

Mike Caldwell, TBM Senior Management Consultant

Last year's skyrocketing fuel prices made many of us look at transportation in a new light. As fuel prices rose, so did the prices of seemingly unrelated items, like groceries or building supplies. Often we don't think about transportation—at least not until any problems that affect the transportation industry start hitting us in our pocketbooks. But in truth efficient transportation is what makes our consumer economy work. Without it, goods couldn't be moved from where they are produced to where they are consumed. And as both production and consumption go global, the transportation industry plays an ever more crucial role in making sure the goods get where they need to be on time.

Norfolk Southern Corporation (NYSE: NSC) is one of the nation's premier transportation companies. Its Norfolk Southern Railway subsidiary operates approximately 21,000 route miles in 22 states and the District of Columbia and serves every major container port in the eastern United States, while also providing superior connections to western rail carriers. The company employs 31,000 people and has 13 classification (hump) rail yards, 8

major system locomotive shops, 14 smaller division locomotive shops, and a total of 26 fixed facilities handling the servicing needs of these locomotives between runs. Norfolk Southern operates the most extensive intermodal network in the East and is North America's largest rail carrier of metals and automotive products. Railroads are also responsible for 75 percent of all automobile transport. The fastest growing segment of the business is in moving containers to terminals, where they are picked up by the customers.

People depend on Norfolk Southern's ability to get products where they are supposed to be on time, every time. When freight is shipped, the customer already has capital tied up in that freight, and that money can't be freed up until the customer has the product in hand and can put it on the shelf to sell. Late arrivals aren't just an inconvenience; they cost money.

Tracking Time and Money

In the freight business, time is the key. The time you've promised to deliver the customer's products to him. The time it takes to manage trains in rail yards. The time needed to service locomotives to keep them running at peak performance. The ultimate goal is to keep the trains running on time, which is very important from a customer point of view.

The greatest kaizen effort at Norfolk Southern has been geared toward locomotive performance and maintenance. This was straight kaizen work performed in the maintenance shops of the Mechanical Department in order to decrease the amount of time a locomotive is out of service. The railroad has about 3,800 locomotives.

The lifespan of a locomotive is between 20 and 40 years. The majority is used for over-the-road freight hauling for their first 15–20 years and then are “cascaded down” to the rail yards to switch cars around the terminals. Similar to the airline model, federal regulations require that each locomotive receive increasing levels of maintenance inspections at regular intervals: daily, 92 days, 184 days, 368 days, 36 months, and 60 months. Understandably, the longer interval inspections require more time in the maintenance shop. Additionally, each locomotive will receive two to three complete overhauls in its lifetime.

Locomotives are also inspected and fueled daily, although they don't need to go to maintenance shops for daily inspections, nor do they require fuel at every stop. Still daily inspections and fueling do take time, and that time must be accounted for. Clearly, keeping those engines running must be a top priority for a business that relies on on-time delivery.

According to Gerhard Thelen, vice president of operations planning and support, additional business can be gained by keeping as many locomotives running as possible and is one way for the company to increase profitability. “We want to spend as

little time on maintenance activities as possible, without sacrificing quality,” he says. “Any time cycle time can be reduced, it helps the customer.” Reducing the amount of time required to maintain the locomotives could also translate into a need for fewer locomotives to do the same amount of hauling that's being done now. Or the company can use the same number of locomotives and increase business. Either way, keeping the locomotives running means providing their customers with the service they have come to expect from Norfolk Southern.

the vision: To be the safest, most customer-focused and successful transportation company in the world

According to Mark Smyre, manager of quality process improvement, the company has seen up to a 20 percent reduction in dwell time as a result of its kaizen activities (dwell time is the amount of time the locomotive spends in the maintenance cycle). Although you might think that this would mean that the Mechanical Department is releasing all of its locomotives back out onto the tracks sooner, in reality, some are going back out sooner, but for others, the company has chosen to dedicate the time savings gained to identify and fix items that can lead to potential failures.

“Unfortunately some locomotives don't stay out for the full 92-day cycle before needing unscheduled repairs,” Smyre notes. “If we can take the time we've saved in our general maintenance cycle to perform proactive inspections, then we can identify potential defects and address them before they become an unscheduled maintenance problem, which ultimately saves ourselves

and our customers time and money.”

