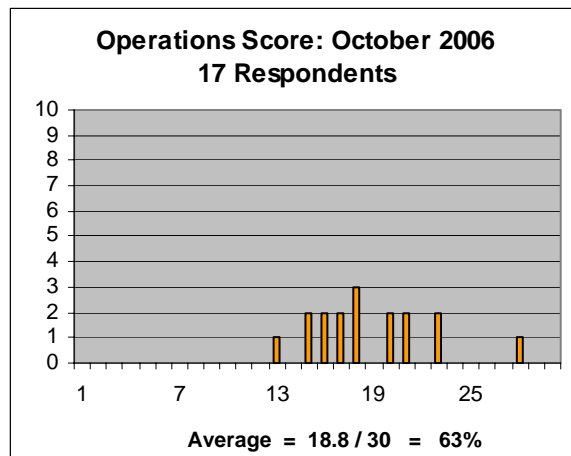
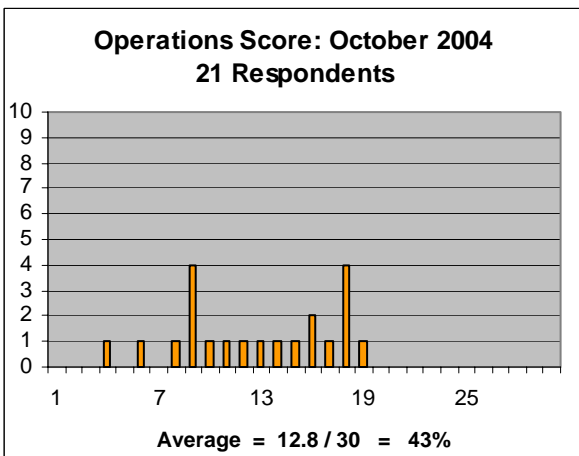


The Devonport site manufactures frozen vegetables (*Birds Eye, Edgell*) for the Retail, Foodservice & Industrial marketplace. It produces 65K tonnes per annum of Peas, Beans, Carrots, Broccoli, Cauliflower, Potato, and Onion. It has achieved international ‘Class A’ accreditation for its Manufacturing Recourses Planning (MRP2) capability. The site employees up to 350 personnel, of which there is a high proportion of casuals due to the seasonality of the business.

In 2000 the site commenced a Project Focused Improvement initiative following the recent introduction of new technology in their packaging area however expected performance improvement started to plateau after several years because they had not addressed the Practices & Behaviour issues through Area Based Teams.

In January 2005, the site commenced their TPM³ journey with an Operations Capability score of 49%. Since the introduction of Area Based Team improvement activities in May 2005 progressively involving all operators to complement their Cross-functional Team improvement activities, performance has significantly improved. In August 2006 the site was awarded Level 1 of the 5 Level Milestone TPM³ Excellence Award, which requires among other things a 40% gap improvement on key performance measures. In December 2006 when they completed the Operations Capability Rating again there was a greater realisation of what World Class Performance is really all about and as such their score of 53% was more critical than there previous score as well there was less spread in the score.

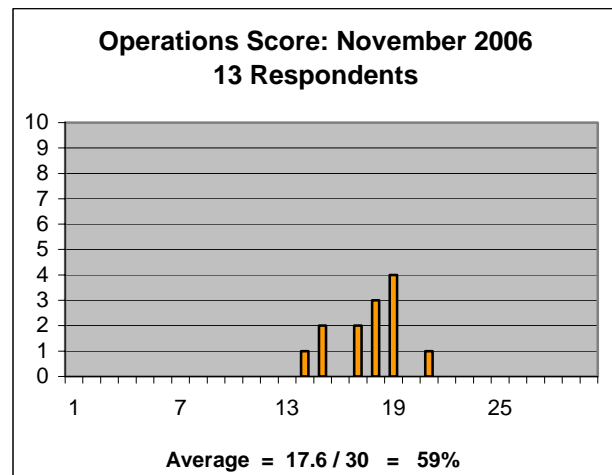
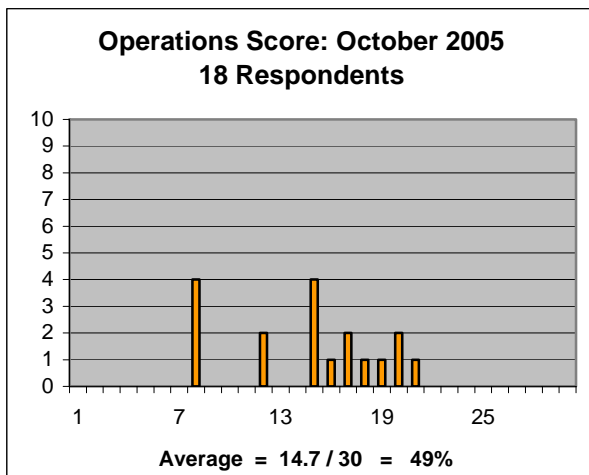
Juken New Zealand Limited – Northland Mill Kaitaia



