



The Business Case for Connecting Lean and Environment:

Economic and Environmental Benefits for the Shipbuilding and Ship Repair Sector

Lean Manufacturing and Environment: Findings and Trends

- Lean manufacturing initiatives are generating significant economic and competitiveness benefits in the U.S. shipbuilding and ship repair sector.
- Research shows that significant environmental benefits typically ride the coattails of Lean efforts.
- Despite these benefits, research indicates that the failure to explicitly connect an organization's Lean initiatives and environment initiatives can leave significant business benefits on the table.
- Shipyards can enhance business and environmental results by explicitly connecting Lean initiatives with an environmental management system (EMS) or other environmental initiatives.
- Lean and EMS are highly complementary business improvement systems.

EMS in the Shipbuilding and Ship Repair Sector

Numerous shipyards are also improving business and environmental performance by implementing EMS. An EMS is a continuous improvement-based management framework for reducing environmental impacts and improving organizational performance over time. EMS need not be burdensome, but they can instead provide a lean approach to consistent environmental performance.

EMS Benefits

- Reduced operating costs
- Reduced risk of non-compliance
- Improved internal communication
- Better decision-making
- Better corporate image

The Business Case for Connecting Lean and Environment: Four Reasons

1. "Learn to see" environmental waste and opportunities during Lean initiatives
2. Use Lean tools to eliminate significant environmental costs
3. Reduce environmental and regulatory constraints on process change and improvement
4. Meet customers' quality, cost, and environmental expectations efficiently

Next Steps: Connecting Lean and Environment

There are many ways shipyards can incorporate environmental considerations into Lean methods and tools without distracting Lean efforts from their core focus on time, cost, and quality. For example:

- Involve environmental personnel in Lean events that address processes with significant environmental impacts and opportunities, such as painting or metal finishing.
- Overlay key environmental metrics and costs, such as energy and water use or hazardous waste generation, on value stream maps to help identify improvement opportunities.
- Incorporate environmental criteria in 5S/6S inspection checklists to equip employees on the shop floor to reduce environmental impacts and ensure regulatory compliance in their work areas.

EPA's Sector Strategies Program Can Help. Working with Lean companies, EPA has developed tools and resources with practical strategies and techniques for implementing EMS and connecting Lean and environmental initiatives. Contact Shana Harbour at EPA (206-566-2959; harbour.shana@epa.gov) to discuss how EPA can assist your organization to improve Lean and environmental performance.

EPA Lean and EMS Resources for the Shipbuilding and Ship Repair Sector

<http://www.epa.gov/sectors/shipbuilding/ems.html>

Lean-EMS Integration Report—In October 2004, the U.S. EPA Sector Strategies Program produced a report that profiles *Findings and Recommendations on Lean Production and Environmental Management Systems in the Shipbuilding and Ship Repair Sector*.

EMS Benefits Brochure—In 2003, Sector Strategies released a brochure highlighting the benefits of EMS implementation at shipbuilding facilities. *Environmental Management Systems: Systematically Improving your Performance* was created in partnership with SCA, ASA, and nine shipyards that have already adopted EMSs.

EMS Implementation Guide—In 2003, EPA released the *EMS Implementation Guide for the Shipbuilding and Ship Repair Industry*. Created in partnership with ASA and SCA, the Guide provides detailed information to shipyards interested in implementing an EMS and incorporates lessons learned and examples drawn from the experience of shipyards that participated in the Sector Strategies pilot.

Lean-Environment Toolkit—In 2006, EPA released version 1.0 of the *Lean-Environment Toolkit* which presents practical strategies and techniques for integrating environmental considerations into Lean methods such as value stream mapping, kaizen, and 6S. The Toolkit draws on company experience across several industry sectors. See <http://www.epa.gov/lean/toolkit>.

Real Results from the Shipbuilding and Ship Repair Sector

Bath Iron Works connected Lean and EMS expertise during a value stream mapping exercise to discover that the painting process in its preservation value stream accounted for 90% of the facility's environmental waste stream. This information enabled Bath Iron Works to explicitly target hazardous waste reduction opportunities during Lean events in this area.

Northrop Grumman Newport News Shipyard applied Lean just-in-time principles and environmental management expertise to its materials management process, which resulted in a shift from paint procurement in high volumes (50,000 gallons) to smaller quantity deliveries in right-sized containers. This reduced set-up times and inventory and storage space while significantly reducing the amount of unused paints that entered the hazardous waste stream.

Bender Shipbuilding & Repair Company targeted a *kaizen* improvement event on its welding process. Improvements focused on reducing over welding, which lowered costs from time and materials savings while significantly reducing weld smoke emissions.