

LEAN MANUFACTURING: Why It's Not Easy, and How to Make It Work

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Agenda

- Lean Manufacturing
 - a brief overview
 - a brief history
- A few case studies
- Why its not easy
- How to make it work
- Summary

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Key Definitions

- Value - A capability provided to a customer at the right time at an appropriate price, as defined in each case by the customer.
Features of the product or service, availability, cost and performance are dimensions of value.
- Waste - Any activity that consumes resources but creates no value (waste).

What is Lean?



Lean production focuses on eliminating waste in processes (i.e. the waste of work in progress and finished good inventories)

Lean production **is not** about eliminating people

Lean production is about **expanding** capacity by reducing costs and shortening cycle times between order and ship date

Lean is about understanding what is important to the customer

Lean Thinking



- Specify value
 - can only be defined by the ultimate customer
- Identify the value stream
 - exposes the enormous amounts of waste
- Create flow
 - reduce batch size and WIP
- Let the customer pull product through the value stream
 - make only what the customer has ordered
- Seek perfection
 - continuously improve quality and eliminate waste

From Lean Thinking by Womack and Jones

Lean Provides Tangible Benefits



Reduces costs not just selling price

Reduces delivery time, cycle time, set-up time

Eliminates waste

Seeks continuous improvement

Improves quality

Improves customer ratings and perceptions

Increases overall customer satisfaction

Improves employee involvement, moral, and company culture

Helps “transform” manufacturers

New Paradigm: Non-Blaming Culture

Management creates a culture where:

Problems are recognized as opportunities

It's okay to make legitimate mistakes

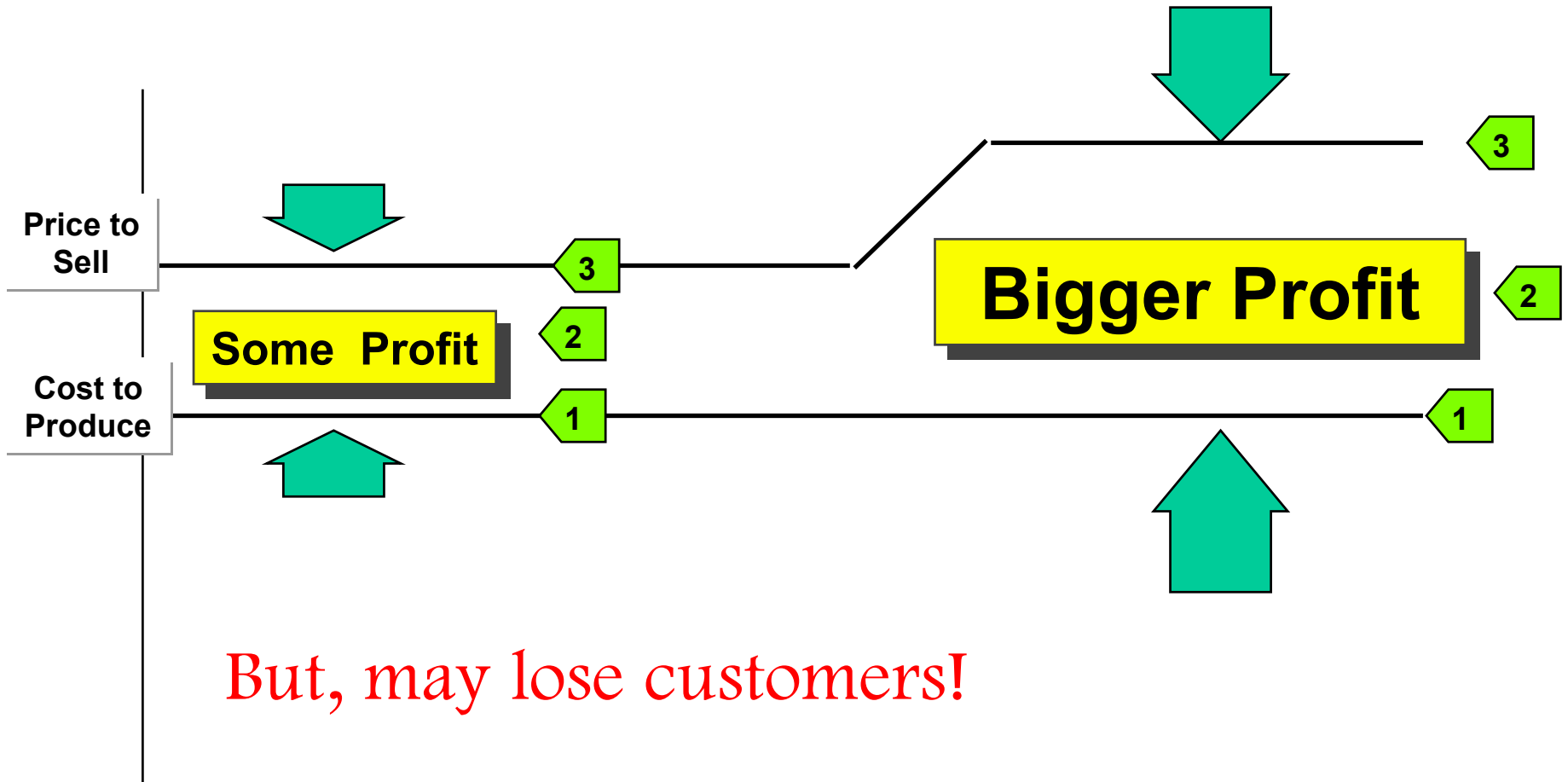
Problems are exposed because
of increased trust