So how did they cut dwell time by 20 percent? They did it largely by focusing on the seven wastes—especially material transportation, wasted motion, waiting on parts, over processing (doing things that weren't necessary), and defects. Defects are defined as missing the identification of a potential failure and therefore not correcting it before the engine leaves the shop. “We don't want to compromise the size of our fleet as a result of missed opportunities,” notes Smyre, “because we need the fleet to pull our freight.” So it makes sense to address potential problems while the locomotive is already in the shop, and since time has been gained by applying lean principles to the process, the maintenance crews can afford to spend extra time when necessary to ensure the quality of their inspections.

And that leads to the second part of cutting dwell time: standard work. “We also re-evaluated inspection procedures,” Smyre says. “Standardization of our work processes was critical.”

Rail Yards: They Aren't the Back Office

Being on time isn't all about keeping the locomotives running though. Another potential time sink is the rail yard. In rail yards, which operate in a hub-and-spoke manner, inbound trains are received; their engines are moved off for inspection or refueling, and the cars are shifted around to different trains with new engines and new destinations. As you can imagine, shifting rail cars and engines around and mixing and matching to create new trains, when everything must be confined to tracks, can be tricky and time consuming. In fact, according to Thelen, the greatest chance for delays to occur is when cars are being moved around yards. So it made sense to apply lean to the yards as well.

CASESTUDY

Norfolk Southern has gained the following results through its kaizen activities:

20 percent reduction in dwell time (the amount of time trains spend in the maintenance yard)

Ability to use dwell time more effectively by adding value-added preventative maintenance activities

Creation of standardized work processes

A relentless focus on waste elimination

The viral spread of lean throughout the organization

Meeting customer requirements by ensuring shipments are received on-time, as promised, like “clockwork.”

Generally when we think of business process kaizen (BPK) events, we think of events that help create smoother flow in the back office, but at Norfolk Southern, BPK is the method of choice for gaining greater efficiency in the yards.

Rail yards face a number of unique issues:

- Car inspection—finding, handling, and repairing cars in the yard
- Car handling—optimal utilization of crews for the most efficient movement of cars through the yard; extra crews must be justified
- Locomotive handling—efficiently moving engines to the maintenance and refueling areas
- Defect handling—what to do with damaged cars

“We are learning to view processes from the viewpoint of our customers, says Terry Evans, vice president of operations planning and budget. “To a customer, one-piece flow would mean that we would tow each railcar with its own locomotive directly to the customer’s dock. We fully understand that we must run this business economically, but we must keep the customers view in mind. As we continue to identify process waste, we understand that there is an abundance of opportunities for improvement.”

To date, Norfolk Southern has conducted 10 BPK events. The purpose of a rail yard BPK is to look at the entire flow of the process from cradle (inbound train) to grave (outbound train). They follow the same procedure as for any other BPK, mapping out the entire process using sticky notes on the walls. Doing so allows them to visualize all of the steps, including tasks, decisions, delays, and inventory. “We then identified the value-added steps in each process and tried to reduce or even eliminate some of the non-value-added steps,” says Smyre. “As always, the value-added step is the one the customer is willing to pay for, and in the rail yard, the basic value-added service is getting the customer’s car onto the right train and

then getting that train out of the terminal on time.”

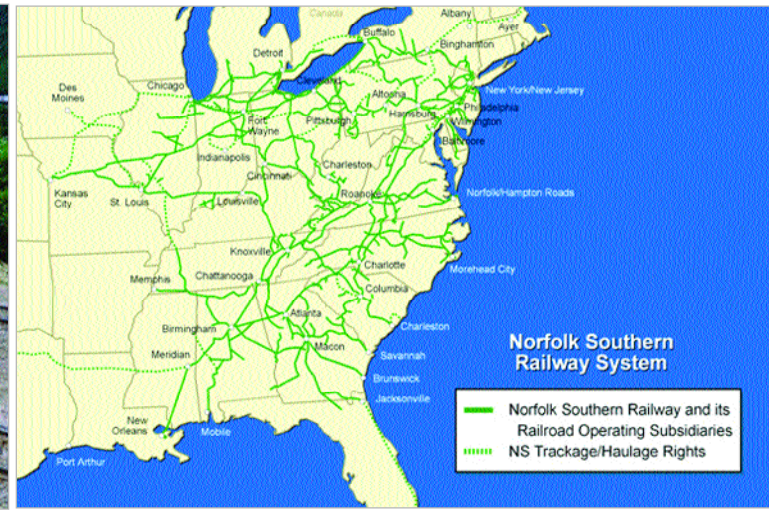
Their objective for a BPK is to increase car velocity through the yards. By using the process map, it was easier to see where the potential bottlenecks were. “In one case,” says Smyre, “we found that a train coming out of one particular yard could be better served by a different yard on the system, so we asked the Service Design Department to re-route that train out of a different terminal to better serve our customers.”

