

6 | PROCESS INNOVATION IN ACTION HOW R.H. SHEPPARD USED 3P TO DISCOVER A NEW WAY TO MANUFACTURE

A WHITE PAPER BY PRODUCTIVITY





PROCESS INNOVATION IN ACTION

How R.H. Sheppard used 3P to discover a new way to manufacture.

Productivity, Inc. and the R.H. Sheppard 3P Team

In 2012, R.H. Sheppard, a manufacturer of power steering systems and related engineered products, faced a key business decision on capital investment for one of its parts manufacturing lines that needed updating. The traditional choice would be to clone the current process and invest heavily in new equipment to replace the old.

That option would certainly modernize the line and improve productivity.

But another alternative emerged: take a calculated risk on innovating instead, and aim to create a radically new process with far greater potential to affect Sheppard's top line, bottom line, and competitive position. Under the impetus of Oliver Hoar, now president, the company decided to seize a golden opportunity, charter their first 3P team, and charge it with discovering a «new way.»

3P (Production Preparation Process) is a method originated by Chihiro Nakao in which employee teams conceptualize, develop, validate, and deploy radical improvement in product and process design. In just 16 weeks, a cross-functional team of operators, a production manager, and several maintenance and engineering staff followed a facilitated 3P process from initial training through final recommendations to upper management.

Their solution will allow the company to manufacture with zero changeovers across seven different part families. The benefits to the company are significant, ranging from radically shorter lead times, to substantially increased capacity and reduced scrap, to anew manufacturing flexibility that makes it easy to accommodate future product design changes.

In a nutshell, they'll have a new platform for competition.

Here's how they did it.

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DECIDING TO GO 3P

At some point it doesn't do any good to keep jacking up production rates.

Founded in 1937 and based in Hanover, Pennsylvania, R.H. Sheppard is a privately held company that designs and manufactures power steering systems and other highly toleranced and finely engineered products for the truck, bus, rail, construction, military, and recreational vehicle industries. The company employs about 900 people spread across several manufacturing facilities and a foundry, with the vast majority based in Hanover.

As is often the case in manufacturing, at R.H. Sheppard many production processes are performed in essentially the same way they were 20 or 30 years ago. When it's time to update a manufacturing line, as it was for the company in 2012, the traditional response has been to focus on acquiring bigger, faster machines that can produce more parts per hour. But there's a limit to the benefits of that kind of capital investment.

At some point, it doesn't really do any good to continue jacking up production rates on a given part family.

That's what prompted Oliver Hoar, who was then vice president of manufacturing, to advocate that, this time around, the company hold off on a traditional large investment in modernized equipment, and see if it could reinvent its process for manufacturing on that line.

R.H. Sheppard had been establishing a foundation in lean and continuous improvement for seven years. Most employees had been trained in lean fundamentals, and some had been through a more rigorous certification process and participated in a number of kaizen events. But in order to break new ground, to forget the way things were currently done and find a dramatically new and better way, Hoar knew that it would take more than a kaizen event.

He'd read up on 3P and attended a workshop that gave him a better understanding of what's involved. Inspired by that knowledge, he became the internal champion for 3P and the bold goals it would enable the company to pursue.

He was integrally involved in the processes for establishing initial goals, drafting and approving the team charter, selecting the team, weekly review meetings, and communicating, communicating, communicating.

ESTABLISHING BOLD GOALS

The management team set bold goals...
some seemed more achievable than others.

The management team started by establishing specific « bold goals » for the 3P team. Working with Productivity 3P facilitator Jim Vatalaro, they arrived at an integrated set of targets that included:

- Zero changeover, down from an average of more than 1,025 hours in the prior year (about 48 minutes per changeover)
- Flexibility up by 33%
- Zero chip inspection
- Reduction of scrap by at least 50%
- Cost reduction
- Improvements in overall equipment effectiveness (OEE) and IT (moving in the direction of paperless processes).

Some targets seemed more achievable than others.

- Scrap reduction, for example, appeared to be low-hanging fruit, because of the amount of scrap generated by the current-state process and the volume of returns to vendor for material defects.
- On the other hand, while the team expected to reduce changeover times, achieving zero changeovers seemed far more difficult given their widely varied part families.
- Throughout the project, the 3P team would continue to clarify their goals and determine how best to measure their progress toward them.