People are not problems -
they are problem solvers

Emphasis is placed on finding solutions instead of
“who did it”

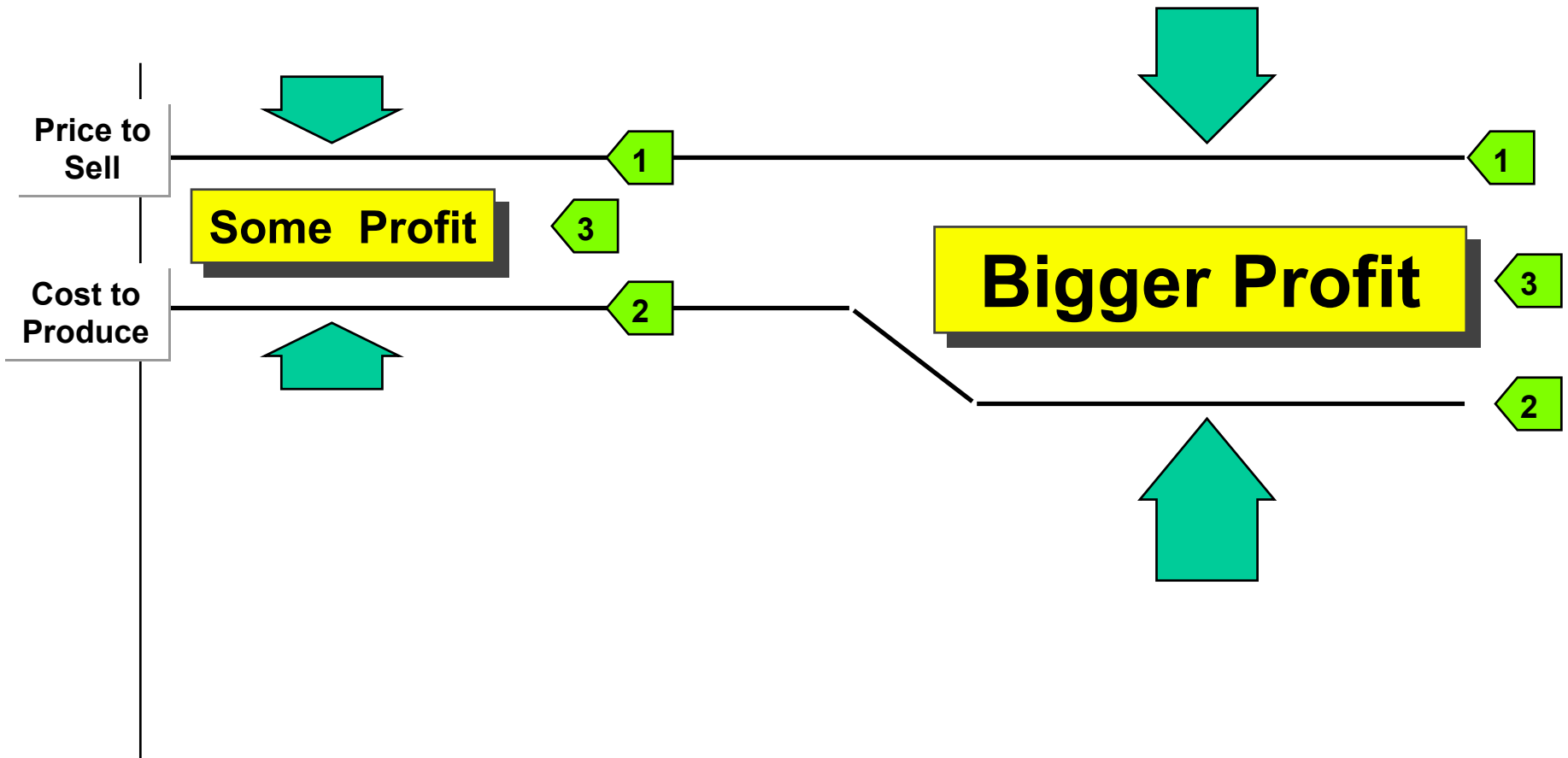


Increase Profits by Price Increase



The old way: Price = Cost + Profit

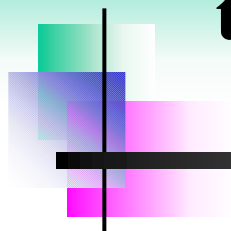
Increase Profits by Cost Reduction



The new way: Price - Cost = Profit

The Toyota Production System

the foundation for Lean Manufacturing



“Lean” is Not Just a Shop Floor Improvement Process



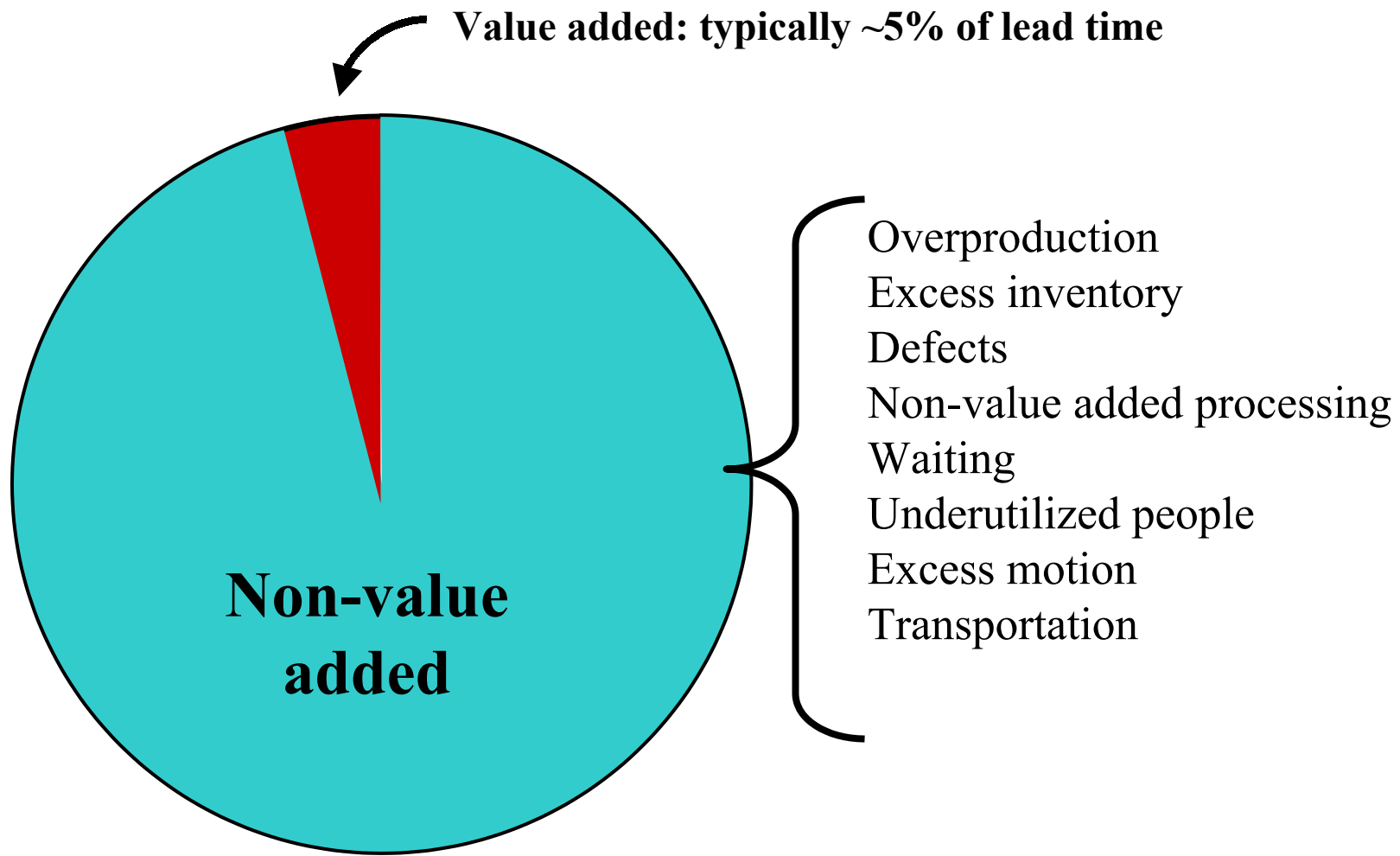
Lean is not a “point” solution but a continuous improvement process

Lean practices and principles are not just “shop floor” improvements

OEM’s are recognizing the importance of deploying lean “beyond the shop floor” in Marketing, Design, Engineering, Finance, Procurement, Contracts, Quality, and other administrative areas

The best companies are migrating lean “beyond the shop floor”

Lean = Eliminating the waste



Typically 90-95% of Total Lead Time is Non-Value Added!