Juken NZ Limited – Northland Mill is a timber processing plant dealing with solid wood and veneer products under Japanese ownership. The Northland site employs approximately 190 staff. Juken NZ – Northland commenced their TPM³ Journey in January 2005 and over the first 24 months have completed 6 cycles of TPM³ team activity with over 93% of their workforce now involved in formal improvement activity every week. On 30 November 2006, the site was awarded Level 1 of the 5 Level Milestone TPM³ Excellence Award. In their press release to announce the award they highlighted their achievements to date as:

- 88% reduction in Lost Time Injury Frequency across the site
- 34% increase in plant Capacity in their Saw Line
- 16% increase in plant Capacity in their Veneer Plant
- 50% reduction in Total Manufacturing Costs

Sugar Australia – Glebe Island



Sugar Australia – Glebe Island site is one of Sugar Australia's 4 bulk supply depots with packaging plants. The depot has 28,000 tonnes of white refined sugar storage capacity, which is supplied via a special purpose 19,000 tonne capacity ship from the Mackay Sugar Refinery in Queensland. Both dry and liquid sugar is supplied to Food & Beverage Manufacturers, Food Service Industry and Retail Markets.

The Glebe site commenced their TPM³ journey in October 2005, and by November 2006 they had completed 3 cycles of formal improvement activity with all employees engaged resulting in:

- 96% increase in the Retail Line OEE
- 180% increase in the Industrial Line OEE
- 25% reduction in Labour Costs

Identifying the Best Way Forward

Our research and experience has highlighted that there are a number of fundamentals that need to be in place:

- Clear purpose of what we are trying to achieve;
- Good scoreboards to feedback on our progress at all levels; and
- The correct relationships among all the players (workforce)

However, by themselves, these fundamentals will not get you there. We need to look further.

In an article in the Harvard Business Review in 1999, several authors reported on an extensive study into what really makes the Toyota Production System work. The results can be summarised into 4 key previously unwritten rules. These rules guide the design, operation, and improvement of every activity, connection and pathway for every product and service. The rules are as follows:

Rule 1:	All work shall be highly specified as to content, sequence, timing, and outcome
Rule 2:	Every customer-supplier connection must be direct, and there must be an unambiguous yes-or-no way to send requests and receive responses
Rule 3:	The pathway for every product and service must be simple and direct
Rule 4:	Any improvement must be made in accordance with the scientific method, under the guidance of a teacher, at the lowest possible level in the organisation
All the rules require that activities, connections, and flow paths have built-in checks, to signal problems automatically. It is the continual response to problems that makes this seemingly rigid system so flexible and adaptable to changing circumstances.	
<small>Source: Decoding the DNA of the Toyota Production System, HARVARD BUSINESS REVIEW Sep-Oct 99</small>	

Rule 4 is the key to sustainable improvement. Any improvement methodology needs to recognise the importance of Rule 4 and provide Team Member Manuals for both Cross-functional improvement teams and Area Based improvement teams to ensure a structured, step-by-step (scientific) method is followed that is flexible enough to suit all sites' unique characteristics.

One of our concerns is that many companies tend to focus on formal improvement through only Cross-functional Teams due to the ability to select the team members and as such minimise the impact to achieve the production plan. Unfortunately, this approach alone often results in Improvement Scenario 1 or 2 occurring as outlined previously.

The challenge is to recognise we all have 2 roles in our companies, not just the operators. Not only do we need to achieve the production (or service) plan obviously in a safe, quality – right first time, cost effective and environmentally sound way, but most importantly we all need to formally improve the way we achieve the production (or service) plan especially in light of the need to achieve prevention at source at the 'lowest possible level'.

