“Brownfield” / “Greenfield” Contrast SPL 3.1

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Presentation for:
ESD.60 – Lean/Six Sigma Systems
MIT Leaders for Manufacturing Program (LFM)
Summer 2004

These materials were developed as part of MIT's ESD.60 course on "Lean/Six Sigma Systems." In some cases, the materials were produced by the lead instructor, Joel Cutcher-Gershenfeld, and in some cases by student teams working with LFM alumni/ae. Where the materials were developed by student teams, additional inputs from the faculty and from the technical instructor, Chris Musso, are reflected in some of the text or in an appendix

Overview

- Learning Objectives
  - Appreciation of the complexity in transforming an existing operation
  - Understanding of the "brownfield" challenge in the auto industry
- Session Design (20-30 min.)
  - ***Part I:*** *Introduction and Learning Objectives (1-2 min.)*
  - ***Part II:*** *Key Concept or Principle Defined and Explained (3-5 min.)*
  - ***Part III:*** *Exercise or Activity Based on Field Data that Illustrates the Concept or Principle (7-10 min.)*
  - ***Part IV:*** *Common "Disconnects," Relevant Measures of Success, and Potential Action Assignment(s) to Apply Lessons Learned (7-10 min.)*
  - ***Part V:*** *Evaluation and Concluding Comments (2-3 min.)*

Introduction

- What are the advantages of Greenfield operations when it comes to lean and six sigma implementation?
- Are there any disadvantages?
- What makes a Brownfield operation difficult?
- Where are you most likely to be working over the next 5-10 years?

Productivity/Quality Performance of Selected Auto Assembly Plants – Early 1980s *

	Productivity (hrs/unit)	Quality (defects/100 units)	Automation Level (0: none)
Honda, Ohio	19.2	72.0	77.0
Nissan, Tenn.	24.5	70.0	89.2
NUMMI, Calif.	19.0	69.0	62.8
Toyota, Japan	15.6	63.0	79.6
GM, Mich.	33.7	137.4	100.0
GM, Mass.	34.2	116.5	7.3

- Productivity here is defined as the number of man-hours required to weld, paint, and assemble a vehicle. These figures have been standardized for product size, option content, process differences, and actual work schedules (i.e. differing amounts of break time).
- Quality is based on a J.D. Powers survey of customer-cited defects in the first six months of ownership. The number in the column are the number of defects per 100 vehicles. Only defects attributable to assembly operations are included.
- Level of automation is a radio robotic applications in each plant divided by the production rate. These figures have been normalized with 100.0 indicating the highest level of automation in this group.

**John Krafcik and James Womack, M.I.T. International Motor Vehicle Program, March 1987. These data are preliminary and not for citation or distribution without the author's consent.*

Passing the Point of No Return: Accelerated Implementation of a Lean Manufacturing System

- A Core Challenge in the Auto Industry: Transforming "Brownfield" Operations
- A History of Joint Initiatives
- Initial Launch of a Lean Manufacturing System: The Challenge of the "Hope/Heartbreak" Cycle
- Value Stream – Within the Plant and Across the Enterprise
- Stability, Infrastructure and Continuous Improvement
- Leadership

Discussion Questions

1. What do you see as the top three challenges in transforming an existing brownfield plant into a lean production system?

2. What are the top three strengths and the top three weaknesses in the transformation process undertaken in Riverside up to this point?

3. Do you think this plant has passed the "point of no return" – where it is harder to revert back to the old approach than it is to continue forward with the transformation?
   a. What are the biggest vulnerabilities of the change process, i.e., what events or process failures might derail the change effort and start it to revert back to the old approach?
   b. What would you do to address these vulnerabilities?

4. What systems changes are required in other parts of an enterprise to support a plant that has reached this stage of transformation?

5. Do you believe that a "brownfield" plant can end up just as capable in terms of lean manufacturing – or even more capable – than "Greenfield" plant that was designed to be lean from the outset? Put differently, what should our expectations for performance be for this plant?

Analysis of "Week in the Life" Data

- Here is sample data on activities from a week in the life of an "on-line" Work Group Coordinator/Team Leader (working on the job and serving as Coordinator)

- These are not all the activities that occur in a week, only those involving some degree of empowerment
  - This was described as a "typical week -- even a bit light" by the Coordinator

Note that this sample of activities is based on an actual department in a large automotive components machining and assembly plant. It is only a sample of the total activities in a week and some details have been changed to make it more broadly applicable

A Week in the Life of a Coordinator

- **Tuesday**

  4:55-5:10 Take inventory

  5:20-5:45 Go to office of next Department over to talk with Supervisor about washer flooding in the isle and in our department -- put in tickets for Facilities and Scrubber Truck

  6:45-6:55 Call to check out why an Operator wasn't paid for Monday

  9:40-10:52 Received bad component from Department X -- returned it and explained what was wrong

  9:50-10:05 Go to General Stores to check out new taps and drills for pedestals

  1:12-1:20 Survey Department about reduction in hours

  1:20-1:35 Sort and tag scrap tub for removal

  2:32-2:55 Line up Tool Crib for afternoons with tooling changes

A Week in the Life (cont.)