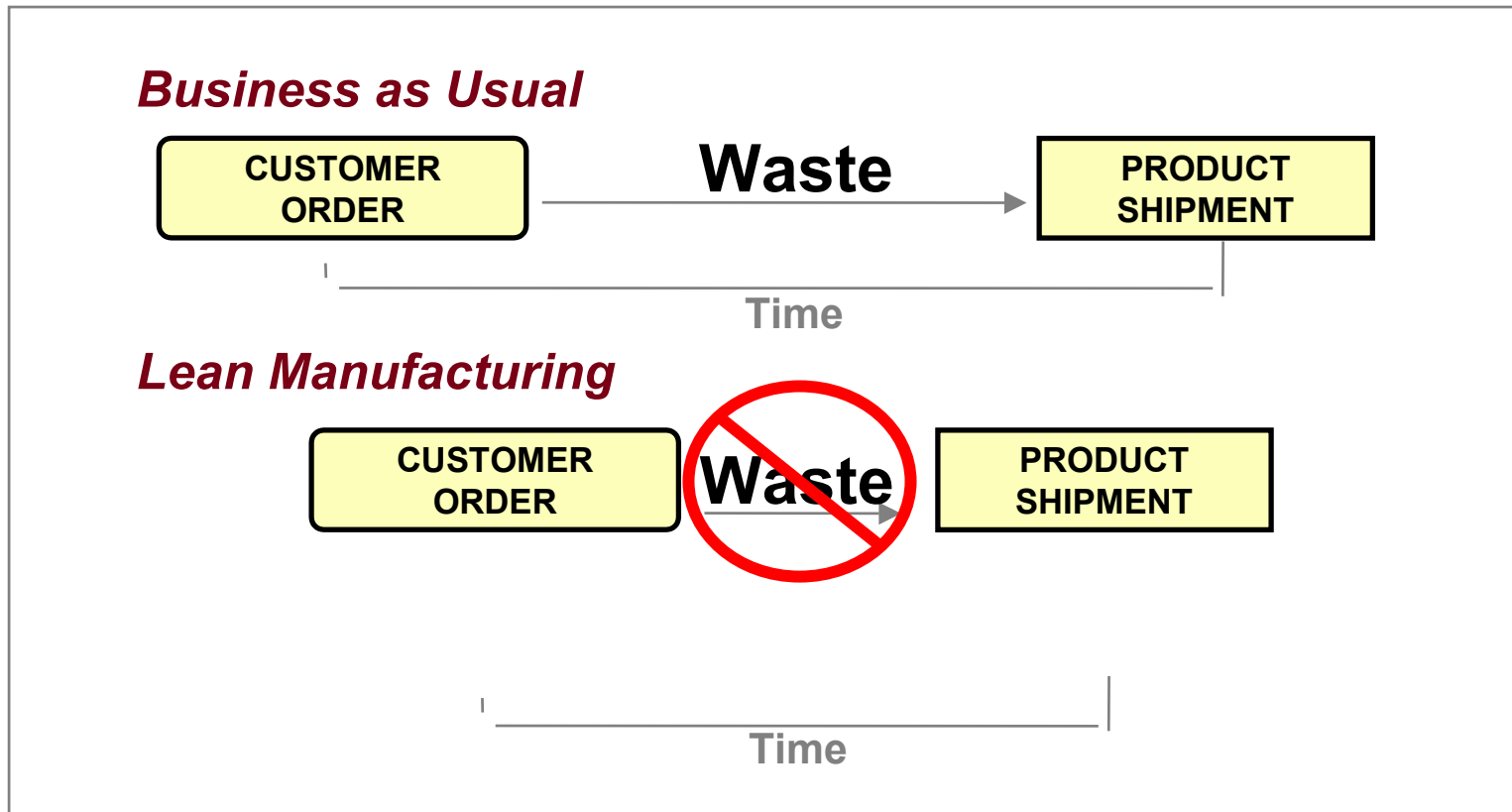
Lean = Eliminating the Waste



Defects
Overproduction
Waiting
Non-utilized people
Transportation
Inventory
Motion
Extra processing

Definition of Lean Manufacturing

- ◆ *Is a manufacturing philosophy which shortens the time line between the customer order and the shipment by eliminating waste.*





“Lean Vs.Traditional”

- Half the hours of engineering effort
- Half the product development time
- Half the investment in machinery, tools and equipment
- Half the hours of human effort in the factory
- Half the defects in the finished product
- Half the factory space for the same output
- A tenth or less of in-process inventories

Source: The Machine that Changed the World, Womack, Jones, and Roos, 1990.

“Lean Vs Traditional”

- 99.9% Customer Schedule Attainment
- Defects of 15 PPM or less
- 4-6 Inventory Days of Supply
- 92%+ Operational Availability
- Leveled, Sequenced Production
- Order to Customer Use - Hours, not weeks
- Functioning Supplier Partnership
- Strong Production Control Function

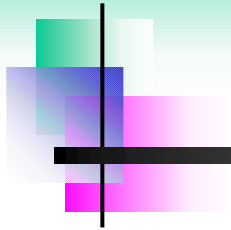
Examples: Tier 1 Suppliers: Johnson Controls Seating, Litens Automotive Partnership, Cadimex, Denso Manufacturing, Toyota Motor Corporation.

