

# Improving Productivity Through Lean Six Sigma Warehouse Design

by Janet Jacobsen

## At a Glance . . .

- As a key customer's order volume rapidly increased, New Breed Logistics struggled to keep pace.
- An improvement team worked collaboratively with internal and external stakeholders to find solutions to meet the challenges of both current and future customers.
- The team applied Lean Six Sigma methodology by employing quality tools such as value stream mapping, PICK charts, and the 5 Whys to increase product flow and meet customers' packaging requirements.
- As a result, overtime decreased by 30 percent, productivity as measured by volume increased 5 percent, shipping accuracy reached 100 percent, and customer satisfaction improved, thereby leading to additional business.
- Once the team completed the improvement project, members shared their success story as a finalist in ASQ's 2008 International Team Excellence Award Process.

A rapidly increasing order volume from a major customer is typically good news for a company such as New Breed Logistics. However, in the case of one key client—aerospace giant Boeing—orders, activity lines, and packaging plans far surpassed expectations. Although New Breed hired additional employees and authorized overtime to meet the increased volume, its output was simply not keeping pace with customer demand. As the company sought to address the challenges of both current and future customers, it turned to a Lean Six Sigma improvement team for solutions.

## About New Breed Logistics

New Breed Logistics is a privately held, third-party logistics services provider dedicated to helping companies design and operate efficient supply chains. The company's quality management system is registered to ISO 9001:2000, AS9100 Rev B, and AS9120:2002, and the organization holds ISO 14001:2004 registration for its environmental management system.

Headquartered in High Point, NC, New Breed manages millions of square feet of warehouse space across more than 50 distribution centers in the United States and it employs nearly 6,000 people. With 35 years of experience in delivering supply chain solutions, New Breed serves clients such as Motorola, Samsung Electronics, Siemens Medical Solutions, Sony Electronics, the U.S. Postal Service, Verizon Wireless, and United Technology, in addition to Boeing.

## Seeking Solutions to Improve Productivity

As employees at New Breed Logistics' distribution center in Swedesboro, NJ, diligently worked to meet customers' increasing supply chain management needs while adhering to customer requirements and internal on-time standards, the company expanded to hire a second shift and authorized weekend overtime. A prime example of increasing volumes was evident in 2006 with Boeing's orders for its V22 aircraft program. Order volumes exceeded projections for more than 24 months, and packaging needs surpassed contractual requirements, causing New Breed to experience a 23-percent decrease in its on-time packaging metric.

The packaging metric served as a focus point because of the interrupted flow in the logistics process: In the case of Boeing, New Breed receives the order, packages it, and then waits for the U.S. government and Boeing to approve it. "Our on-time delivery is essentially looking at packaging," explains Sherif Mahdi, director of business performance excellence and project manager for the improvement team. Prior to the improvement project, metrics focused on on-time delivery—something that was out of New Breed's control. "On-time packaging is something that we can control as well as something value-added for both Boeing and the government," adds Mahdi, a Lean Six Sigma Black Belt.

Several factors were adversely affecting New Breed’s ability to achieve on-time metrics, including:

- Order activity rates were higher than planned.
- Orders had higher priorities within the total system than anticipated.
- The mix of orders was skewed toward those classified as more difficult to package, due to strict packaging guidelines.
- Packing plans were modified, which required additional higher-end packaging configurations, thus taking more time.

Company leaders realized that focused improvement was essential for keeping pace, so they began searching for an improvement project to create solutions. A Lean Six Sigma team was chartered to accomplish the following:

- Improve customer satisfaction by working with customers, such as Boeing, to develop a solution to increase on-time packaging.
- Increase both throughput and packaging efficiency.
- Reduce waste through Lean Six Sigma warehouse design.
- Improve product flow to support increased throughput.

Both internal and external stakeholders were involved in the project selection process. The potential impact for these groups is shown in Table 1. By involving stakeholders from the beginning of the project, New Breed ensured buy-in and created a sense of ownership as team members participated in all steps of the decision-making process.