- **Wednesday**

  4:50-6:15 Take inventory; Give schedule for week to the Team; Post weekend schedule; Cover for missing person

  6:50-7:25 Informed by Operators that there is no stock to load/unload; Run Raymond hi-lo to get job set-up; Call transportation to ensure hi-low service

  7:45-7:55 Contact Facilities/Maintenance and then Skilled Trades Leader about drill bushings for new tooling testing

  7:57-8:15 Contact Engineering about new test tooling

  9:00-9:35 Direct Team meeting and vote on reduced hours -- agreement to work 6 days and 9 hours per day

  1:30-2:40 Attend lean Business Unit Steering Committee meeting

  2:50-3:10 Sort and tag scrap tub for removal

Week in the Life (cont.)

- **Thursday**
  - 4:50-5:10 Take inventory
  - 5:12-5:35 Search for bike
  - 6:15-6:30 Direct transportation with incoming stock
  - 6:30-6:45 Survey department for week-end work (Sunday)
  - 6:35-6:40 In middle of survey, call Receiving Inspection about contaminated tubs of aluminum caps (bolts mixed in)
  - 7:05-7:20 Show Receiving/Inspection the problem with the aluminum caps
  - 7:25-7:50 Take Engineer through the quality inspection process used as part of a root cause analysis by an internal customer department
  - 8:10-8:25 Prepare for sort of aluminum caps from supplier due to bolts mixed with caps
  - 9:10-9:25 Meet with TPM support person about benchmarking trip to Indianapolis Plant to learn about their process
  - 9:55-10:10 Talk with set-up person from Supplier about aluminum caps
  - 11:45-12:10 Go see Work Group Coordinator in internal customer Department Z about special run parts that will be coming from us
  - 12:30-12:40 Give upper management run-down on cap problem

Week in the Life (cont.)

- **Friday**

  4:45-5:05 Take inventory

  5:15-5:55 Set up with Internal Customer Department Z to run special parts

  6:40-6:55 Sort and tag scrap tub for removal

  6:10-6:25 Plan overtime schedule for weekend and also plan coverage for next week

  1:40-2:05 Go to Internal Customer Department Z to check about special parts -- did not run -- will try again on Monday

  2:15-2:20 Line up Maintenance and afternoons on finisher Piping work

- **Saturday**

  5:45-10:27 Dig through storage area, sort, arrange and consolidate; Separate scrap from other Departments mixed in our area; Separate foundry returns; Get ready for lean “red tagging” exercise

Week in the Life (cont.)

- **Monday**

  4:50-5:10 Take inventory

  5:30-6:12 Try to arrange coverage for Thursday and Friday

  6:20-6:40 Discuss with Facilities and Maintenance supervisor problems with pipe work from the weekend

  7:40-8:20 Back to Internal Customer Department Z about special parts (which were returned to us over the weekend and which need to go back to the Department Z staging area (happened twice)

  7:05-7:15 Call Inspection Receiving about the amount of parts to be returned to Supplier (foundry scrap)

  9:05-9:20 Show Inspection Receiving person location of 18 baskets to be returned to Supplier

  11:30-12:10 Review tubs of scrap from nearby department (after weekend sort)

  12:30-12:55 Sort and tag two tubs of scrap for removal

  1:45-2:10 Discuss possibility of getting a person from nearby department for coverage during hunting season

Week in the Life (cont.)

- Note that the Coordinator also pointed out that many activities would be handled by the Contact People from the Work Group
  - For example, it would be typical for the Safety Contact Person to put in tickets for missing guards on the machines
  - Similarly, it would be typical for the FTPM, Quality, and other Contact Persons to be working on those issues

- Also, some “empowered” activities take place for reasons other than the Coordinator position
  - For example, it happens that this Coordinator has attended training to earn a Raymond Hi-Lo operator’s license
  - As a result, this individual might drive the Raymond to get a new battery and take it through the safety check-sheet -- because of the training, not just as a Coordinator

Small Group Analysis

- Analyze the data on the “week in the life” to determine in what ways this coordinator has been empowered
- Work in small groups to answer these questions:
  - What impact will these activities have on safety, quality, TPM and cost?
  - To what degree would you classify this as a lean operation?
  - What would be your priorities if you were serving as a coach or supervisor for this individual?

Focus on Disconnects

- It's a debate!
  - Side 1: Social Disconnects
    - In a brownfield transformation the social disconnects are a much greater barrier to lean transformation than are the technical or physical disconnects
  - Side 2: Technical/Physical Disconnects
    - In a brownfield transformation the technical or physical disconnects are a much greater barrier to lean transformation than are the social disconnects

Concluding Comments

- Begin where you are at – know your current state
- Honor the past – value lessons learned and investments in capability
- Provide evidence supporting the sense of urgency
- Build a compelling future vision
- Stabilize social and technical/physical systems as a foundation for flow and pull