CHOOSING THE 3P TEAM

The key question was not who can be spared but who will help guarantee success?

Allen Smith, plant superintendent, and Oliver Hoar both agreed that deciding who to involve on the cross-functional 3P team was « incredibly important. » In order to generate a radically new process design, they'd need to immerse people in the project; part-time participation wouldn't cut it. That would mean dedicating perhaps seven to ten employees to the project full time—not for just a week or two, but for a few months. Their regular workload would have to be delegated to other staff members; that could require overtime.

Given the level of investment, the key question was not who can be spared? But who will help guarantee success?

After much thought, deliberation, consultation, and internal ranking of potential candidates, a team was selected that included some members who had a good working knowledge of the target manufacturing line and some who had no clue about the process but would ask good questions.

A few technical experts were also brought in. Ultimately the team included three experienced CNC machine operators (Mickey Glass, who was also a setup helper, Rob Rohrbaugh, and Tim Conrad), a production manager (John Sneeringer), a manufacturing engineer (William Neff, Jr.), a maintenance mechanic (Brian Simerly), and a tester (Mark Kipple). An oversight committee that included executives and most department managers would meet with the team on a weekly basis to track progress.

John Sneeringer, who had just been promoted from manufacturing technical support to production manager in recognition of his leadership abilities, was chosen as team leader.

He had been certified in lean production and participated in lean projects, as had Brian Simerly, who could also lend mechanical expertise from his prior experience as a CNC operator, a setup helper, and a maintenance technician.

THE 3P PROCESS

A moonshine shop was set up as a space for the team's work.

An area about 30' x 40' was set up as the « moonshine shop, » a dedicated space where the team could work and develop prototypes. Construction of the shop began a couple of months before project launch. The walls were made of materials repurposed from another facility that was being remodeled. Most of the workbenches and tools had been removed from other areas during 5S activities, and the rest were « begged, borrowed, or stolen, » according to John Sneeringer.

Richard Livelsberger, a set-up person from another department, came over when available to act as construction foreman. Sneeringer commented:

« Many people pitched in from all departments: material movers, maintenance, manufacturing, tool crib, and quality control. »

With bold goals laid out, the team chartered, and the working space ready to go, it was time to set out on the intensive 3P discovery process.



The moonshine shop at R.H. Sheppard.

TRAINING IN THE FUNDAMENTALS OF 3P

WEEK 1

During the first week, the team worked with Vatalaro to learn the seven fundamental phases of 3P (see sidebar), and to establish a more detailed context for their project. They reviewed and further characterized the bold goals and articulated the business case. They also analyzed the current value stream operations and gathered data to establish baseline metrics.

WEEK 2

Week two focused on intensive training in both the 3P process and (to ensure the whole team was working with the same knowledge base) several critical lean tools and methods including standard work, continuous flow, quick changeover, mistake-proofing, and total productive maintenance.

As the training progressed, team members articulated their high-level visions of how they might apply the learning when it came to conceiving a new process.

Seven basic phases comprise the 3P process

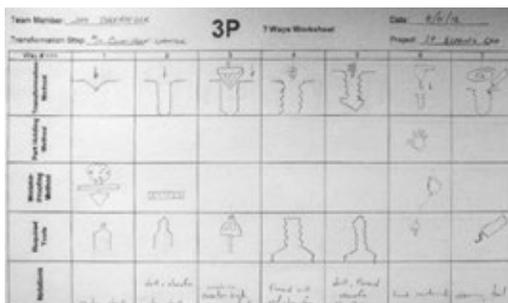
1. Project Sponsorship
2. Planning Process
3. Project Milestone Plan Development
4. Team Leader and Team Training
5. Discovery
6. Narrowing
7. Implementation

DECOMPOSITION AND THE SEVEN WAYS – THE TEAM’S REACTION TO THE WORK THAT LAY AHEAD WAS DISBELIEF.

