



**HIGHLIGHTS
OF THE
FIFTY-SEVENTH
ADVANCED MANUFACTURING FORUM
APRIL 2005**

CENTER FOR THE MANAGEMENT OF TECHNOLOGICAL AND ORGANIZATIONAL CHANGE
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SMEAL COLLEGE OF BUSINESS • THE PENNSYLVANIA STATE UNIVERSITY
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**Journey to Lean:
From Base Camp to Summit**

ArvinMeritor, Inc.

**The Journey
To
Lean**

Mark Frazier
Site Manager
Emissions Technology
Manufacturing Facility
ArvinMeritor's Gladstone Plant
Columbus, Indiana

ArvinMeritor is an \$8 billion global supplier of a broad range of integrated systems, modules and components to the motor vehicle industry. The company serves light vehicle, commercial truck, trailer and specialty original equipment manufacturers and related after-markets. AM employs 31,000 people at more than 120 manufacturing facilities in 25 countries.

Mark Frazier is the site manager for ArvinMeritor's 2004-Shingo Prize-winning Emissions Technologies manufacturing facility. The plant has about 900 employees. Frazier shared his insights on ArvinMeritor's continuous improvement journey.

Continuous improvement will not come without employee involvement, and employee involvement will not come without communication. Employee involvement is

(ArvinMeritor continued on page 2)

Kennametal, Inc.

**Implementing and
Sustaining
Better Practices**

Bill Kimbro
Corporate Lean Enterprise Manager
Kennametal, Inc.
Latrobe, Pennsylvania

Kennametal provides to customers a broad range of technologically advanced tools, tooling systems and engineering services aimed at improving customers' manufacturing competitiveness. Kennametal's products utilize highly complex metallurgy and materials science in tungsten carbide powders, high-speed steels, ceramics, industrial diamond and other materials that are particularly resistant to heat, abrasion, pressure and wear.

With annual sales at approximately \$2 billion and 14,000 employees worldwide, Kennametal has been named one of the best places to work in Pennsylvania. As Corporate Lean Enterprise Manager, Bill Kimbro is responsible for the Lean transformation of Kennametal's global metalworking locations, supporting 42 production facilities in 12 different countries as well as various global support facilities.

(Kennametal continued on page 2)

Rockwell Automation.

**Power Lean:
An Integrated Approach
To
Continuous Performance
Improvement**

David W. Conrad
Manager—Power Lean Core Team
Rockwell Automation Power Systems
Greenville, South Carolina

Rockwell Automation Power Systems operates 14 plants and 11 service centers in North America. RAPS includes electric motors and standard drives, and Dodge mechanical power transmission components. The Dodge bearing plant was an *Industry-Week Best Plant* in 2004. The company launched Power Lean in 2000, a continuous improvement effort aimed at identifying and eliminating waste in all business and production processes. At its core is a five-week training program that includes classroom theory on, and production floor application of, tools associated with Lean Manufacturing, Six Sigma, and Maintenance Excellence. To date, 140 employees certified as Power Lean Masters are driving the change for 4,200 employees. Every manufacturing plant has eight or nine Power Lean Masters.

Rockwell's mantra: maximize value-added activity in all business processes (production and support) by eliminating the barriers to flow. Conrad said operational

(Rockwell continued on page 3)

United Defense

War on Waste

Marty Paino **Bob Koller**
Lean Manufacturing Manager Manager, Material Control
United Defense Ground Systems Division
York, Pennsylvania

United Defense is a leader in the design, development and production of combat vehicles, artillery, naval guns, missile launchers and precision munitions used by the U.S. Department of Defense and allies worldwide. Paino, UD's Lean Manufacturing Manager, and Koller, Material Control Manager, outlined the company's journey towards operating excellence and how lean tools helped to produce world-class results.

