TMG News
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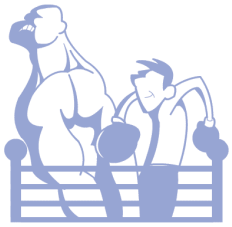
"Sharing Information to Improve Reliability"



Dueling Defect Elimination Approaches

One advantage of our dynamic benchmarking approach is the ability to conduct what-if analysis on best practices. One of the best practices that we have recommended for some time is the use of many small, cross-functional action teams made up of hourly operators and maintenance personnel. For those familiar with TPM these would be called Equipment Improvement Teams. This approach to defect elimination is very bottom-up. Teams pick their own defects to pursue; there is no formal facilitation of the team and no embedded expertise from management or engineering.

The more traditional approach to defect elimination would be top-down. The two most popular versions of this approach today are Reliability Centered Maintenance (RCM) and Six Sigma programs. The top-down approach ensures that teams are focused on the most important defects, have a very rigorous process and are heavily facilitated by managers and engineers. These approaches each have distinct benefits and pitfalls that we have known about for some time but did not have a way of quantifying or comparing…until now. Let's get ready to rumble!

In this corner — bottom-up defect elimination

In the dynamic benchmarking simulation, bottom-up teams have the following features. The number of teams that we target is two teams for every site employee per year. That translates to teams equal to 40% of the site population assuming our standard 5 person teams. A site with 1,000 employees would have 400 teams a year. Wow! What a huge number. This volume of participation is, as we will demonstrate, the great strength of this approach. Each team targets a small defect that they can eliminate in 90 days or less. They spend on average about $2,000 and expend on average 60 person hours eliminating the defect. Based on client data we know that only about 50-70% of those teams will be successful; in the simulation run for this article we used 55%. The low yield has to do with motivational problems that a bottom-up approach cannot overcome since it does not have heavy facilitation and encounters organization impediments that cannot be overcome by hourly workers. The low yield is one of the down sides of the bottom-up approach. We also know that an even smaller fraction will not only eliminate a defect but also eliminate the source of that defect (e.g., replace a faulty impeller –defect eliminated versus replace a faulty impeller and change the specifications in purchasing – defect and source eliminated.) Of the successful teams only 40% will get at the source.

And the challenger — top-down defect elimination

Top-down defect elimination gets a

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Magnus – Export Gas Compressor

Following the compressor cartridge change outs completed in July 2002 there was still a problem with lube oil migrating to the seal oil system. There was also a noticeable increase in oil usage from the time when the compressor was recommissioned. The oil transfer was stopped in mid December through reducing the lube oil supply pressure to the Low Pressure compressor thrust bearing. Once the oil transfer had stopped the quantity of oil being lost became more apparent and sometimes the rate of loss was as high as 25 gallons/day. Some of this oil was building up in the High Pressure compressor suction drum and a large quantity of oil was also found in the main gas export line. This pointed towards oil being lost through both sets of compressor seals.

Hugh Lodge and Willie Cowie took up the challenge of discovering the cause of the problems and identifying a suitable solution.

Finding the cause

In an attempt to trace the cause of the oil losses it was decided to set up a 12 hour log to monitor the Gas Process for any changes that may increase/reduce the rate of oil loss and also to check the lube/seal oil pressures & temperatures for abnormal readings. Sulzer also provided a short list of checks to be carried out.

Following these checks it was decided to check all the lines again. It was noticed that the orifice plate was icing up on the wrong side, indicating a reverse gas flow through the traps. The bypass was found to be half open but even so, the excess gas should have

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What s Inside?

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Public Workshop Calendar

Throughout the year, The Manufacturing Game® holds workshops for the general public at various universities and/or professional organizations across the country.

Lean Management and TPM Expo and Conference
28 October 2003 - Nashville, TN
To register and for more information, please visit the Productivity Inc. web site *www.lean2003.com* or call (800) 394-6868

11th Annual SMRP Conference
5 November 2003 - Indianapolis, IN
To register, and for more information, please visit the SMRP Web site at *www.smrp.org* or call 800-950-7354

PROJECT VALUE GAME PUBLIC WORKSHOP
5-6 September 2003, Falls Church, VA

For details or to register go to the PMI Chapter Web site: *www.pmiwdc.org* or contact Mara Spencer at (703) 691-5221 or John Cormier at (703) 250-2806

Other workshops for 2003 may be announced at a later date. Please check our Web site: www.manufacturinggame.com for registration details and frequent updates.