TPM, the DNA of the Toyota Production System

Over the past 5 years we have been gaining greater experience and learning from implementing business improvement based on the Toyota Production System / Toyota Way focusing on people, equipment and processes (rather than just a TPM focus), however we are now finding TPM is taking a greater focus with many major companies who have been going down the Lean path for some time.

For example: at the Mainstream 2007 conference in Sydney over 300 delegates heard one of Alcoa's senior people from the USA (Hugh Blackwood) explain how TPM is now being recognised as the DNA of the Toyota Production System.

If we reflect back, Toyota developed TPM to address equipment problems (Defects) at the Source so as to increase reliability while reducing costs. We now know it was also used to develop their people so as to sustain their Toyota Production System.

When they first introduced TPM they realised they faced 3 challenges in implementing this concept: How do we:

- Train the operators to know what to look for regarding equipment defects;
- Change the equipment so it easy for operators to find the problems; and
- Create a maintenance support capability that can respond to small problems and issues identified by the operators

We have found these challenges are still with many companies today.

We have also found that an improvement methodology needs to address issues such as:

- Establishing Goal Aligned Performance Measures at all levels ie Site / Department / Area;
- Improving equipment performance (OEE) so as to reduce costs and increase capacity to allow both increased production AND time for regular formal team based improvement activities (need to invest in our people for further improvement);
- Building relationships between production and maintenance so they work in harmony;
- Establishing Area Based Teams of 4-8 employees under the guidance of a working designated Team Leader to allow the rapid development of your employees;
- Improving communications and standards between shifts;
- Developing skills and abilities of operators to identify safety, quality and equipment problems at the source through weekly improvement activity; and
- Developing a maintenance capability that can respond to problems identified by operators so that the operators are motivated to continue to find more.

Our TPM³ – Australasian Lean methodology has been developed to address the above in a flexible way that allows each step to build a stronger foundation for the next step. This approach supports the ongoing development of employees so we unleash their full potential.

We have found that to develop employees is like teaching a child to play a musical instrument (similar to new skills such as problem solving or finding equipment problems at the source). We can either provide the child with say a 2-5 day training course (Blitz) and then expect them to play the musical instrument competently or we can arrange a half-hour lesson every week for say 2-3 years and provide some time for practice and support this learning journey with a lot of encouragement. Experience tells us the latter is the approach that provides the sustained success.

There are times when urgent action is required, however if sustainability and ongoing improvement is required then the people who do the work need the skills. Short cuts rarely sustain.

Our flexible approach is based on understanding where a client is on their journey and then working with them to develop a plan which is reviewed (3 monthly) involving regular (weekly) activities in employees normal work times to get immediate gains like 10-20% lift in OEE within 3 months then develop the sustainability of improved business performance by focusing on finding problems at the source so as to significantly improve safety, quality and costs.

Summary

We need to engage all employees to the challenge, as the article from Harvard Business Review said; we need to get Rule 4 in place.

TPM³ - Australasian Lean has been specially developed for this purpose as it is an enhanced Australasian approach to applying the principles and practices of the internationally recognised Toyota Production System.

Several of our clients now describe our methodology as a structured, yet flexible and practical, phased *journey* to Operations Excellence to support Business Excellence. Others see it as a proven company wide improvement strategy that initially focuses on equipment performance and reliability with the flexibility and capability to allow management to expand the methodology throughout the supply chain, ultimately involving all employees, suppliers and customers.

With TPM³ – Australasian Lean, the steps are not difficult with the pathway well defined. There is great flexibility to allow full control by your management team. And it has been developed and refined to suit our unique Australian workplace culture.

About CTPM Australasia

Originally called The Centre for TPM (Australasia), CTPM was established as an outcome of the first conference dedicated to TPM in Australasia held in Sydney in 1995. During the conference, which was chaired by Ross Kennedy, there was a call from the delegates to establish a much-needed Institute for TPM to support industry, academia and government similar to those already present in Japan, USA and Europe. Responding to this call, Ross with several colleagues launched the Centre in January 1996 with its head office located in Wollongong (a major city some 80 kilometres south of Sydney on the NSW South Coast).

TPM was developed in 1970 as an integral part of the Toyota Production System. Originally known as Total Productive Maintenance, the words correctly interpreted mean all employees (Total) creating greater return on investment (Productive) by caring for the plant & equipment (Maintenance) so as to maximise its performance and output.