UD's lean journey began the fall of 2001, with lean certification from the University of Michigan, and core leadership and support team training (both theory and hands-on in a simulated factory from Mantec, in York, PA. The Bradley Fighting Vehicle's Turret Assembly was chosen as the lean pilot project, and through the application of lean tools, value stream mapping, 5S,

**58th
Advanced Manufacturing
Forum**

October 20-21, 2005

**The Journey to Lean
Continues . . .**

Details soon!
<http://www.smeal.psu.edu/cmtoc/index.html>

ArvinMeritor (continued from page 1)

key, and Frazier returned to this theme throughout his presentation.

"The person in the work cell on the production floor is the one making the money for the company, and everyone else is supporting that person," said Frazier.

AM followed four basic steps in implementing continuous improvement:

1. Forming (introduce the CI culture);
2. Storming (immerse in CI culture);
3. Norming (implement);
4. Performing (assess, revise, move forward);

with communication and recognition during all phases. (See slide on page 4.)

AM gave up production time for training, weekly team meetings (one hour per week) and cleaning — time for all is taken out of their takt time calculation. Quarterly meetings are also held with every employee, where the focus is on what is happening at the plant, how the plant is performing, where they are headed, and what the future holds.

Every salaried and non-exempt salaried employee is a facilitator on some team. And they facilitate on a team that, for the most part, has nothing to do with their day-to-day job so that the facilitator does not interfere with the team's decision-making. They facilitate only, making sure there are no roadblocks. There are regular facilitator meetings to talk about issues, and the facilitating work is on the employee's performance plan. It partly determines merit increases, so employees stay focused on it.

AM creates a supportive environment through such "People Supportive Practices" as leading by example, encouraging teamwork, providing clear communications, developing shared goals and sharing rewards. Incentives are aligned with company and site objectives.

Supporting documents such as kaizen idea cards, tangible suggestion forms, and meeting invitation cards all reinforce communication - the number of suggestions per employee went from 2.0 in 1991 to 15.9 in 2004.

AM's Continuous Improvement culture consists of four main training modules:

- Identification of waste
- Elimination of waste
- Pull System
- Workplace Organization and Visual Controls

Much of the training is done in-house, by their own trainers. Suppliers are also brought into workshops. Engineers, finance people—everyone in the whole company undergoes basic training. ArvinMeritor utilizes the 20 Keys of Continuous Improvement (see slide on page 5) to measure performance levels.

Communication, communication, communication—it is the backbone that sustains the CI culture at ArvinMeritor. Frazier said to

(continued next column)

Kennametal (continued from page 1)

Kimbro stressed leadership, communication, and passion as key elements in Kennametal's lean journey. Strategies, tactics, tools and practices are useful, but more important are how you relate with your people, do you understand their issues, and can you guide them with principles.

Kennametal utilized "25 Keys to Manufacturing Excellence" to map and understand their 'current state' (see slide on page 6). The company then created a vision of where it wanted to be (the future state), and how to get there. Lean became one of the core strategies in the Kennametal Value Business System.

Five components support Kennametal's Lean strategy; they are, briefly:

- Standardization: their training material is standardized around the globe
- Stabilization: there is a dedicated support staff and certification program (see slide on page 7);
- Innovation: simulation modeling and apprenticeship programs are examples;
- Customer: "voice of the customer" weekly meetings where the customer is thanked for letting Kennametal know how it can improve;
- Culture/Involvement: LEAD board weekly meetings, communication that involves everyone, pilot programs that allow people to learn by doing.

Kimbro said that Kennametal realized early on that it was necessary to get involved with other companies. When Kennametal benchmarks another company, the team denotes three things that that company is better at than Kennametal, and develops strategies to implement them. The team is also instructed to find three things that are less than optimal, and to come up with a way to keep those from Kennametal. They may leave with six or seven ideas, and use one or two of them.

Gretchen Schneider, a Kennametal Manufacturing Management Associate in Latrobe, walked through a value stream map project at Kennametal's Vohenstrausse facility. The facility regrinds their customers' used drills. The goal of the project was to reduce lead time, increase capacity, and stabilize customer service metrics. A multinational cross-functional team was formed to analyze the regrind area and to create a single page plan. The team assessed the background and goals of the project, created a "current state" map of the processes, and envisioned a "future state" map. Out of that map came the implementation plan and attendant actions.