Goals of Lean Manufacturing



All Goals Are Met.

Trade Offs Not Made!



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Lean Manufacturing is **Not** New

“One of the most noteworthy accomplishments in keeping the price of Ford products low is the gradual shortening of the production cycle. **The longer an article is in the process of manufacture and the more it is moved about, the greater is it’s ultimate cost.**”

Henry Ford, 1926

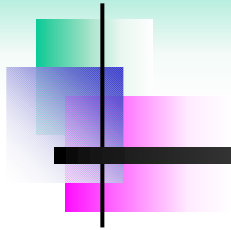
Toyota's Pursuit of Ford

- Taiichi Ohno's marching orders in the 1950's:
 - “Catch up with Detroit in three years”
- Ohno's situation:
 - no money
 - a small diverse market
 - productivity - one-tenth that of Detroit
 - production - less than one-hundredth that of Ford
- Ohno's solution
 - after studying Ford for years, created a manufacturing system to reduce cost through eliminating waste

How Did We Find Out?



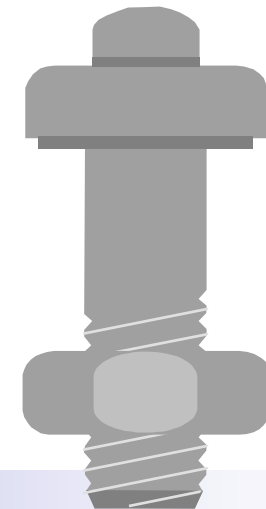
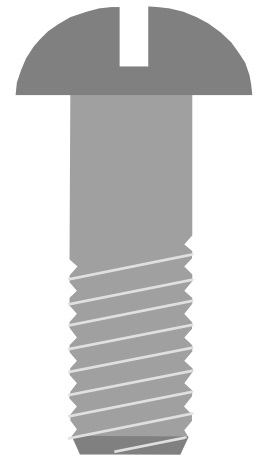
- “*The Machine that Changed the World*”, published in 1990 by James Womack, Daniel Jones and Daniel Roos (MIT International Motor Vehicle Program)
- “*Lean Thinking*”, published in 1996 by James Womack and Daniel Jones



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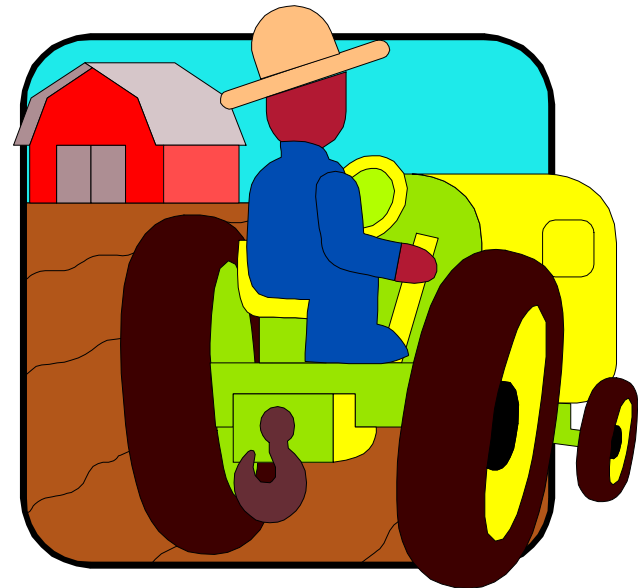
Automatic Screw Machine Products, Inc.

- Profile
 - leading manufacturer of screw machine products
- Approach
 - Implement a systematic approach to increase operating efficiency
 - 5 day cellular manufacturing kaizen events to start
- Results
 - reduced lead time from weeks to days
 - 25% productivity improvement
 - 90% WIP reduction
 - 90% throughput reduction



LDL, Inc.

- Profile
 - producer of farm equipment such as cutters, landscape boxes, discs, etc.
- Approach to start lean production
 - Three day 5-S kaizen events in the steel fabrication area
- Immediate Results
 - 50% reduction in travel distance
 - 70% reduction in required floor space
- Short term (2 months) results
 - 30% productivity increase
- Results at 1 year
 - 35% increase in sales



Sonoco Products, Baker Division

- Profile
 - largest producer of wood reels for the cable and wire industry
- Approach to start lean production
 - 6 kaizen events
 - developed a scrap reduction program
- Results in areas improved
 - 50% reduction in material handling
 - 80% reduction in defects
 - 90%WIP reduction
 - 40% productivity increase



Donnelly Mirrors Grand Haven Plant



Established 1987

Sales:

\$10 million in '88

\$40 million in '96

\$100 million in '01

360 employees in '01

Main products: exterior mirrors & door handles

Main processes:

Mold — 3 Shifts

Paint — 2 Shifts

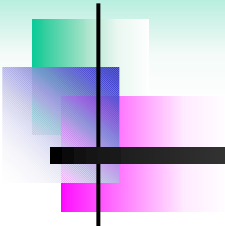
Assembly — 3 Shifts

Donnelly Mirrors Grand Haven Plant



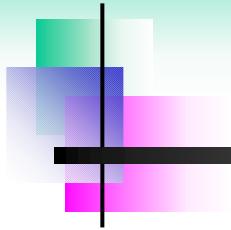
- Western Michigan
- Built to serve Honda for exterior mirrors
- Plastic injection molding->paint -> assembly
- Donnelly culture of highly empowered teams (e.g., set own annual pay increase, gainsharing)
- Showcase plant on tour circuit
- **In 1995 quality and deliveries were so poor Honda threatened to pull the contract**

Results of Improvements



	Early 1990's	1999
Financial:	Loss	Strong Profit
Quality (ppm):	27,000+	44 to 178
Paint yield:	60-65%	80-85%
Lead time:	29.4 days	8 days
Inventory turns:	1996 data	1999 data
<i>Raw:</i>	<i>31</i>	<i>38</i>
<i>WIP:</i>	<i>88</i>	<i>400</i>
<i>FG:</i>	<i>90</i>	<i>120</i>
Morale:	Union Drives	++ Climate

Lead time in 2001: Less than 2 days!



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On the Creation of a New System

“There is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old system and the merely lukewarm defenders in those who would gain by the new one.”

Machiavelli, 1513

*Does your company culture reward/recognize firefighters,
but not problem preventers?*

Why is Transforming to Lean Hard?

- It *is not* a set of isolated techniques
- It *is* a complete business system
 - a way of designing
 - a way of selling
 - a way of manufacturing
 - a way of involving all employees in improving processes, product quality and customer satisfaction

Why is Transforming to Lean Hard?

*Because it is Counterintuitive
from a Traditional Paradigm:*

Buying multiple small machines rather than one big machine that offers economies of scale.

Shutting down equipment when maximum inventory levels are reached rather than running flat out.

Using standards (bureaucratic) to continuously improve.

What Makes It Hard?



- There is no step-by-step cook book
 - There are some basic steps but the how-to varies from organization to organization
 - Requires an assessment of the company in order to map out the strategy
- Company culture plays a big part in the how-to

The Reality Of Becoming Lean



- Lean manufacturing can't & won't happen overnight
- Converting to a lean system will take time & effort
- Results driven people will still expect to see bottom line improvements immediately (*if not sooner*)
- At the first sign of trouble (and there will be some) the tendency will be to revert to the old way of operating
- Problems will be exposed and very visible, which will require people to respond rapidly - **this is the intent, to make problems visible and REMOVE them**

The Reality Of Becoming Lean



- Maintenance people may resist change **because it will require more rapid response to problems**, increased preventive maintenance and faster set-up of equipment
- Monument builders may resist change because it takes a lot more effort and thought to design simple systems
- Suppliers may resist change because they must be more responsive without buffers
- Financial people may resist change by supporting all of the above arguments with financial data that states how much has already been paid for the monuments and facilities



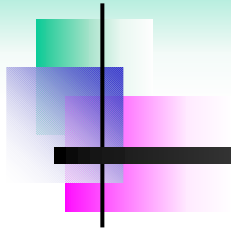
The Reality Of Becoming Lean

- Traditional thinking people who do not understand "why" and "how" will become human roadblocks
- Transportation and packaging people may resist change and support their arguments with increased delivery and container costs
- Materials people may resist change because it will reduce comfort stocks of inventory and they will argue that handling costs will increase
- Production scheduling people may resist change and support their position with "complexity" issues, in the name of customer wants



The Reality Of Becoming Lean

- Middle management may be the most resistant
 - don't want to give up decision making
 - may feel threatened unless there is a clear job path
 - may feel threatened even if there is a clear job path
 - may have spent years working to be “the boss”



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**“It Is Not The Strongest Of
The Species That Survive,
Nor The Most Intelligent,
But The One Most
Responsive To Change”**

Charles Darwin

Does this apply to businesses?