WEEK 3

By week 3, the team had completed the essential task of decomposing the target manufacturing line operation into 34 required features or processes. That set up the basis for what many said was the most creatively challenging part of 3P— « the seven ways. »

Each team member would have to come up with seven new and uniquely different ways that each of those 34 processes/features could conceivably be produced, for a total of 1,666 « ways. » Moreover, they developed a scorecard of 26 criteria by which they would need to evaluate each and every one of those « ways. » Their initial reaction as they saw the work that lay in front of them—« disbelief. »



A « 7 ways » worksheet for one required transformation.

Nevertheless, by the middle of week 4, they'd done it: they'd completed both the ideation and the evaluation, identified the top three highest-scoring ways for each process/feature, and started constructing mock-ups of prototype new manufacturing processes. They'd also begun digging into the technical details, discussing possibilities with engineering and the foundry, and contacting tooling suppliers.



The 3P team works on a simulated process layout with Vatalaro.

MOCK-UPS, TESTING, TESTING ... AND MORE TESTING

Mock-ups were reviewed with employees and equipment vendors.

By week 5, the team had constructed full-scale mock-ups for their top three ideas. And the testing began. They conducted tours of the mock-ups with employees from the day, night, and weekend shifts so that they could solicit operators' perspectives, feedback, and ideas. They also began reviewing the mock-ups with external equipment suppliers, to get a better handle on feasibility.

The process of mock-up evaluation continued for several weeks, and that included simulating the production flow of 16 dominant parts through all three prototypes, as well as ongoing work with engineers and suppliers to nail down technical details and fine-tune the prototypes. By week 12 they'd done extensive exploration with vendors and were able to simulate testing through all vendor proposals.

The process was « very demanding, » according to John Sneeringer and the team. The strict time constraints under which they worked were challenging enough, but getting « internal and external resources to respond with the same sense of urgency » posed additional challenges.

In the end, the team narrowed the options down to the equipment that proved out the best. They proposed a solution to management for a new custom-built manufacturing line that would replace approximately 15 different machines, and achieve almost all the bold goals that had been set for them.

The process was «very demanding.»



Mockups and testing took most of the elapsed project time.

COMMUNICATION

Employees from the existing process were involved as early as possible.

Throughout the entire process, the team went to great lengths to establish regular and deep communication with the rest of the plant.

- The moonshine shop was highly visible.
- Information was posted on a communication board outside the moonshine shop.
- Weekly bulletins were sent to and posted by all departments.
The updates spelled out exactly what the team was doing and what issues they were running into.
- Everyone was invited to see what was going on—no secrets—and walk-throughs of the mock-ups were conducted.
- Meetings were held with night and weekend shifts as well as day shifts.
- Critically, employees from the existing process were involved as early as possible to ensure discovery and resolution of as many daily problems as possible. The workers on that line were the first sounding board, the first to critique ideas and proposed solutions.

There was informal communication as well. As one team member put it, « I don't think any of us didn't get quizzed on a regular basis. » Part of the top-level vision for this first 3P project was generating interest around the plant, so that others would want to participate in future projects.



Reviewing a mock-up with the day shift.

Communication It's important to remember always that people get married to the way they do things, and change is scary and difficult.

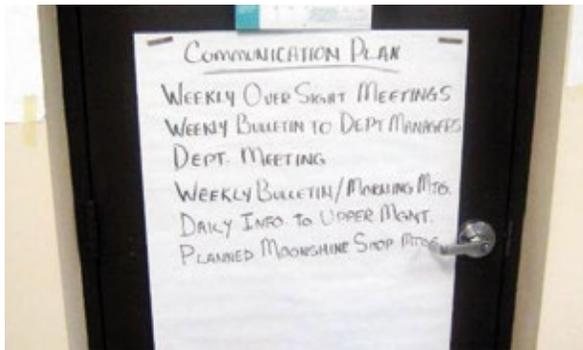
Communication is key, Hoar said.

« We did a great job of it, but if anything we probably still could have done more. There will always be people who are resistant, but they may not always be expressing what they really think and feel. That emotion and frustration may come out later on, and you have to be prepared to deal with it. It can be surprising when you thought you had someone's support. It's important to remember always that people get married to the way they do things, and change is scary and difficult. »

It's also crucial to communicate regularly and openly with executive management. Because 3P represents a significant investment of people's time and involves radical goals that are often mission-critical, the process naturally generates lots of challenging questions, like:

« You're going to do what?—take all these people off their jobs for months? You're working on a machining operation and you're going to use this guy who has no machining experience on the team? »

The team met weekly with the oversight committee to keep them apprised of current activities and the health and status of the project.