Dave Puckett, Kennametal's Focus Factory Manager at their Orwell, Ohio facility, offered some lessons learned along their lean journey:

1. Don't forget middle management. Be sure to train your middle managers along with everyone else.
2. Look at how your measurement systems support your lean activities. Supervisors may think they are measured on how many items come off the shop floor. Lean tells you to build based on customer demand.
3. You cannot change everyone at once.
4. It is okay to fail, but be sure to fail fast. Teams can work in both positive and negative ways. Follow up, follow up, follow up.
5. Commitment—when starting a lean journey, there are tremendous amounts of low-hanging fruit, so the drive and passion is there. As the journey continues, and you look for more lean initiatives, the commitment has to be there. Everyone can contribute, and the only way to success is if everyone *does* contribute.

define what you mean by success, for the organization, for the team, for each individual. Get agreement on goals. Support the system by monitoring progress, providing additional training as needed, and following up on ideas. Communicate approval or disapproval, and if disapproval, why.

ArvinMeritor's lean journey is proving itself: absenteeism is down, perfect attendance numbers are up, grievance activity is down (from 107 filed in 1996 to 4 in 2004), safety incidents have plummeted (129 in FY2001 to 14 in FY2005), and Gladstone Plant sales have grown from \$153M in 1994 to over \$321M in 2004.

Third Klein Symposium

October 14, 2005

Penn Stater Conference Center
State College, PA

Organized by **Gerald Susman**
Robert and Judith Klein Professor of Management

The symposium will focus on the opportunities that exporting offers to small and medium-sized enterprises (SMEs). In addition to advancing knowledge, consultants and managers will be provided with guidance that they can use to help their SME become an effective exporter.

Details soon!

<http://www.smeal.psu.edu/cmtoe/index.html>



Rockwell (continued from page 1)

excellence comes from wrapping together Lean, Six Sigma and Maintenance Excellence. The goal with Maintenance Excellence is 100% *planned* downtime. Even if processes are relatively free of waste and have low levels of variation, it is not much good if equipment is not always available when you need it.

Value comes from improving quality, reducing costs, and accelerating delivery. As products become commoditized, consumers want them cheaper and immediately. Rockwell recognized that past improvement programs were just point solutions, not always traceable to the bottom line. And when China came on board, very quickly, in the mid-1990's, with good products, management put together a team five years ago to decide what kind of program was needed. Lean was the answer.

Rockwell hired continuous improvement professionals to develop a full-fledged program. They spent nine months with the company behind closed doors and when they emerged, Conrad attended his first Power Lean session. Nuggets that came out of the program:

- Get the foundation of Lean out to the masses;
- Current and future state value mapping is very important - they now think and plan 3, 4, 5 years down the road - have a vision of where you are going;
- Continuous Improvement projects have to be linked specifically to the path from current to future state;
- Measure kaizen improvements - kaizen is Rockwell's tool to drive the most base level of changes and they are very disciplined about measuring the results.

Power Lean is a long-term philosophy, a business strategy and a tactical plan - it is about improving Rockwell's business altogether, not just productivity. When plant managers and other leaders of product groups convene to develop their annual operating plans, financial decisions are based on what the future state says things will be like next year. Confidence in reaching objectives allows Rockwell to make plans based on what they think they will improve next year. (See slide on page 8.)

After the program was up and running, an assessment program was instituted to verify that they were sustaining the gains. Conrad spends two to three days at each plant, and using a 24 Key assessment tool, scores each plant (see slide on page 9). Scores can be highly variable, and low scores are acceptable, as long as the plant scores higher during the next assessment.

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United Defense (continued from page 1)

coursework, training, and benchmarking, the turret line saw significant results. Turret travel on the line was reduced 67%, from 1038 to 340 feet; hours per unit saw a 40% improvement; turret cycle days went from 24 to 9 - in just over two years.

Among companies UD toured were Saturn, Boeing and JLG; benchmarking such diverse business segments was key - high volume/low mix, low volume/high mix, commercial vs. defense, etc. One of UD's assessment tools on point of use came from Boeing (see slide on page 10). JLG offered good instruction and information on working closely with suppliers to have everything come in exactly the same way.

