



Creating a “Green” Culture: Integrating lean and clean

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CONNSTEP Mission

*As **Connecticut’s Manufacturing Resource** CONNSTEP, Inc. is committed to helping Connecticut manufacturers apply modern manufacturing and management methodologies to become more Competitive, supporting the growth of Connecticut’s economy.*



CONNSTEP Services

- Lean Solutions
- Clean Manufacturing (environment, energy, & health and safety)
- Enterprise Growth Services
- Quality Management Systems
- Business Assessments
- Culture and Change Management Solutions



3

Key Discussion Points

- Explore the concept of “green” and “sustainability” as fitting into eliminating waste
- Think differently about conducting business
- See the value added benefits of adding Clean Manufacturing concepts to Lean Manufacturing



4



Sustainability

“Meeting the needs of the present without compromising the ability of future generations to meet theirs.”

US EPA

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6

Challenges

- Increasing environmental requirements around the globe
- Earth's resources are limited
- Population expect to grow by 50% over next four decades
- CO₂ emissions and global warming

Opportunities

- Manufacture in an efficient, cost effective way that minimizes impact on the environment
- Develop and market new products and services to address the challenges



7



8






100% Renewable Energy





Notebook PC with 97% less packaging

- Carrying bag is made with 100% recycled fabric
- Can fit 3 computers in 1 box
- 31% more products on a pallet




Eco Highlights

HP LaserJet P4515 Printer


- Instant-On Technology – up to 50% energy savings¹
- Advanced toner technology enables more energy efficient printing²
- Cut paper consumption by 25% with optional automatic two-sided printing
- Designed for recyclability and supports 100% recycled paper

• ENERGY STAR® Qualified

- HP LaserJet P4515x
- HP LaserJet P4515xm



HP Recycling Services makes it easy to recycle computer hardware and printing supplies responsibly. HP's goal is to recover 2 billion pounds (900,000 tonnes) of electronic products and supplies by the end of 2010.



Visit www.hp.com/go/ecohighlights

HP Eco Highlights label

Look for this new label on select HP products. With just a glance, you can get information on key environmental features as well as HP's environmental programs and goals. The new HP Eco Highlights label is just one way HP is making it easy to make smart choices for the environment.

Mouse over the image for more information. Then click for details.

¹ Compared to products that use traditional fusing
² HP LaserJet P4515 uses approximately 10% less energy - based on ENERGY STAR TEC (Total Energy Consumption) / pages per minute compared to prior generation, HP LaserJet 4350



The Need for Lean & Clean

Pressures on supply chains today

- Must eliminate waste in order to reduce costs and become more responsive to customer needs
- Greater pressure on companies to minimize environmental impact
- Growing trends to market focusing on environmentally friendly products
- Business-to-business specifications, e.g., the Wal-Mart “scorecard”

International Drivers for Clean

- **WEEE Directive**
 - Requires producers of electrical and electronic equipment to finance collection arrangements for their products at the end-of-life (8/05)
- **ROHS**
 - Restricts use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBBs), and polybrominated diphenyl ethers (PBDEs) (7/06)
 - Deca-bromodiphenylether (deca-BDE) (6/08)
- **REACH**
 - Requires all manufacturers and importers into the EU to register all chemical substances into a database managed by the European Chemicals Agency (ECHA) in Helsinki (11/08)

Rethinking the Way We do Business

- Broaden the definition of waste
- Begin on internal practices
- Use Lean practices to focus on “green” opportunities
- Green product development, including packaging and delivery



13

Defining Lean

Lean is:

“A systematic approach to identifying and eliminating waste (non-value added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection.”

MEP Lean Network



14

Defining Waste?

Waste is “anything other than the **minimum** amount of **equipment, materials, parts, space** and **worker’s time** which are absolutely necessary to **add value** to the product.”

Soichiro Toyoda, President, Toyota

Defining Clean

Clean is a systematic approach to eliminating waste by optimizing use and selection of resources and technologies while lessening the impact on the environment.

Combining Lean/Clean Manufacturing

"Lean" Eliminates...

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

"Clean" adds...