The communication plan, front and center.

As Hoar put it, there's always a risk from the executive standpoint, and to some extent it's a leap of faith. It was important for him to quantify that risk in his own mind and do everything he could to set up the project for success. That success depended largely on selecting the right team and garnering internal support.

To some extent it's a leap of faith, but it's important to quantify the risk and set up the project for success.

REWARDING RESULTS

Rather than just buying updated equipment, the company has invested in its current and future competitiveness.

In the end, the team's intensive efforts yielded excellent results, and bold goals were met. Management has been very pleased with the outcomes. The new manufacturing line is about to be installed, and R.H. Sheppard will realize a host of benefits:

- All parts on the line can be produced with zero changeovers across seven different part families and a growing list of part numbers (currently totaling about 70).
- Lead times are radically shorter, allowing much greater flexibility and same-day production turnaround on any part.
- Throughput has been improved.
- Cycle time has been halved, from up to 150 seconds for some parts down to the new target of 73 seconds required to meet takt time.
- Capacity is up about 30%.
- Scrap is down about 50%.
- Paperwork has been reduced, and complete elimination of paper is the target of an ongoing project.
- Processes have been mistake-proofed, affecting all the above metrics as well as quality.
- The number of employees needed on the line is down dramatically, from 14 to 2, allowing the redeployment of employees to other areas in which they are needed.
- Costs for future equipment upgrades will be significantly lower.

The original goal of finding a less capital-intensive solution ended up being a wash; management decided to spend the money on the new set-up because it was the best business decision for the company. But now, rather than just buying updated equipment, the company has invested in its current and future competitiveness.

The manufacturing flexibility they've gained allows them to accommodate future product design changes easily. That alone provides a new competitive advantage.

Allen Smith remarked:

« Our customer demand for that model mix is constantly changing, We started out with 68 parts, and that's grown a few since then and will continue to grow. That's the reality out there. And for us to be able to react to that at the spur of the moment with zero changeover is going to be huge. »

Moreover, they've built a strong internal capability to perform future 3Ps. And they've significantly enhanced their ability to implement advanced lean changes. There are many places in the plants where Hoar envisions using 3P to come up with new processes, new ways of doing things. He said:

« We have to rethink things in a lot of areas, 3P forces you to look at a lot of the details. »

The team also found the process personally rewarding. For Mickey Glass it was « seeing everything come together » as the team tied up the process and arrived at their final proposal to management.

John Sneeringer found his increased knowledge and abilities to be a big bonus. He also explained that the innovative thought processes fundamental to 3P have enhanced his and the company's ability to apply lean thinking elsewhere in the plant. He says 3P enhances the use of the other tools because:

« you tend to decompose processes and problems further for a deeper look at possible solutions. »

In fact, the 3P team has not been disbanded. Management originally had concerns about what they would do with the team when the project had been completed. But as they witnessed the degree of knowledge the team had acquired and the new insights they brought to processes, the management team ultimately agreed that the company would benefit most by having the team apply their skills in other areas.

Most of the original members continue to work full-time on improvement opportunities in the company, mainly by reorganizing other manufacturing lines into work cells and helping improvement teams with 5S, quick changeover, and other lean projects. In early 2014, more employees will be trained in the 3P process so that new people can be brought in to the mix.



The 3P process in action – intense, rewarding, and sometimes fun.

3P is an intense and impressive process.

As Marty Paino, vice president of manufacturing put it.

« I was very impressed with the new tools, and with Jim. The seven ways was really something—anyone can get the first four but after that...! »

And then there's the excitement it generates. Hoar said:

« It's a neat process, and there's some fun to it. It's not one that I would recommend jumping into without some pretty decent experience. But it's fulfilling when you have people discovering new things, learning. They are naturally skeptical. So it's great when you see the excitement and enthusiasm it generates. »



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#4 White Paper Kaikaku Moving Beyond Kaizen

One Organization's Story of Radical
Process Change Using 3P.

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