Education of the workforce and development of the culture is a recurring lean theme, and UD is no exception. Their leadership was characterized as extremely involved, driving decision-making to the team level, training and utilizing people, while focusing on the customer's perception of value. But how to get the buy-in of the employees?

UD did not lay off anyone during the transition; employees helped to paint, clean, and reorganize. Everyone was part of the transition team. One of the biggest challenges was the transition from tool boxes to tool boards. Some of the operators had had their toolboxes for 25 years. The solution - employees were told they could have their tool boxes, but they had to take them home.

It was 400 yards from the line to the cafeteria, which was no good for a ten-minute break. Instead, as the lines were cleaned, fire safety cabinets were installed that now hold coffee pots, microwaves, and small refrigerators.

The most expensive acquisitions made were (basically) truck lifts for stands; it no longer mattered what the height of the employee was - the turret could be raised to any height as it was being worked on.

One of UD's problems had been overproduction. They now use cards to trigger the building of a specific part - the visual factory.

UD's lean transition involved workplace organization, creation of the visual factory, assembly lines, safety, ergonomics, and material handling improvements. Their approach:

1. Value stream mapping and analysis
2. Workplace function analysis with 5S
3. Balancing the line
4. Standardizing the work
5. Putting visuals in place
6. Point of use staging
7. Visual Kanban
8. Safety and Ergonomics

UD took their lessons learned from the turret assembly and moved them over to the vehicle assembly. "What's after Lean? We don't know, because the more waste you remove, the more you see that needs to be removed...it's a journey and it never ends," said Bob Koller.

SUGGESTED READING
from our presenters

Learning to See, by Mike Rother, John Shook, Jim Womack, Dan Jones

Lean Thinking : Banish Waste and Create Wealth in Your Corporation, Revised and Updated, by James P. Womack, Daniel T. Jones, James Womack, Daniel Jones "

Who moved my cheese?: An amazing way to deal with change in your work and in your life, by Spencer Johnson

Good to Great: Why Some Companies Make the Leap... and Others Don't, by Jim Collins

First, Break All the Rules: What the World's Greatest Managers Do Differently, by Marcus Buckingham and Curt Coffman

The Toyota Way: 14 Management Principles From The World's Greatest Manufacturer, by Jeffrey Liker

Two efforts that help sustain results:

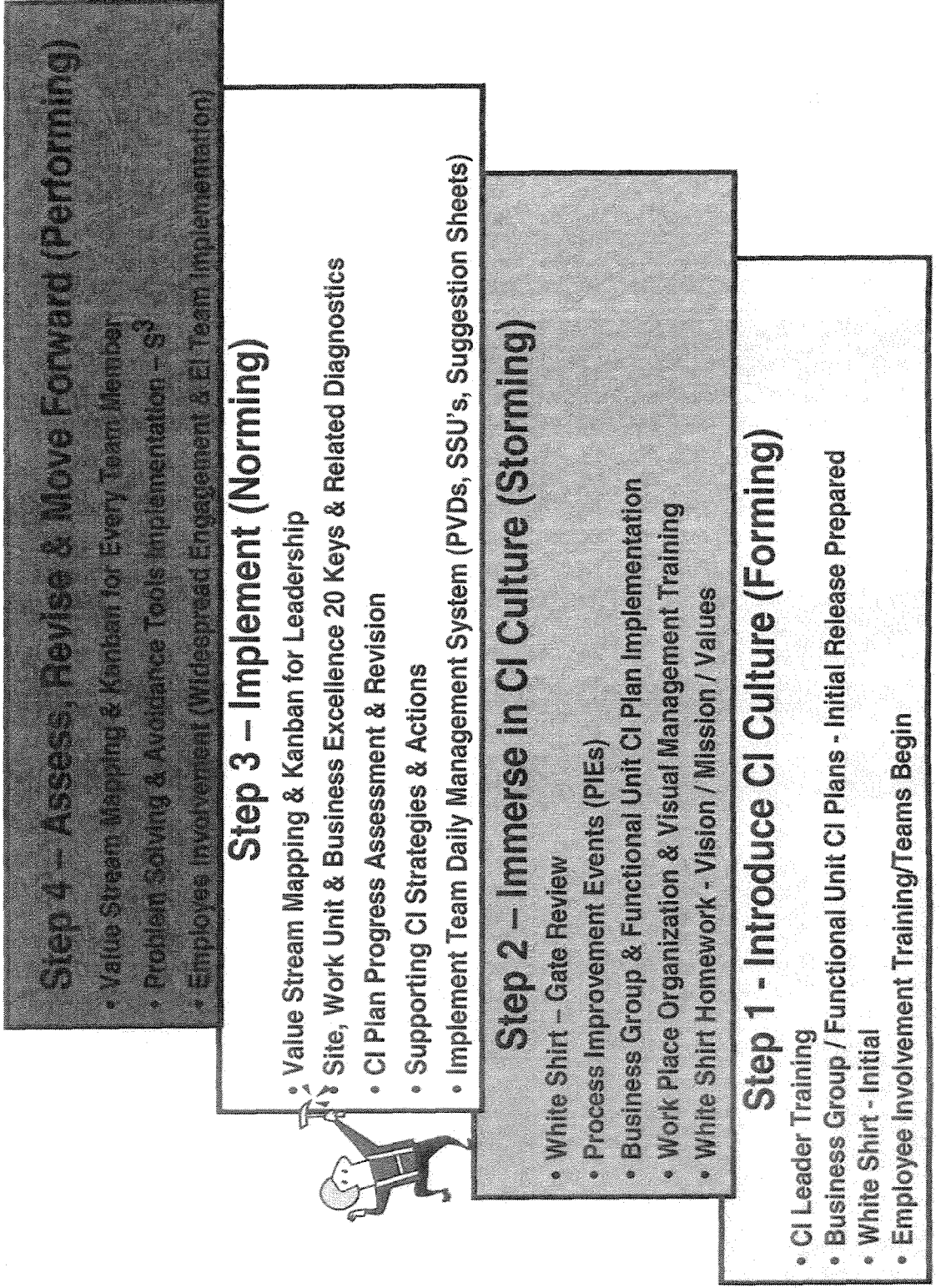
1. Throw extraneous items away. If a stool or cabinet is not needed, remove it.
2. The plant manager's staff (typically seven or eight people) are each assigned to an area of the plant that they are not involved with, and once a month a 5S audit is conducted - an independent audit.

Conrad concluded his remarks with a listing of Rockwell's key success factors:

- Understanding and support from top management;
- Dedicated resources;
- Tough but attainable goals;
- Projects with business goals;
- Individual performance standards tied to Power Lean goals;
- Highly visible reward and recognition for Power Lean Masters and leading facilities;
- Measure, measure, measure.