- Full use of Raw Material
- Energy Efficiency
- Water conservation
- Eliminating Toxic Material
- Reduction of:
 - Packaging Wastes
 - Emissions to Air and Water
 - Solid & Hazardous Wastes
 - Regulatory obligations and risks

Relationships Between Lean and Clean

- Optimize Material Use → Less Scrap = **Reduced Solid Waste**
- Reduce Inventory → Less Chemical Spoilage = **Reduced Hazardous Waste**
- Reduce Overproduction → Less Runtime = **Energy Savings**
- Reduce Transportation → Less Fuel Consumption = **Reduced Air Emissions**
- Less scrap, fewer defects, less spoilage = **Reduced Environmental Waste**

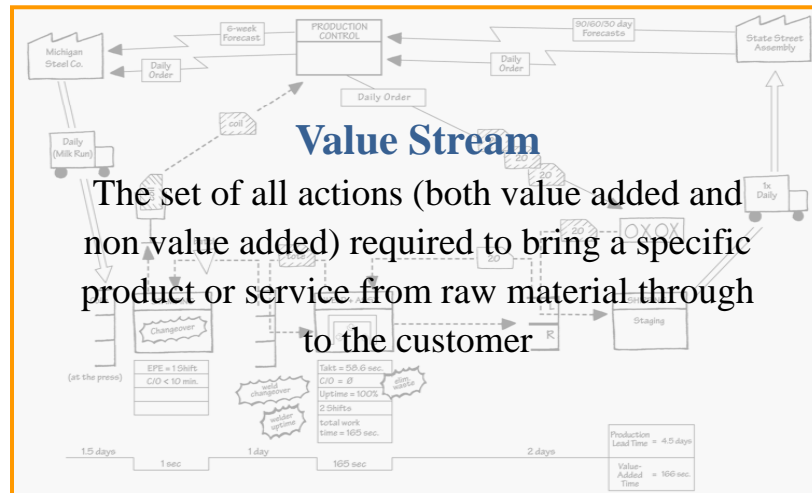
Lean's "Blind Spots"

- Hidden environmental waste is often buried in overhead and facility support costs
- Environmental and human health risks are often not explicitly considered in Lean initiatives
- Environmental impacts throughout the product lifecycle can affect customers and stakeholders
- Explicit materials use vs. need not always captured by Lean

Lean & Clean: Highly Complementary

- Focus on systematic and on-going efforts to identify and eliminate waste
- Seek active employee participation in improvement activities
- Emphasize the importance of using metrics to inform decisions
- Seek engagement with the supply chain to improve enterprise-wide performance

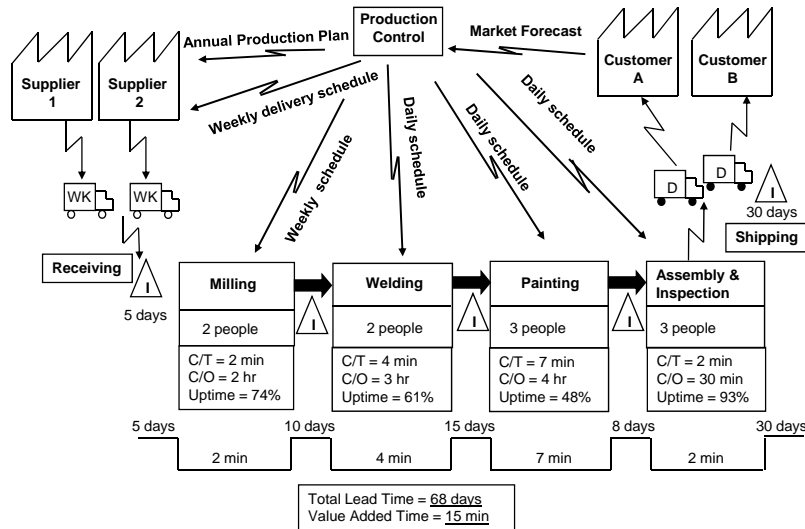
Value Stream Mapping



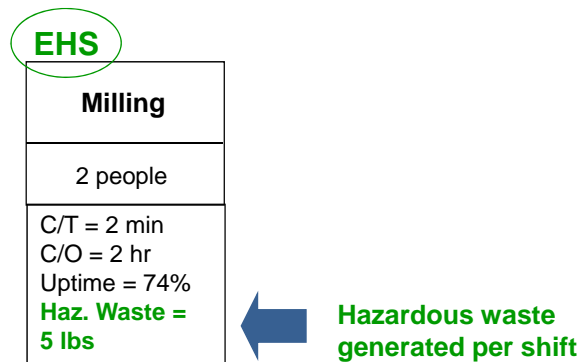
Value Stream Mapping

- Value stream mapping enables an organization to “see” all the actions involved in producing a product or service
- Current State Map: Visual representation of existing operations (information and product flows)
 - Identify the largest sources of waste (non-value added activity) in the value stream
- Future State Map: Drawing of Lean flow (vision)
 - Develop implementation plan for Lean activities