### Applying Lean Six Sigma

In late 2006, the improvement team, the members of which are shown in Table 2, began narrowing the focus of the project. Soon, the team drafted project objectives, including:

- Increase throughput from 167 orders to 240 orders per day.
- Modify warehouse layout to accommodate an increase in volume by 40 percent to 45 percent.
- Modify customer requirements from 98-percent on-time delivery to 98-percent on-time packaging.

The improvement team found several quality tools helpful in identifying potential root causes, including:

- Brainstorming to gather all possible outcomes to improve process flow and to identify customers with increasing volumes.
- Value stream mapping to document both current and future states of the process.
- Cause and effect analysis to identify root causes.

**Table 1—Potential Impact on Project Stakeholders**

Stakeholder	Positive Impact	Negative Impact
Internal customers (production employees)	Better product flow and visibility	None
Internal customers (support personnel)	Enhanced trust and teamwork	None
External customers	Less customer involvement, increased on-time delivery, and greater customer satisfaction	None

- Trend analysis for key performance indicators (KPIs).
- 5 Whys for root cause analysis.
- PICK charts to organize information and implement a solution.
- Run charts to analyze data.
- 7S (spirit, safety, sort, straighten, shine, standardize, sustain) as a baseline for the improvement process.

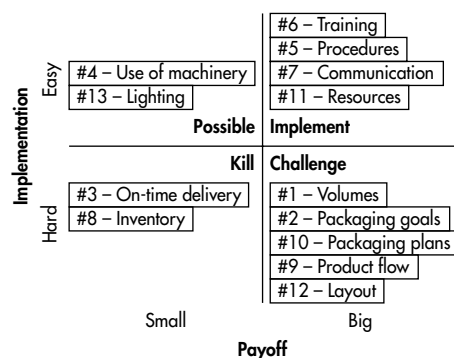
Through the data analysis process the team discovered root causes for the reduction in on-time metrics. A few of the obvious root causes were the warehouse layout, resource allocation, and packaging method times. In addition, training and audits were uncovered as unforeseen root causes. To further narrow the root causes the team used value stream mapping. Mahdi says the biggest findings from the value stream mapping exercises involved packaging: “That’s where we had the biggest bottlenecks because of the different packaging requirements involved.”

Another data analysis tool employed by the team was the PICK chart. As illustrated in Figure 1, this chart categorizes solution ideas into four quadrants: possible, implement, challenge, and kill. This tool was helpful for evaluating various brainstorming solutions and in selecting the best solutions to implement for the highest payoff.

**Table 2—Project Members**

Team Member	Function	Role	Task and Involvement
Sherif Mahdi	Project manager	Subject matter expert	Project plan/layout
Joe Elko	Plant manager	Subject matter expert	Project plan/layout
Frank Necci	Program manager	Process owner	Executive support/buy in
Gene Stephenson	Operations manager	Process owner	Procedures/layout
Tom Bonner	Supervisor	Process owner/subject matter expert	Procedures/layout
Mike Murphy	Corporate quality	Facility corporate quality support	Quality management system
John Eichler	Boeing project manager	Process owner	Project plan/negotiation
Jack Steer	Boeing operations	Process owner	Monitoring performance
Michelle Pace	Order prep	Process owner	Monitoring orders
Thomas Falvey	Inventory	Process owner	Inventory accuracy
Ed Zarek	Site operations	Site management	Monitoring site performance

**Figure 1—PICK Chart**



The New Breed improvement team also used the 5 Why's exercise, as shown below, to help select a final solution.

*Focus: Why is New Breed not keeping up with increased volumes?*

1. Why: Not enough floor space.
2. Why: Improper lighting level.
3. Why: Not enough product staging available.
4. Why: Resources not available to keep up with increased volumes.
5. Why: Equipment not available to support increased volumes.

This exercise helped the team conclude that the increasing order volume was not supported by New Breed's processes or equipment because the layout in the warehouse was limited and therefore did not support additional equipment.

Ultimately, the team came to a final solution: Create space in the existing facility through a new layout. This would maximize flow, improve lighting, and help New Breed employees in meeting the customer packaging requirements. To accomplish these objectives, the team created the project plan shown in Table 3.

