



# **Advanced Line Design And Lean Strategy Workshop Syllabus**



**Lean Factory Group**



## Learning Objectives

While many Lean practitioners are well acquainted with Lean methods like Value Stream Mapping, 5S, SMED and Kaizen, they are often lacking in knowledge and experience in a core skill: process design or line design. This is especially true regarding mixed-model line design, where many of the common Lean methods (like takt time and line balancing) are misunderstood and misapplied. These are challenges that the application of Kaizen or Continuous Improvement were never intended to fix.

The learning objectives of the Advanced Line Design Workshop are as follows:

- To embrace the Lean Business Strategy, and train in the Lean Benefits Calculator and the use of Hoshin Kanri (Goal Deployment) tools.
- To train participants in the Line Design Roadmap, the step-by-step process for designing a mixed-model production line
- To practice the method using actual hardware, in a simulation environment
- To be provided with and use the line design tools, worksheets and forms
- To be able to implement these tools immediately in your company

People learn best by doing, and the line design projects completed in the classroom are based on real products. The culmination of the workshop is to bring a new line “live” and run a mixed-model line. Workstations and products have been provided by Lean Factory Group members Bosch Rexroth and Orgatex Americas.



## Workshop Syllabus

Following is a detailed agenda of the topics that are covered in this workshop. Each classroom session of approximately 90 minutes will be followed by a hands-on application of the concepts learned, starting with data collection and concluding on Day 3 with a “line live” event.

### Day 1 Morning: Line Design Method

- ❑ Introduction to Flow Processing
  - ❑ What is Flow Processing?
  - ❑ Flow Processing involves more than the factory.
  - ❑ Where does Flow Processing come from? Some historical references.
  - ❑ Why do companies embrace Flow Processing? Benefits of Flow Processing.
  - ❑ Class schedule.
  - ❑ Class expectations.
  - ❑ Introductory overview of the steps to implement a Multi-Product Flow Processing Line.
- ❑ Leonardo Group Americas implementation methodology. Similarities with the Toyota Production System.
- ❑ The Lean Benefits Calculator: quantifying Lean benefits related to line design.
- ❑ The Process Flow Diagram (PFD)
  - ❑ What is a Process? Definition. Line design implications.
  - ❑ What is a PFD? Definition.
  - ❑ The PFD as a relationship of work and time.
  - ❑ The correct way of documenting a PFD.
  - ❑ How do I walk through a factory and define a product's PFD?
  - ❑ Examples of PFDs from different industries.
- ❑ The Process Flow Matrix
  - ❑ What to document in a Process Flow Matrix.
  - ❑ Organizing the product-process relationships.
  - ❑ The product family. Process design implications.
  - ❑ The process cell. First definition.
- ❑ The Multi-Product PFD
  - ❑ How to create it.
  - ❑ How to use it for line design.

### Day 1 Morning: Hands-On Workshops

- ❑ Identify Target Area. This information will be provided by the instructors, and will involve a family of products.
- ❑ Create Product List with daily volumes. This information will be provided by the instructors.
- ❑ Create Process list. Spreadsheets to be provided.
- ❑ Create Process Flow Diagrams (PFDs) for each product in the family.
- ❑ Create Process Flow Matrix. Identify Patterns and Families. Extrapolate potential line design.