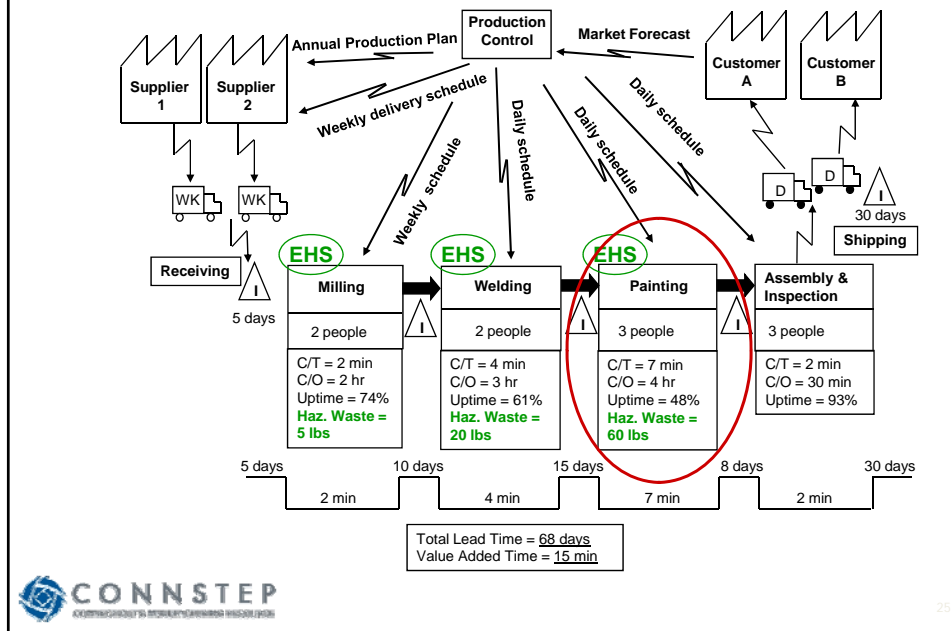
Current State Value Stream Map



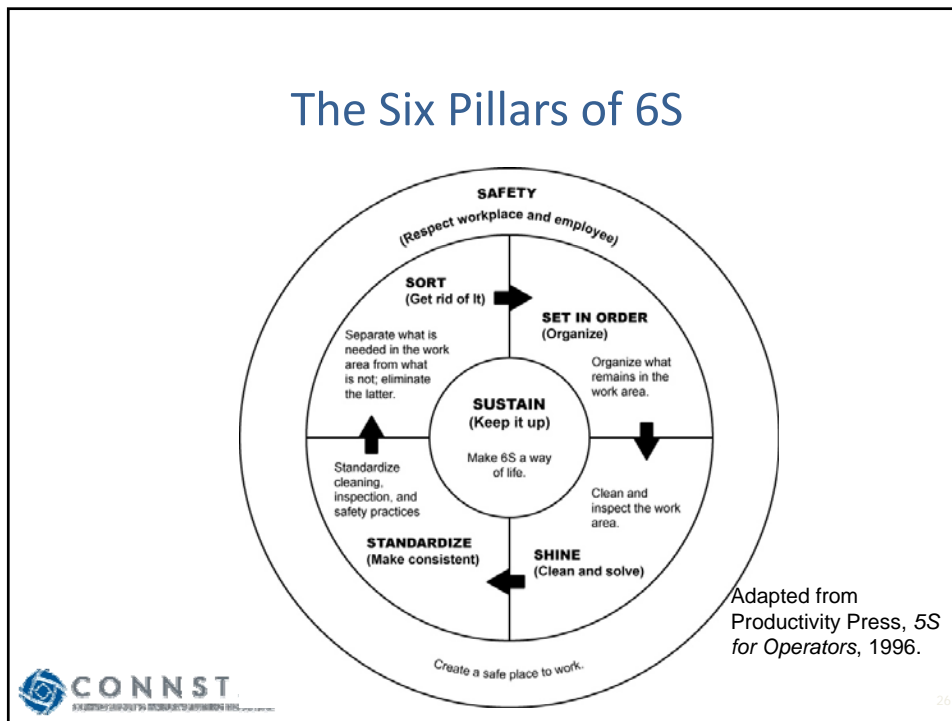
Record Environmental Data for Processes in VSMs



VSM with Environmental Metrics & EHS Icons



The Six Pillars of 6S

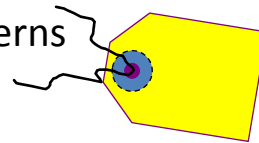
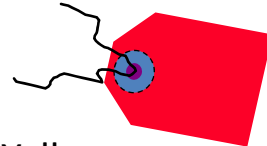


