ARDEC’s Lean Six Sigma (LSS) Program

TO

NDIA

Armaments Technology Firepower Symposium & Exhibition

PAUL E. CHIODO
Director, Quality Engineering & System Assurance,
RDECOM-ARDEC
Chair, AMC Quality Federation
Certified Lean/Six Sigma Master Black Belt

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ARDEC Lean/Six-Sigma Program

• LSS has Proven Fundamental to ARDEC Satisfying Army Objectives in the Acquisition and Sustainment of Armament & Munitions Systems
  ✓ Institutionalizing a culture of “Fact & Data Based Decision Making”
  ✓ Instilling Lean Six Sigma into Workforce Daily Activities for a Continuous Improvement “Way of Doing Business”
  ✓ Evolving from DMAIC/DMALC to Design for Lean Six Sigma
  ✓ Provides the tools for improving all our processes
Why Did ARDEC Change to “LSS Way of Doing Business”?

- **Original Burning Platform:**
  The Army could not afford to have ammunition with critical defects escaping into the battlefield.
  ACAT I Program Productibility Issues

- **Current Burning Platform:**
  Continuous process improvements to better serve Warfighter needs – Quality, Cost, Schedule & Risk (Q$SR).

- Provide a Framework to Achieve Enterprise Excellence (QMS, L/6σ, VoC)

  ✓ A disciplined, structured approach for process and product optimization that is focused on the effectiveness and efficiency bottom line of the organization.
Do Things Consistently

Baldrige as management framework; Controlled, repeatable, tailorable processes (CMMI, ISO); Balanced Scorecard

Drive efficiency - Fewer steps

Do the Right Thing

Systems Engineering for common understanding of customer requirements

Drive effectiveness

Do Things Right

Integrates best practices
ARDEC LSS Deployment Timeline

**JUL 2000**  
**Burning Platform Initiated by PM ARMS**  
- Commercial Partnership Established  
- Training Begins  
- Program-Based Projects  
- Targeted at Manufacturers  
- Focus on Corrective Action  
- Sporadic Deployment

**Phase I:**  
Launch & Management Buy-In

**APR 2001**  
**Leadership Transitioned to ARDEC**  
- Management Review Board Established

**OCT 2002**  
**Integration of Lean with Six Sigma**  
- Move from Re-active to Pro-active  
- Expansion to In-house CPI  
- Institutionalization  
- Scope Widened to Include Engineering, Business & Management

**Phase II:**  
Full Scale Deployment

**MAY 2003**  
**ARDEC Leadership Black Belt (BB) Trained & Working Projects**  
- Support to Culture Change  
- “Walking the Talk”
ARDEC LSS Deployment Timeline (Cont)

JUN 2004
- LSS Competency Office Established & Initiated Transactional (Administrative) Green Belt (GB) Training

APR 2005
- Leadership Deploys ARDEC Enterprise Excellence Plan
  - Integrates LSS, Voice of Customer (VoC) & QMS

JAN 2006
- GB Training & Consulting Moved In-house

May/June 2007
- Pilot Internal DFLSS Course

Phase III: Self Sustain for Continuous Improvement

Gold Army Performance Excellence Award Winner
“[ARDEC] is one of the Army leaders in Lean Six Sigma and serves as a benchmark for other Army organizations to emulate.”
– Francis J. Harvey, Secretary of the Army, 16 December 2005
LTG N. Ross Thompson III is the Director of the Army Acquisition Corps (AAC) and the lead office of the Assistant Secretary of the Army for Business Transformation. LTG Thompson oversees the deployment of Lean Six Sigma across the Army.

“Together we will constantly evaluate the way we are doing business in order to streamline our business practices”

“Integrate and apply Lean Six Sigma (LSS) and the Balanced Scorecard approach into all of your business practices at every level”
“Need to be faster, more agile, less bureaucratic… better support to the Warfighter. AMC will continue aggressive implementation of Lean Six Sigma … leaders who are willing and able to change the way we are doing business.”
LSS Alignment

**DA/AMC FY06-FY07**

- Deployment Director
- Master Black Belt
- Support
- Black Belts

**PEO AMMO/ARDEC FY00-FY07**

- Deployment Director
- Master Black Belt
- Black Belts

AMC – FT Core Team of (4) BB & (4) Support
ARDEC – FT Office of (8) MBB/BB & (1) GB

- Organization’s Senior Leader
- ESG
- Project Team Member(s)
- Green Belt(s)
- Project Support
- Mentor/Consult
- Fulltime Position
ARDEC LSS Implementing Infrastructure

- Change Agents
- Vision & Resources
- Support through Words & Deeds
- Controls
- Relevance
- ROI
- Structure & Measurement
- Training & Mentoring
- Evolution & Innovation
- Work System-level Programs
- Assist Green Belts/Black Belts
- Satisfy Timelines
- Target Q$SR
- Use the Tools
- Support the Customer

Executive Leadership

Review Board

Competency Management

Consultants

Project Leads

Integrated Teams

Executive Black Belts

Black Belts

Master Black Belts

Green Belts

Integrated Teams

Executive Leadership

Consultants

Project Leads

Competency Management

Review Board

Executive Black Belts

Black Belts

Master Black Belts

Green Belts
Lean Six Sigma
Continuous Benchmarking

Books
- Achieving the Competitive Edge, Jackson Jr., H.K., et al
- Lean Six Sigma Pocket Toolbook, George, Michael L., et al
- Service Design for Six Sigma, EL-Haik, Basem, et al
- Six Sigma for Technical Processes, Creveling, C.M., et al

Continuously Learning from Industry Leaders

- GE
- IBM
- Caterpillar
- ASQ
- PDSS Ship Creveling
- The Toyota Way Dr. Jeffrey liker
- The George Group
- Naval Supply Systems Command
- 3M
- Honeywell
- Textron
- Booze Allen Hamilton
- Raytheon
- Enterprise Excellence VSE Corp.
ARDEC LSS Metrics (1Q07)

Training & Certification

- Green-Belts Trained: 1576
- Green-Belts Certified: 795
- Black-Belts Trained: 241
- Black-Belts Certified: 113
- Master Black-Belt: 19

Over 55% ARDEC Community Green Belt Trained!