### **Day 1 Afternoon: Standard Work and Line Design Calculations**

- ❑ The Standard Work Definition (SWD)
  - ❑ Documenting the work elements in a process.
  - ❑ How to complete the SWD.
  - ❑ Assigning standard times to work elements.
  - ❑ Identifying resources, tools, materials, and material quantities to work elements.
  - ❑ Documenting Total Quality Management (TQM) criteria per work element.
  - ❑ Defining “Self-Checks” and “TQM checks”.
  - ❑ Using the TQM information to achieve parts-per-million quality in workmanship.
  - ❑ The SWD as a training document.
- ❑ The Graphic Work Instruction (GWI)
  - ❑ How is the GWI created?
  - ❑ What to document in a GWI.
  - ❑ Avoiding typical pitfalls.
  - ❑ How to maintain GWI.
- ❑ Designing the Processes for a Forecasted Volume
  - ❑ Different sales volume patterns.
  - ❑ Summarizing volumes per family and for the line.
  - ❑ Understanding forecasted volume.
- ❑ Takt time
  - ❑ The process’s target rate.
  - ❑ Calculations.
  - ❑ Examples:
    - ❑ High volume, design implications.
    - ❑ Low volume, design implications.
    - ❑ Seasonality, design implications.
- ❑ Calculation of required resources in Flow Processing.

### **Day 1 Afternoon: Hands-on Workshops**

- ❑ Write SWDs for key processes in the target area.
- ❑ Gather time estimates for all processes.
- ❑ Assemble resource calculation tool.
- ❑ Calculate Takt for all processes.
- ❑ Identify process candidates for GWI.
- ❑ Develop one GWI with digital photographs.
- ❑ Prepare progress report.

### **Day 2 Morning: Line Balancing, Refining Calculations and Physical Line Layout**

- ❑ Designing Multi-Product Flow Processing lines
  - ❑ Formulas.

- ☐ Understanding the weighted average standard time.
- ☐ Interpreting the results.
- ☐ Are the resources balanced against Takt?
- ☐ Process Balancing
  - ☐ Elimination of waste.
  - ☐ Relocation of work.
  - ☐ Addition of resources.
  - ☐ Labor.
  - ☐ Machines.
  - ☐ Batch machines.
  - ☐ Addition of Inventory
    - ☐ The In-Process Kanban.
    - ☐ Formulas.
    - ☐ Management.
- ☐ Designing the perfect workstation
  - ☐ Operational Definition
  - ☐ Ergonomics
  - ☐ Material/tool access
  - ☐ Modular workstation design
- ☐ Potential process configurations and process Takt time
  - ☐ Feeders.
  - ☐ Independent Processes.
  - ☐ Split processes.
  - ☐ Fan.
  - ☐ Options.
  - ☐ Loop-back.
- ☐ Realities of manufacturing that impact Takt time
  - ☐ Recoverable yield (Rework).
  - ☐ Non-recoverable yield (Scrap).
  - ☐ Optional processes.
  - ☐ Oversizing processes.

### **Day 2 Afternoon: Workshop Session**

- ☐ Complete all line design calculations, with Excel tool provided
- ☐ Complete conceptual line design, using Sticky Notes and brown paper.
- ☐ Balance processes on paper.
- ☐ Complete line layout.
- ☐ Present line design to other sub-teams.

### **Day 3 Morning: Mixed Model Line Management and Hoshin Kanri**

- ☐ Managing the flow processing line

- ❑ Managing a multi-product line with variable volumes
- ❑ Employee flexing
- ❑ Flow-based response time
- ❑ Flow processing planning
- ❑ Process sequencing and developing sequencing rules, use of the Heijunka Box
- ❑ Building a Lean culture: line lead and supervisor responsibilities in sustaining a Lean culture
- ❑ The A3 tools of Hoshin Kanri for goal deployment

### **Day 3 Morning: Hands-on Workshops**

- ❑ Make all physical changes to the target area.
- ❑ Set up material presentation.
- ❑ Train target area team.
- ❑ Set up production status visual display.
- ❑ Prepare for Line Live.

### **Day 3 Afternoon: Hands-on Workshops**

- ❑ Bring live target area. Begin actual production in the target area.
- ❑ Observe and support target area team.
- ❑ Gather suggestions for continuous process improvement.

### **Day 3: Final Session**

- ❑ Kaizen of Line Live Event and Lessons Learned
- ❑ Concluding remarks
- ❑ Other resources available
- ❑ Complete workshop evaluation