### Warehouse Redesign Leads to Gains in Productivity, Satisfaction, and Accuracy

Once the project plan was implemented, the results were quickly apparent. Key performance indicators were modified to measure on-time packaging rather than on-time shipping measures. The risk of employee injury was reduced through improved ergonomics in the new warehouse layout. Mahdi says that both safety and quality were maintained while efficiency increased dramatically as overtime was reduced by at least 30 percent. Other tangible

**Table 3—Project Plan**

	Start Date	Finish Date	Duration in Days
Lay out the facility	1/1/2007	3/1/2007	59
Creating floor space, moving of racks and inventory	1/1/2007	4/1/2007	90
Customer approval	3/5/2007	4/15/2007	41
Electrical wiring modifications	4/1/2007	5/15/2007	44
Data lines	4/14/2007	5/31/2007	47
Computers/monitors/keyboards	4/16/2007	5/1/2007	15
Scales	4/16/2007	5/1/2007	15
Heat sealers	4/16/2007	6/1/2007	46
Airlines	4/16/2007	5/1/2007	15
Roll label and bag dispensers	4/16/2007	5/1/2007	15
Computer scanners	4/17/2007	5/2/2007	15
Heat sealer carts	4/17/2007	5/2/2007	15
Workbenches-53-288AX-(96" W x 36" D)	4/17/2007	5/2/2007	15
Deluxe R-398 48" paper dispensers	4/17/2007	5/2/2007	15
Laser printers	4/18/2007	5/3/2007	15
Zebra printers	4/18/2007	5/3/2007	15
Packaging carts	4/18/2007	5/3/2007	15
Mobile security computer workstations-47-525A (26" W x 24" D x 62½" H)	4/18/2007	5/3/2007	15
4' wide x 75' long x ½" thick anti-fatigue matting invigorator, solid black	4/18/2007	5/3/2007	15
72" x 30" x ¾" natural polypropylene sheets	4/19/2007	5/4/2007	15
96" x 36" x ¾" natural polypropylene sheets	4/20/2007	5/5/2007	15

results gained by using Lean Six Sigma to eliminate waste and reduce process variation included:

- Throughput increased from 167 orders per day to 240 orders.
- The ability to accommodate a 40-percent to 45-percent increase in customer volume improved.
- Shipping accuracy reached 100 percent in January 2008.
- In just one month, the company saw a decrease in errors from contract goals from 9903 parts per million (ppm) to 9.4 ppm.
- Customer satisfaction improved and New Breed gained additional business from Boeing.

Mahdi reports the following intangible benefits were also the result of this project:

- Greater employee involvement and input into solutions.
- Better team collaboration and communication.
- A work environment built on honesty and trust.

Yet another benefit of the project was the opportunity to share the team's success through ASQ's International Team Excellence Award Process. The improvement team was selected as a 2008 finalist, giving team members the opportunity to present their story in front of a large audience at the World Conference on Quality and Improvement in Houston, TX. Mahdi, an ASQ member, says that the team's participation in the Team Excellence Process was so valuable that one of the organization's corporate goals is to enter at least one team from each of its facilities in the 2010 awards cycle.

### Measurement Systems Help Sustain the Momentum

With the solutions in place and the results evident, leaders at New Breed remain diligent about sustaining productivity gains. Several measurement systems, which are validated through audits and system checks, are utilized, including:

- A corporate training database to ensure continuous training of employees.
- A corporate document control database to make sure that all employees are using the same work instructions and documents.
- Customer service level summaries to help ensure that New Breed is meeting customer requirements and expectations.

These databases are monitored at both facility and corporate levels with reports generated daily and weekly.

Looking back at the improvement project, Mahdi says he was impressed by how the members came together as a team to accomplish the end result. He notes that it was a challenge to apply Lean Six Sigma methodology to distribution logistics: "It wasn't your traditional manufacturing environment; we're in a transactional business. We had a toolbox of Lean Six Sigma tools so we could select what would and wouldn't work for our business."

*For More Information:*

- To learn more about this Lean Six Sigma team project, contact Sherif Mahdi at [smahdi@newbreed.com](mailto:smahdi@newbreed.com) or 856-467-7316.
- For more information about New Breed Logistics, visit [www.newbreed.com](http://www.newbreed.com).
- Details on the ASQ International Team Excellence Award Process are available at <http://wcqi.asq.org/team-competition/participants.html>.

*About the Author*

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