In order to better suit our Australasian workplace culture, TPM³ was developed in 1998 as an enhanced and expanded Australasian version of the Japan Institute of Plant Maintenance (JIPM) third generation TPM model. In 2006, we further expanded and enhanced our methodology and renamed it TPM³ – Australasian Lean to better reflect our Australasian approach to applying the principles and practices of the internationally recognised Toyota Production System and began formally trading as CTPM Australasia.

CTPM is a membership-based organisation with the charter to develop, promote and advance the knowledge and practice of TPM and more recently TPM³ - Australasian Lean.

The TPM³ – Australasian Lean methodology synergistically integrates 10 Pillars of improvement activity, so as to allow companies to unleash the full potential of their People, Equipment and Processes as they strive to achieve World Class Performance.

CTPM and its membership continue to grow. There are now more than 20,000 company employees covered by CTPM membership and over 30 sites covering 14 Industry Groups from Manufacturing, Mining, Processing, Utilities and Service companies currently progressing their TPM³ – Australasian Lean journey to World Class Performance.

CTPM is very mindful of the need for companies to establish their own in-house capabilities to lead, manage and facilitate their TPM³ – Australasian Lean journey in order to achieve sustained success. However we also acknowledge that TPM³ – Australasian Lean has been developed based on more than 30 years of learning involving practical experience, reflection and research, and as such, establishing or developing internal capabilities is not achieved just by attending one or two training courses. Proper training from a recognised authority is critical (such as the TPM³ Leadership / Instructor's Program which was developed in November 1997 and to date, some 22 courses later, has over 250 graduates from some 30 companies), however most of the learning comes from doing.

There are very few short cuts to experience.

5 Year Study of the Operations Capability of Australian Industry

For this reason, CTPM has developed a proven flexible methodology supported by:

- A range of educational training courses;
- Introduction and Pre-cycle planning workshops;
- Team kick-off workshops supported by comprehensive step-by-step Team Member Manuals;
- A site wide Assessment & Planning process;
- The 5 Level Milestone TPM³ Excellence Award supported by our Milestone Assessment Process; and most importantly
- A full-time team of experienced TPM³ Navigators to provide on-site facilitation and training support who are located throughout Australia, New Zealand, Indonesia and Thailand.

CTPM became a Registered Training Organisation on the 17 May 2007. We are registered to provide:

MCM30104 Certificate III in Competitive Manufacturing
MCM40104 Certificate IV in Competitive Manufacturing
BSB41004 Certificate IV in Business (Frontline Management)

Our approach is to link the training and assessment for Competitive Manufacturing Certificate III and IV to our TPM³– Australasian Lean journey where employees, once enrolled, will be assessed for the required units while they are Team Members of (Cert III), or Team Leaders of (Cert IV) TPM³ Teams.

The benefits for companies taking this approach rather than a traditional training approach are very significant. It allows their employees to be formally recognised with a National Qualification as they contribute to the companies strategically driven improvement initiative, rather than just complete a series of often ad-hoc projects to satisfy their training requirements.

About the Author

**Ross Kennedy B.Sc (Eng) Mech Eng, B.Comm (Mgmt), MAICD
President & Managing Director**

CTPM Australasia

A fitter and turner by trade, Ross has a Mechanical Engineering degree from the University of New South Wales and a Management degree from the University of Wollongong.

He has more than 20 years of hands-on manufacturing and operational experience covering maintenance, production, operations and executive roles. In 1985 Ross developed his passion for Lean Production following his involvement in the Value Added Management (JIT) initiative by the NSW Government. Ross quickly and effectively applied the new Lean principles and practices firstly at the CMA Foam Group Lullaby Bedding Factory while Factory Manager, then CMA's Cable Accessories Factory as Site Manager before moving to David Brown Gear Industries as Manufacturing Manger to oversee the relocation of the company from Sydney to Wollongong to a new facility set up on Lean principles and practices. In 1989 after the new facility was well established and recognised for its leading edge improvements based on Lean, Ross was invited to join the new JIT / Lean practice being established by the Manufacturing and Operations Group of Coopers & Lybrand's International Management Consulting Practice.

Over the next 5 years Ross had the opportunity to work on major assignments with some of the firm's leading Lean practitioners from USA, Canada and the UK. It was also during this time that he first came across TPM (a critical missing link in the Lean tool kit) in 1990 when he led one of the first implementations of TPM in Australasia under the guidance of John Campbell who was Partner-in-Charge of Coopers & Lybrand's Global Centre for Maintenance Excellence based in Canada and author of the internationally recognised maintenance book – Uptime.