**What about AT&T, Xerox, Lucent, Cisco, Arthur Anderson,
Polaroid, Kmart, Sunbeam? What about NASA and the FBI?**

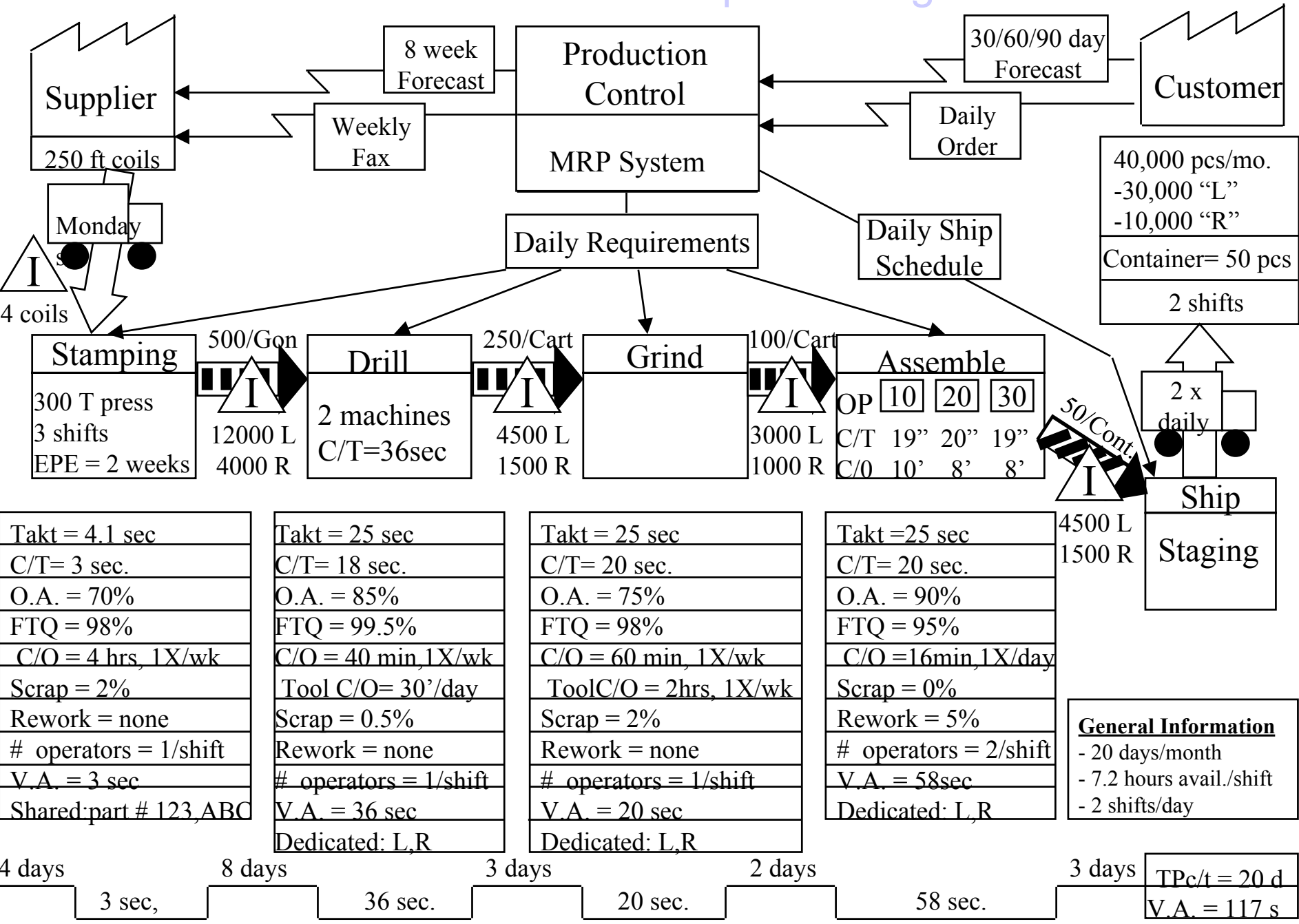
The General Lean Action Plan

- Find a change agent (how about you?)
- Find a teacher whose learning curve you can borrow
- Seize (or create) a crisis to motivate action across your firm (remember Donnaly?)
- **Map the entire value stream for all your product families (Find the waste)**
- Pick something important and get started removing waste quickly

From Lean Thinking by Womack and Jones

Current State Map- Housings

Date: _____





What Does this Look Like?

Gain top Management “Buy In” and Support

Perform overall company assessment tied to company strategic, operational, and marketing plans

Develop strategic lean deployment plan

Integrate customized training with lean to improve specific skill sets, leverage training resources

Team Building, Communications, Problem Solving, Change Management, Lean Manufacturing Tools

Conduct “Kaizen blitz” high impact events

5S, Manufacturing Cell, Set-Up Reductions, Inventory Reductions, Work Standardization

Use an enterprise wide approach to help “Transform” a client’s culture and the way they do business.



Implementation Subtleties

- Remove “anchor-draggers” & add “rowers”
- Create a lean “implementation office”
- Develop a growth strategy for additional business
- Create a policy for reallocating people



Implementation Success Factors

Prepare and Motivate People

Widespread orientation to CI, quality, training and recruiting workers with appropriate skills

Create common understanding of need to change to lean

Employee Involvement

Push decision making and system development down to the “lowest levels”

Trained and truly empowered people

Share information and manage expectations

Identify & empower champions, particularly operations managers

Remove roadblocks (i.e., people, layout, systems)

Make it both directive yet empowering

Implementation Success Factors



- Unyielding Leadership
- Strategic vision based on lean enterprise as part of overall business strategy!
- Observe outside successes and failures
- Ability to question EVERYTHING, ask “*why*” at least 6 times
- Deep commitment to EXCELLENCE

Implementation Success Factors

- **Implementation**

- People need to understand their new roles **before** change is implemented
- Establish timelines and targets, establish some easy to achieve near term goals

- **CI -- Continuous Improvement**

- Track impacts associated with changes made. Communicate them.
- Monitor, “enforce,” and improve the system

- **Improvement Leaps**

- Avoid mentality of collapsing over the finish line.