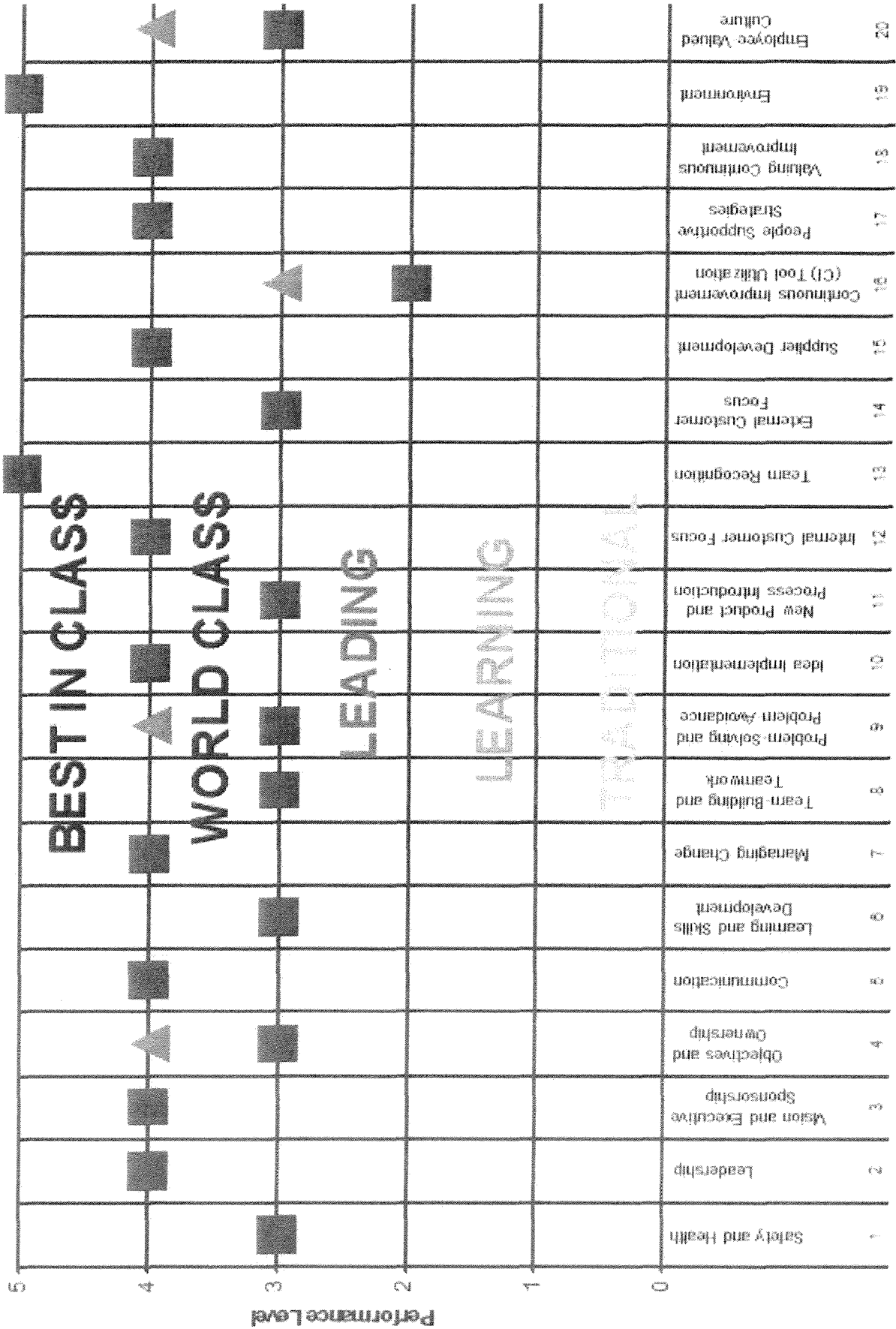
Principal Steps • CI Implementation Sequence