A typical rail yard process might look like this: When a train enters a terminal, it is first parked in a receiving yard and the engine is cut off from the train and goes to the engine house for service. The body of the train is left parked in the receiving yard until its individual cars are “humped” onto “classification tracks.” Once the various cars from the inbound train have been separated off and shifted onto the appropriate classification track, they are joined up with other cars bound for the same destination. At the opposite end of the classification tracks, the cars are pulled out and put into a “forwarding yard.” From there they are dispersed onto outbound trains.

Rail yard BPKs have also allowed Norfolk Southern to take a close look at staffing alignment to make sure that they have people where they’re really needed. This may seem to be common sense, but sometimes traditional staffing methods just remain in place and new people will be hired when in fact simply making sure that you have the right people in the right places is all that’s really needed.

Another benefit that the company has gained from BPKs is the “viral spread of lean.” “When we put together a team for an event, we include agreement and non-agreement people local to the terminal and also from outside the terminal who can come in and see things that the local employees may overlook due to familiarity,” says Smyre. “Union leaders have been very supportive of our lean initiatives,” he adds, “and from the

“Customer satisfaction will remain as a driving force for quality at Norfolk Southern. A high level of safety awareness will always precede our efforts for continual improvement.” –Mark Smyre, Manager of Quality Process Improvement



point of view of our agreement employees, it instills ownership in our continuous improvement process.”

“Having these events has not only gained us process improvements,” continues Smyre, “it’s also helped to familiarize our workers with their own terminals, some of which are large, complex places. And the outside workers invariably take the good ideas back and apply them at their own terminals.”

Interconnectedness

While it may seem that lean events at Norfolk Southern have been focused on two very different areas, they are in fact connected. Making the Mechanical Department more efficient has a direct impact on the Transportation Department, which is actually an internal customer of the Mechanical Department, because without healthy locomotives the Transportation Department can’t get trains to their destinations on time. And if the Transportation Department can’t operate efficiently, then the company might not be able to leverage the improvements in train maintenance to grow its business.

But ultimately Norfolk Southern has focused lean on its business for one main reason: efficient transportation means that customers get more value for their transportation costs. “Efficiency and on-time performance of the railroad has a direct financial impact on the customer that goes beyond the simple cost of transportation,” notes Thelen. “And that also means profit for Norfolk Southern, because those companies with better service performance can charge more for that service. Again it’s a matter of perceived value. Customers want their products on time and they want delivery times to be consistent; that is, if a product is coming from a particular location, they want it to arrive in the same timeframe every time. Our customers want to know that they will be receiving their shipments like clockwork. Norfolk Southern can guarantee that sort of delivery schedule thanks to its continuous improvement efforts.”

Blue-Ribbon Standard

Norfolk Southern has already set the standard in rail transportation, and now it’s doing the same with lean and kaizen. “During a visit to Norfolk Southern, a Union Pacific mechanical officer who sat in

on a portion of our kaizen activities marveled at the progress we have achieved in such a short period,” says Smyre. And no one needs fear that the gains in efficiency have caused slippage in other areas: for nineteen consecutive years Norfolk Southern has won the coveted Harriman Safety Award for having the safest employees in the railroad industry.

Lean has given the employees of Norfolk Southern a renewed pride in their work. Says Thelen, “I see the passion in our employees’ eyes as they display their kaizen improvements, and those teams are displaying a sense of urgency. That will not be easily matched by the competition.” ■