6S

- Based upon the visual workplace in the Toyota Production System
- “Clean up” and organize the workplace
- Typically the starting point for shop-floor transformation
- Provides a methodology for organizing, cleaning, developing, and sustaining a productive work environment
- Encourages workers to improve the physical setting of their work

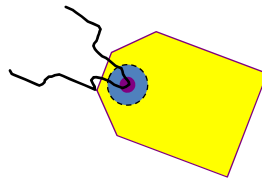
6S and Tagging

- Red tagging is a visible way to identify items that are not needed or in the wrong place
- Supplement red tags with “Yellow tag” to identify any safety or environmental health concerns



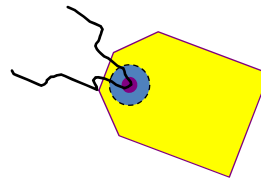
Yellow Tag Targets

- EHS Hazards in the workplace
- Chemicals and other hazardous materials
- Environmental Wastes




Examples of Yellow Tags

- ✓ Slip and fall risks
- ✓ Repetitive motion
- ✓ Lifting injury
- ✓ LOTO
- ✓ PPE requirements
- ✓ MSDS health concerns
- ✓ Hazardous materials
- ✓ Natural Resources wasted




Expand 6S Audits to Include EHS Issues


- 6S includes weekly or other periodic audits to assess progress
- Expand to include EHS personnel in creating plant-wide inspection and audit questions and checklists
- Ensure that environmental wastes and risk are routinely identified, properly managed, and eliminated where possible



Lean & Clean Case Studies

 **CONNSTEP**
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Department of Energy & Environmental Protection
University of Connecticut

Packaging



Company A Disposable Packaging



Company B Returnable Totes



Parts Cleaning: Case History

A manufacturer of threaded fasteners needed to improve productivity, throughput and on-time delivery. The parts washing process, removing oils and residue was identified as a bottleneck:

- **Solution**
 - Replace oil/water separator
 - Cost \$8300
 - Most parts now through on first pass
- **Results**
 - Eliminate bottleneck & increase productivity
 - Reduce labor costs
 - Reduce water usage & cost of water
 - Reduce detergent use & cost of detergent
 - Reduce energy costs of heating water & operating washer



35

Zinc Plating: Case History

Costing nearly \$80,000 in annual revenue due to high rates of rework, scrap, and waste.

- **Process Changes**
 - Reduced unnecessary steps in the process
 - Reduce scrap from 15% to 7.5%
 - Replace dip rinse tanks with spray rinse – longer term
- **Results**
 - Reduce water usage by more than 120,000 gallons
 - Reduce hazardous chemicals by 1,200 lbs.
 - Reduced run time from 9 hours-8 hours/day
 - Replace with spray rinses, reduce water use by >1 million gallons/year
 - Reduced start-up time by 25%
 - Retained sales of \$546,000 and five jobs



36

Other Lean/Clean Results

- Improved on-time delivery by 25%, cut lead time by one day, ten jobs created, ten jobs retained, \$600,00 increased sales and \$77,750 energy consumption savings
- Increased productivity 45%, while reducing waste generation by 30%, and \$350,000 equipment cost avoidance
- Reduced scrap metal generation by 35%, scrap rates reached an all-time low
- \$25,000 annual savings in solid waste reduction, focusing on paper and packaging
- Increased productivity by 10%, on-time delivery by 5%, save \$100,000 in reduction of rework, while reducing chemical and energy usage and hazardous waste generation by 15%.



37

Why Make Clean a Part of the Lean Methodology?

- Eliminates more waste and reduces costs
- Strengthens compliance and risk
- Piggybacks environmental improvement on Lean process change; more benefits cheaper and faster management
- Removes environmental obstacles to competitiveness and Lean
- Creates a competitive advantage as customers increasingly expect products/services with less environmental footprint



38

When everything else slows down, “Green” still means go!



- Make the business case to support the investment
- Don't just look at hard numbers – think globally
- Measure the short and long-term payoff of a potential project
- Implement programs that focus on behavior as a start, e.g., recycling, shutting off computers



39

Resources

- CONNSTEP.ORG
- www.greensuppliers.gov
- www.epa.gov/lean/toolkit
- www.epa.gov/NCEI/lean/energytoolkit
- www1.eere.energy.gov/industry/bestpractices/quickpep_tool
- www.epa.gov/climateleaders/resources/lowemitters



40



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