Manufactured Housing Research Alliance

Improving Plant Operating Efficiency through Lean Production Methods

Summary

MHRA has funding to support the efforts of a few factory builders interested in applying lean production methods to improve plant operations. The goal of this effort is to transform the way homes are manufactured, substantially reducing manufacturing costs, production time, product defects, and labor hours per home while improving quality.

The approach is geared toward achieving two goals: 1) planning and implementing cost-justified changes in manufacturing process and 2) establishing within the plant a culture of continuous improvement.

MHRA will select between four and eight plants to begin incorporating lean principles throughout the production process. Each plant will send one or more representatives to a training workshop where they will learn the principals of lean production and the skills to begin implementing lean processes at the plants. The representatives, referred to as the "lean advocates," will return to their plants where, using tools provided at the workshop, they will document how value is added or not added in the current production process (plant "value stream mapping"), and plan rapid process improvement events, or RPIs, designed to achieve the goals stated above.

The lean advocates will be supported by MHRA team. The team will review and critique the plant's value stream map and work closely with the lean advocates in planning and carrying out the three RPI events. These support activities will include multiple visits to the plant by the MHRA team members.

Plants will be expected to make substantial commitments in terms of management time and production staff time, as well as a financial contribution to offset some of the associated costs.

A summary of the steps in the process follows:

1. One-week off-site training for lean advocates
2. Value stream mapping by lean advocates supervised by MHRA team
3. Develop strategy to implement lean techniques
4. Conduct three rapid process improvement events in the plant supported by the MHRA team
5. Team meeting with all lean advocates to review successes and challenges

These tasks are described in detail below.

Detailed project description

Task 1. Training the plant's lean advocates

Each plant will identify one or more key staff members as their lean advocates. Advocates will participate in a one-week off-site training session conducted by MHRA. Training will enable the plant's advocates to identify waste (principally wasted time and cost) in the manufacturing process and develop and put in place approaches that will reduce this waste.

The training will cover essential lean concepts and techniques: takt time, continuous flow, pull/kanban replenishment, cellular manufacturing, value stream mapping, process observation analysis, waste discovery, cycle time/bottleneck analysis, line balancing/production leveling, standard work, visual control, rapid process improvement (RPI), etc.

After completing the training program, the advocate(s) will be given a series of assignments as described in the tasks that follow.

Task 2. Value stream mapping and other data collection

Using the tools provided during training, the lean advocate(s) will take the following steps in the plant:

- Collect information describing current plant performance, including production levels, labor productivity, cycle and lead times, inventory levels, space requirements, quality levels, etc. This information will build on the information already assembled by the plant as part of Lean Production Benchmarking Plant Survey.
- Develop a preliminary high-level *current-state* value stream map of plant operations.
- Identify from the value stream map specific areas of improvement. In each area, conduct detailed observations, create process flow maps, and collect quantitative data that will be used to document and measure waste (process times, non-value-added/delay times, material waste/scrap, bottlenecks, rework, product variation, work in process inventory levels and changeover times).
- Develop an initial *future-state* value stream map, focusing on high priority, high return lean improvements. Potential improvements will likely include the following: workplace organization and standardization, labor optimization (cellular production, line balancing, and production leveling), better tools and equipment (including devices to minimize lifting and carrying of large/heavy materials), procedures (kanban replenishment) and information systems (bar code/RFID).

This information will be collaboratively shared with the MHRA team as it is collected. The team will visit the plant to review progress and confer with the plant's lean advocate(s). Working with the advocate(s), the advisory team will review and help refine the current- and future-state value stream maps. Focusing on the future-state map, the advocate(s) and the advisory team will jointly identify candidate lean improvements. The product of this task will be completed value stream maps and a short list of candidate lean improvements for consideration by the plant. These ideas will form the basis for the Rapid Process Improvement (RPI) events.

Task 3. Select areas for improvement and develop implementation strategy

The lean advocate(s) and the MHRA advisory team will work together in developing a strategy for implementing lean improvements as depicted on the future-state value stream map. The plan will be based on conducting three RPI events (see Task 4).