In August 1994 Ross established his own consulting practice specialising in TPM. He organised and chaired Australasia's first TPM conference in 1995 and, as at the request of the delegates at the conference, Ross with several colleagues founded The Centre for TPM (Australasia) or CTPM in January 1996 to provide a membership-based organisation to support Australasian industry and academia.

After extensive research including a trip to Paris in 1997 to attend Europe's first World-Class Manufacturing & JIPM-TPM Conference and associated workshops with leading TPM practitioners from throughout the world, the CTPM launched its TPM³ methodology in January 1998, which is an enhanced and expanded Australasian version of 3rd Generation TPM embracing the Toyota Production System and spanning the entire Supply Chain.

Since then CTPM has been involved with a wide range of leading manufacturing, mining, processing, utilities and service companies. For example from Sept 1998 to June 2003 CTPM assisted Telstra roll-out their TPM initiative to over 200 teams servicing their Customer Access Network in 16 Regions throughout Australia resulting in over \$110m in savings.

Ross has been actively involved with Lean since 1985, TPM since 1990 and TPM³ since 1998 and has delivered publicly over 200 workshops and papers on the subjects both within Australia and overseas.

CTPM, under the direction of Ross with his team of experienced full-time TPM³ Navigators, is presently assisting over 30 sites spanning some 14 different industry groups located in Australia, New Zealand, Thailand and Indonesia on their TPM³ – Australasian Lean journeys to World Class Performance.

A Brief Overview of TPM³ - Australasian Lean

- An enhanced Australasian approach to applying the principles and practices of the internationally recognised Toyota Production System
- A company wide improvement *strategy* ultimately involving all employees, suppliers and customers
- A flexible, structured and practical *journey* consisting of 10 integrated Pillars, each with defined steps

TPM³ – Australasian Lean is unique in that it:

- Initially focuses on *equipment performance* and *reliability* recognising that if your equipment and people aren't working well, frustrations run high and attempts to introduce Flow and reduce Waste in the Value Streams through Lean thinking becomes unsustainable;
- Provides *rapid returns on investment* through strategically driven cycles of ongoing improvement activity supported by key performance measures which act as 'drivers' for improving overall company performance;
- Reduces *frustrations* and achieves *engagement* of all employees generating a significant positive impact on safety and morale;
- Promotes a *positive behaviour change* of the whole workforce with significant benefits for Customers, Employees and Shareholders; and
- Takes the mystery out of integrating all the principles, tools, and concepts from traditional Lean Production, *cutting through all the confusion* and providing an approach that works.

The Key Objectives of TPM³ - Australasian Lean

- *Maximise productive capacity* by cost effectively maximising overall workplace effectiveness through the identification and elimination or minimisation of all losses (wastes) associated with People, Equipment, Processes and Materials;
- *Minimise overall costs* by creating a sense of "ownership" among all employees so they become committed to developing an understanding of how to care for their workplace through a "prevention at source" approach;
- *Improve workplace conditions and culture* by establishing everyone's involvement in formal continuous improvement through Cross-functional Teams and Area Based Teams so as to unleash the full potential of employees;

so as to significantly improve the Return on Investment (ROI) for the company.

Benefits of TPM³ – Australasian Lean

There are many success stories throughout Australasia covering some 14 industry groups from Manufacturing, Mining, Process, Utilities and Service companies.

Example success story taken from a recent CTPM Newsletter article:

Juken New Zealand Limited - Northland, a timber processing plant, commenced their TPM³ Journey in January 2005 and over the first 12 months completed 3 cycles of TPM³ team activity with 28% of their workforce in teams by Cycle 3. On 30 November 2006, while progressing Cycle 6 the site was awarded Level 1 of the 5 Level Milestone TPM³ Excellence Award. In their press release to announce the award they stated they now have 93% of their workforce involved in improvement activity every week. Achievements to date include:

- | | |
|---|--|
| • 88% reduction in Lost Time Injury Frequency | • 93% reduction in Sawmill Yield Loss |
| • 34% increase in Sawmill Capacity | • 67% reduction in Sawmill Maintenance Costs |
| • 16% increase in Veneer Plant Capacity | • 29% reduction in Sawmill Electricity Costs |

all contributing to a 50% reduction in Total Manufactured Costs