LSS Project Disciplines

Processes Impacted by LSS Projects

- Engineering: 32%
- Production: 27%
- Business: 12%
- Management: 29%

ARDEC LSS Metrics (1Q07)

Projects

- ARDEC: 257 Completions, 210 On-Going
- Industry: 50 Completions, 29 On-Going
- GOCOs: 18 On-Going

257 Completed Projects

ARDEC LSS ROI

- Return on Investment ($M): $43,014
- $43,014 Savings/Avoidance

QSSR Improvements:
- Quality (92%)
- Co$t (68%)
- Schedule (72%)
- Risk (87%)

15:1 VE Validated Returns
- Value Engineering Adds Rigor
- Recognized Standard
- Independent Verification
- Hard Numbers Only

Only Q$SR Improvements:
How We Change “Way of Doing Business”? 

- **Leadership Commitment/Involvement**
  - Leadership Communication to the Workforce
  - Leadership Involvement to Prioritize Workforce Projects
  - Project Accountability through Management Chain to Align with Mission Objectives

- **Overcoming Resistance to Change**
  - Show how employee participation “makes a difference”
  - Consistent message between upper level and mid-level management
  - Convince employees not to fight change by making them part of the process, listening to their concerns and addressing issues as they arise
The ARDEC Journey Continues …

- Design for Lean Six Sigma (DFLSS)
  - Innovative, Quality Products Meeting Customer Requirements

- Probabilistic Technology
  - Systematic Processes for Smarter Decisions in Situations of Insufficient Data

- Process Integration & Improvement
  - Manage and Improve Processes across Enterprise Using Enterprise Excellence (LSS, VoC and QMS)
DFLSS Influencing the Product Life Cycle

Robust Designs Reduce Production & Sustainment Costs

Costs are Low to Redesign

Greater ROI through Early Detection & Preventive Action

Costs are High to Repair Fleet or Stockpile

Little Impact w/o Re-design

"An Ounce of Prevention is Worth a Pound of Cure" – H. De Bracton
Operational Definition of DFLSS

- Disciplined, Structured, Data-Driven Approach to Technology and Product Design, focused on Customer Requirements
- Integrate Probabilistic Technology tools when addressing uncertainties
- Focus on Critical Parameter Management (CPM)
  - Identifying Critical-to-Quality (CTQ) Requirements
  - Optimizing Robust Performance (S/N and σ)
  - Certifying Capability ($C_p$ and $C_{pk}$)
  - Considering Manufacturing & Life Cycle Support Processes
- Integrates Three (3) Major Elements:
  1. Clear & Flexible Technology/Product Development Cycle built upon Systems Engineering Principles
  2. Portfolio of Tools & Best Practices and Defined Exit Criteria for each Phase/Gate
  3. Disciplined Project Management

DFLSS is about preventing problems and providing breakthrough solutions to well defined requirements and not about fixing problems created in earlier phases
Phase – Gate Process Using DFLSS

**IDOV Phases & Gates**

1. Innovate
2. Design Development Phase
3. Optimization Phase
4. Verify Capability Phase

... then individual Product Developments are conducted

- Product #1 Dev
- Product #2 Dev
- Product #3 Dev

Technology Transfer ...

**CDOV Phases & Gates**

1. Concept Development Phase
2. Design Development Phase
3. Optimization Phase
4. Verify Capability Phase

Production of Product

Production Launch ...
Probabilistic Technology

- Probabilistic Technology is a **Generic, Systematic, And Quantitative** Approach for Making Reliable, Cost Effective **Business or Technical** Decisions for All **Products and Services** In Any Industry Or Domain
  - Considers and Incorporates **Uncertainties** in Decision Process
  - Minimizes Costs Associated With Change
  - Identifies And Eliminates Waste Effectively
  - Complements Existing **Design For Lean Six Sigma** Tools
  - Provides Critical Information at **Early Phases of Decision Making** When **No Or Limited Data Is Available**
  - Predicts Reliability, Failure Probability, and Risk at All Stages of Decision Making.
**ARDEC Challenge**

- Develop and Utilize a Disciplined ARDEC Process that Integrates Project Management, Systems Engineering and Design for Lean Six Sigma Tools as a Framework for Technology & Product Development
ARDEC LSS Take-a-Ways

- ARDEC Initiated LSS Over 6 Years Ago to get “Eyeballs on the Process” and to Deliver Quality Products to the Soldier in the Field
  - LSS Provides ARDEC a Mechanism to Solve Problems in an Effective and Efficient Manner and to Achieve Continuous Process Improvement Across the Entire Enterprise
  - ARDEC is Providing the Army with Meaningful Savings…Every Quality, Reliability and Process Improvement Equates to Real Dollars
  - ARDEC’s LSS Success has been Driven by Leadership Commitment to Cultural and Business Transformation
  - Workforce Applies LSS Tools for Fact Based Decision Making on a Daily Basis
- ARDEC’s Enterprise Excellence Journey Continues through Deployment and Integration of DFLSS, QMS, Systems Engineering and Project Management Best Practices

Evolving Cultural Change … Positively Impacting the Warfighter