The goals of the RPI events can include: increase productivity, reduce or eliminate waste, standardize building processes, reduce delays, alleviate bottlenecks, eliminate unnecessary material handling, raise skill levels, reduce inventories, minimize defects, and optimize space usage.

Each RPI event will be carefully planned, including: a description of what is to be accomplished; how the event will be conducted; what resources and materials are needed; and, what plant personnel will be involved. It is strongly recommended that involvement include both floor supervision and operators. This is critical to encourage broader ownership of the new process and instill an ongoing continuous improvement culture. The advocate(s) and the advisory team will jointly draft the plan for the first RPI event. It will likely focus on workplace organization and standardization (5S), since this serves as the foundation for future lean improvements. Plans for subsequent RPI events will be drafted by the advocate(s) and reviewed by the advisory team.

Task 4. Conduct RPI events and evaluate results

Over the course of several months, the MHRA advisory team will work with the lean advocate(s) in conducting approximately three RPI events (each RPI may address a different area of plant operation).

The RPI events will initially be led by the MHRA advisory team. This responsibility will be shifted to the plant's lean advocate(s) in subsequent RPIs with the goal of transferring the expertise in facilitating the process of continual improvement to plant staff. One or more members of the advisory team will be in the plant for each of the three RPI events. During these events, the advisory team will move from active leaders and facilitators (RPI 1) to a resource for the advocate(s) (RPI 2) and, finally, to observers (RPI 3).

RPI events will be documented and evaluated by the advisory team with the assistance of the advocate(s). Results will be reported to plant management. The evaluation will focus on the following: RPI accomplishments, factors that limited RPI success, barriers that inhibit the development of a lean culture, further opportunities for improving production, and related issues.

Advocates will be encouraged to conduct additional RPI events between advisory team visits.

Task 5. Final team meeting

After completion of all RPI events, the lean advocates from all plants and the MHRA advisory team will convene for a one-day de-briefing where participants will share experiences.

Benefits of participating

Participating plants will benefit in two major ways:

1) Make immediate and lasting changes to plant operations that measurably improve performance. The successful implementation of lean production results in fewer labor hours per home, more homes built in less space, reduced capital expenditures, and more consistent home quality with fewer defects.

2) Start on the road to transforming the plant's approach to production by building on a proven base of knowledge and experience with lean techniques. Build a cadre of plant employees who can continue the lean transformation with limited or no outside assistance.

Commitment by plants

Deriving value from this ground-breaking lean exercise requires commitment and ownership of the lean production process by plant management. Participating companies will be required to invest time and resources in the project that includes the following:

- Assignment of a senior staff member(s) as the lean advocate(s) for the plant. This person(s) should anticipate devoting approximately 200 hours to the effort over a four to six-month period. The lean advocate(s) will be a pivotal member of the project team and ultimately responsible for transferring the knowledge gained through the project to the plant and to the company as a whole. The advocate(s) will also be expected to participate in a final wrap-up meeting after all RPI events have been completed to share and learn from experiences at other plants.
- Assignment of other staff as necessary to assist the lean advocate(s) in data collection and to participate in RPI events. Over the three events, their cumulative commitment is anticipated to be several hundred labor hours depending on the type, extent and duration of events in the plant.

Summary of MHRA team activities in support of the plant

Task	MHRA team effort*
1. Training lean advocates	**5 days** at training location
2. Value stream mapping and other data collection	**4 to 7 days**
Initial mapping and refinements	1 to 2 days off site
On-site evaluation and identification of target areas	2 to 3 days in plant
Refine future-state VSM	1 to 2 days off site
3. Select areas for improvement and develop implementation strategy	**1 day** off site
4. Conduct RPI events and evaluate results	**16 to 18 days**
RPI event 1 Planning	1 day off site
Conduct event	5 days in plant
Evaluate results	1 day off site
RPI event 2 Planning	1 day off site
Conduct event	3 to 4 days in plant
Evaluate results	1 day off site
RPI event 3 Planning	1 day off site
Conduct event	2 to 3 days in plant
Evaluate results	1 day off site
5. Final team meeting	**1 day** meeting
TOTAL	**27 to 31 days** (12 to 15 days in plant plus 15 to 16 days off site)

* MHRA team consists of one to five members depending on the task/event