Communication & Recognition During All Phases



Current 72
Goal 76

20 Keys of Continuous Improvement Site Excellence



Understanding Current State

Engineering
Your
Competitive
Edge

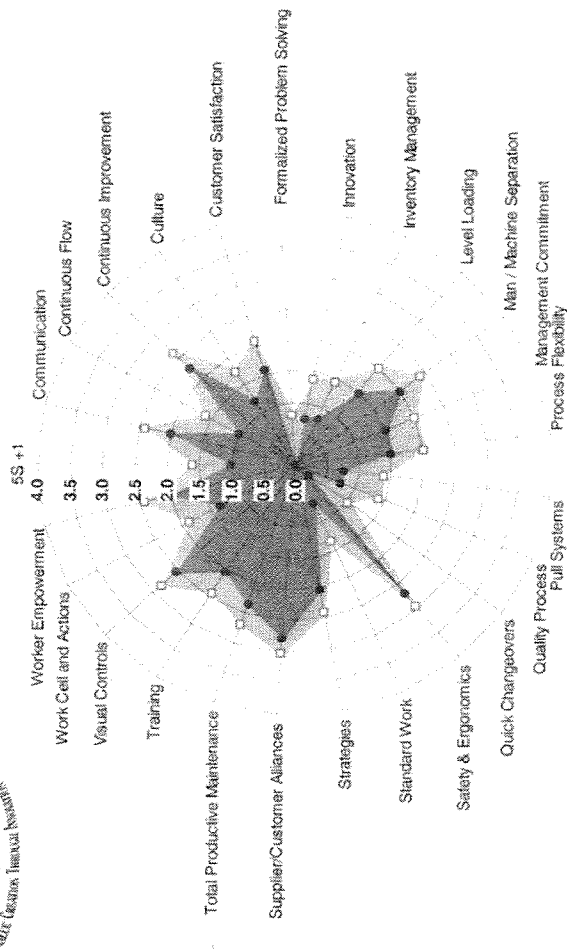
25 Keys to Manufacturing Excellence

Plant: Andrezieux
Assessment Done By: Bill Kimbro, Tim Jenkins, Gretchen Schneider

Date of Assessment: 3/14/2005
Assessment #: 1

Overall Assessment

Category	Current	Current Goal	Future Goal
5S +1	1.0		1.6
Communication	2.0		2.4
Continuous Flow	1.0		1.6
Continuous Improvement	2.3		2.6
Culture	1.2		1.8
Customer Satisfaction	1.6		2.1
Formalized Problem Solving	0.0		0.8
Innovation	0.8		1.4
Inventory Management	0.8		1.4
Level Loading	1.5		2.0
Man / Machine Separation	2.0		2.4
Management Commitment	1.5		2.0
Process Flexibility	1.5		2.0
Pull Systems	0.8		1.4
Quality Process	0.8		1.4
Quick Changeovers	0.3		1.0
Safety & Ergonomics	2.7		2.9
Standard Work	0.7		1.3
Strategies	2.0		2.4
Supplier/Customer Alliances	2.8		3.0
Total Productive Maintenance	2.3		2.7
Training	2.0		2.4
Visual Controls	2.5		2.8
Work Cell and Actions	1.3		1.9
Worker Empowerment	2.0		2.4
Assessment Score	37	0	50



□ Future Goal ▲ Current Goal ● Current

Implementing and Sustaining Better Practices – presented by Bill Kimbro – 4/15/05



Engineering
Your
Competitive
Edge

Future State Lean Certification

Compensation for Certification:

- Monetary Gains for Certification
- Different Compensations for Different Levels of Advancement Through Certification

Selection Criteria for Applicant:

- Candidate Must Submit Application
- Candidate Manager Must Submit Competency Rating Worksheet

Training:

- Establish Criteria for Different Tool Sets
- Specify Requirements for Certification
- Define Expectations and Accountability

Apprenticeship:

- Methodical Steps for Certification
- Prescribe Initial Steps for Involvement
- Advanced Steps for Facilitating and Training
- Demonstrate Mastery of 10 Competencies for Certification

Appraisal Team:

- Team Members Include: Responsible LEAP Member, Appropriate Lean Black Belt, Lean Certification Manager
- Role is to Evaluate the Candidate Qualifications and Mastery Competencies
- Team Will Evaluate Projects and Results
- Team Will Certify Candidate

Certification:

- Specify Requirements for Each Phase
- Rate Competencies During the Certification
- Framework for Systematic Process Approach

Re-Certification:

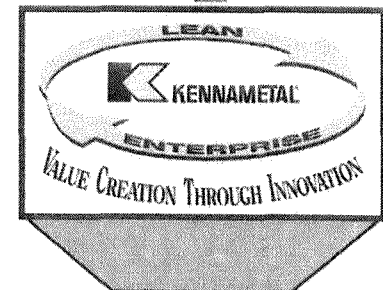
- Bi-Annual Re-Certification for Belts
- Division Management Re-Certifies Green Belts
- Appraisal Team Re-Certifies Black Belts

Goals:

- Establish a Method for Personnel to Quickly Become Certified in Lean Methodology and Begin Driving Business Results
- Methodology for Selection of Candidates
- Systematic Approach and Criteria for Advancement of Candidates
- Allows Advancement to Different Skill Levels and Compensation Packages

Purpose of Program:

- Relate Customer Needs to Critical Business Processes Develop Trained Personnel with Skill Sets and Abilities to Improve, Enhance, and Sustain
- Develop at Each Location of Every Business Deep, Broad Lean Enterprise
- Become More Valuable Asset to Our Company by Increasing Your Skill Set by Helping to Shape Our Future



Implementing and Sustaining Better Practices – presented by Bill Kimbro – 4/15/05

Power Lean Assessment

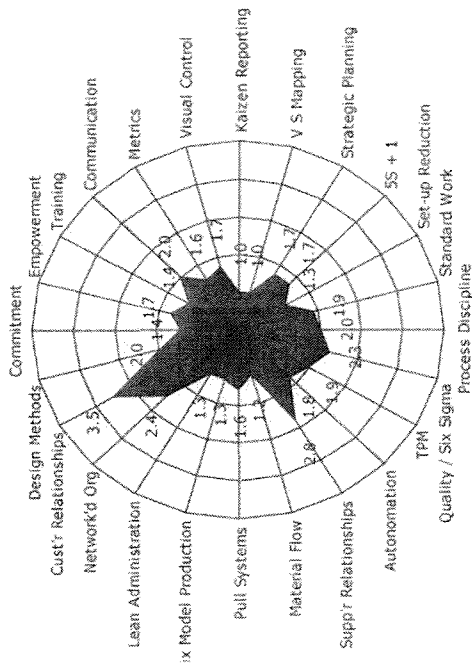
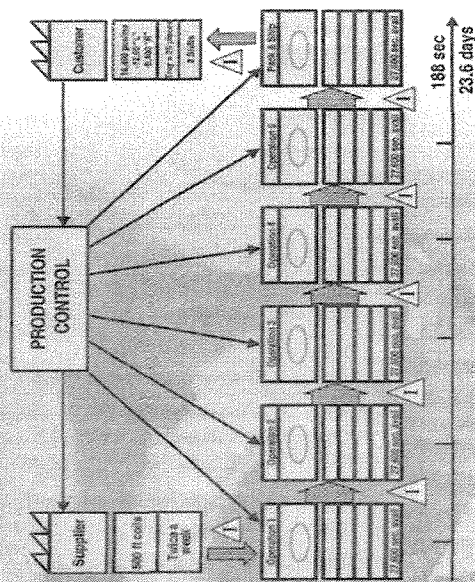
POWER LEAN

Business Analyses

Value Stream Mapping

Lean and Maintenance Assessments

	2002		2003		Potential	
	\$	%	\$	%	\$	%
Net Sales	33,235.90		36,210.90		36,210.90	
Material	8,051.50	24.23%	8,689.05	24.00%	8,689.05	24.00%
Direct Labor	2,577.20	7.75%	3,105.45	8.58%	2,807.89	7.75%
Indirect Labor	828.40	2.49%	903.30	2.49%	902.55	2.49%
Supervision	1,191.70	3.59%	1,209.60	3.34%	1,138.72	3.15%
Other Wages	1,290.50	3.88%	1,365.70	3.74%	892.99	2.47%
Repairs & Maintenance	863.00	2.60%	1,485.30	4.10%	940.25	2.60%
Other	7,674.30	23.09%	9,088.60	25.10%	8,733.20	18.59%
COGS	22,476.60	67.63%	25,837.20	71.35%	22,105.66	61.05%
Gross Margin	10,759.30	32.37%	10,373.70	28.65%	14,105.24	38.95%
Selling Cost	551.40	1.66%	687.45	1.90%	532.38	1.47%
Admin Cost	1,286.30	3.87%	1,373.70	3.79%	807.00	2.23%
Income from Operations	6,653.10	20.02%	6,189.15	17.09%	10,642.46	29.39%
					4,453.31	12.3%



Rockwell Automation



Point of Use Pre Assessment - 8 Scoring Categories

Area: _____

Date: _____

United Defense

Maturity Criteria

- 5** No walking required
Within Strike Zone
< 5 seconds to obtain
- 4** Within 5 steps
< 10 seconds to obtain
- 3** Within immediate work area
< 30 seconds to obtain
- 2** Within shop area
< 180 seconds to obtain
- 1** Must leave shop area
> 3 minutes to obtain