Implementation Success Factors



Atmosphere of Experimentation

Tolerate mistakes, have patience, etc.

Willingness to take risks (Safety nets)

Install “enlightened” and realistic performance measures, evaluation, and reward systems

Do away with rigid performance goals during implementation

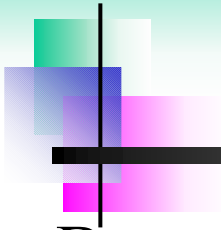
Do measure results and not number of activities/events

Tie improvements, long term, to key macro level performance targets. (i.e. inventory turns, quality, delivery, overall cost reductions).

Execute “pilot” projects prior to rolling out across entire enterprise (e.g., model lines, kaizen blitzes)

After early wins in operations, extend across ENTIRE organization

What doesn't work?



Bottom-up effort without top management support.

Driving lean from a staff function without active line involvement.

Great training and materials rolled out to everyone before taking any action.

Many one-shot kaizen blitzes with no systems focus.

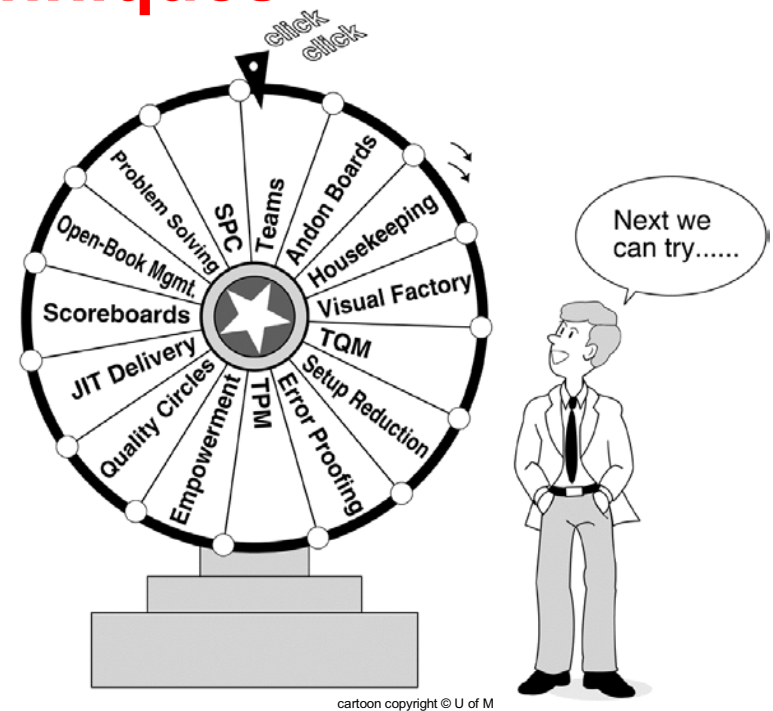
Excessive focus on stability and 5-S without major changes to flow.

LEAN IMPLEMENTATION

Some Lessons Learned

Philosophy → System → Techniques

- Cherry-Picking the tools is not enough
- The tools comprise a system to give customers what they want when they want it
- Focus on flow to create a system



Source: John Shook, TWI Network

***Management must lead the design
and introduction of lean value streams***



Action Orientation--Just Do it!

“At Jake we have a very large extended stay parts hotel for work-in-process inventory... We talked and talked about this evil and the need to change. No action... Finally, we said that this parts hotel would face the wrecking ball. Literally.”

“D-Day came on a weekend. Saturday A.M. everything was hauled out of the building and shoved into, and blocking, the aisles. It looked like the DMZ. *The three managers of the hotel were horrified...*”

Bob Pentland, Jake Brake
Becoming Lean, 1997

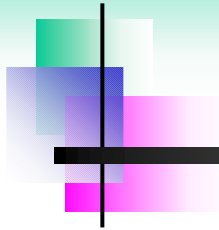
Evidence of Progress toward Lean

- Smaller lot sizes
- Increased capacity / throughput
- Higher inventory turns
- More available floor space
- Improved workplace organization
- Improved quality : reduced scrap / re-work
- Reduced inventories : raw, WIP, FG
- Reduced lead times
- Greater gross margin
- Improved participation & morale

If It Is So Hard, Why Do It?



- It is a formidable competitive advantage
- It is truly win-win-win:
 - the customer gets higher quality, lower costs and shorter lead times
 - the company increases market share AND profits
 - employees will have increased job satisfaction and better salaries



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