Please check the Project Value Game web site: www.practicefields.com/pvg.html for more information and updates.

much higher yield. The literature would suggest an almost 100% success rate. Our experience suggests that there are multiple opportunities to fail in a top-down effort, but we will give this approach the benefit of the doubt and say that less than 10% of teams fail due to lack of motivation, poor idea generation or lack of management support. So a 91% yield rate versus the bottom-up yield of 55%. Top-down efforts also benefit from bigger impact because they tend to systematically go after the big defects. Based on published results of bottom-up teams the average savings is $25,000 per team. Published results from Six Sigma efforts suggest a $250,000 savings per team. The impact of a successful top-down team is 10X a bottom-up one both in terms of defects eliminated and sources eliminated. So, a doubling of the yield and a 10X factor on impact per team would lead you to believe that the top-down approach is all but invincible. But lets examine the short -comings. To extend the boxing analogy, the top-down approach packs a lot of punch but it lacks reach. RCM analysis, due to their time consuming nature and high cost, are slow and can only be justified on critical equipment. Six Sigma requires trained Black Belts to sponsor and facilitate projects. If you take the recommendations from the Six Sigma literature, you would have one facilitator for every 100 employees who each conducted 3-5 projects a year. In our fictitious 1,000 person site, that would mean about 40 projects in a year. Forty RCMs in a year would be a large number as well. But that is still a far cry from the 400 bottom-up teams. At best, in a year, 40% of the plant would be involved and our experience suggests it would be much lower since many of the same people tend to be involved in these projects.

Squaring off

The top-down approach looks good in the early rounds of the simulation. Teams are knocking out significant defects and rooting out the source of those defects. Almost every team is successful and they all make a significant contribution. But ultimately the short reach is its undoing versus the lower yield but longer reach bottom-up approach. The hourly action teams are far less likely to be completed successfully and even when they are, yield only 1/10th the benefit, but they involve everyone. To understand the impact of this you need to understand the nature of ownership. Ownership is defined as an employee's willingness to get involved in and initiate improvements. We measure it on a 0-5 scale with a 0 meaning that most people will actively resist improvement efforts and a 5 meaning that most people will initiate improvements without management prompting. The plant in the simulation is at an ownership level of 2, which is pretty typical for the plants that we work with. This means that most people will go along with improvement efforts if asked but are unlikely to initiate them. From previous articles, you should already know the power of raising ownership. Increasing ownership creates self-generating improvements, a desire to find root causes and improved productivity. A move from 2-5 in ownership at this plant is worth almost $150 million over three years.

The best way to build ownership is to give people a chance to have an impact and let them see their results. Most people will be hungry for more when they get that opportunity. But ownership declines over time if not fed. If you involve me today and get me excited but then don't give me another opportunity for several years, the ownership that I gain slowly diminishes. This is where the reach problem hurts top-down efforts. As we mentioned, at the very best, the top-down approach impacts the ownership of 40% of the personnel in a year compared to 100%+ in the bottom-up approach (2 teams each person with a 55% yield). When the ownership advantage kicks in and people start generating their own improvements, finding root causes and working smarter, the bottom-up approach takes the lead and never gives it up. Stated another way, the bottom-up approach is a much more effective way of changing a culture even if it is not quite as effective at eliminating specific defects. This is shown even more dramatically if you turn off both programs after the first

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3 years and run an additional 3 years. The bottom-up scenario continues to improve due to the imbedded culture change reflected in the ownership level while the top-down approach slowly decays as the outside stimulus of teams is removed and ownership begins to decline.

Post-fight wrap up

Western culture favors the top-down approach because we love the control that it implies and because of the apparent advantages in terms of yield. We fail to see the shortcomings of the reach. It would be a mistake to read this article as an indictment of either RCM or Six Sigma. We believe and our dynamic benchmarking shows both to be highly effective defect elimination approaches. In fact, once ownership reaches a 4 on our scale, where many employees are willing to initiate improvements, the top-down approach is preferable to the bottom-up. To quote Jack Welch, "You couldn't have Six Sigma without Workout. You couldn't put Six Sigma in a bureaucratic company doing bureaucratic things. It would just have sunk it." Our argument is that they lack reach and in many cases fail to build the ownership necessary to make a dramatic and lasting change. If you are using either approach or a similar approach, the lesson from this article is to look for ways to extend the reach. Involve more people in the implementation. One client we work with takes the recommendations from an RCM as the starting point for action teams. Have a simplified process for smaller problems. Use the top-down process for the big defects and have some form of bottom-up approach for the small ones. In any case, track your ownership and make sure that your program is moving the needle on this critical measure.

Heroic Change

Organizations today are in need of some drastic changes to deal with the fast pace of business. We call this Heroic change because a lot of everyday heroes are required to make the change. This type of change happens in three stages, requires three processes and for the people involved it is a Heroes' Journey.

The three stages are: first the organization has to be unfrozen so that change can be made, second improvements are made, and finally you refreeze the organization at the new performance level to avoid back sliding to the old ways.

The first of the three processes is to articulate the business need and measures to clarify the need for and direction of the change. The second process is to empower the workforce to accomplish their tasks and make improvements. The third process is the leadership process to deal with authority issues.

Many initiatives fail because they do not anticipate the fear and anger generated by adopting new work practices. It is helpful to understand the Heroes' Journey pattern to anticipate the feelings people will have along the way and to be prepared to deal with the issues that will arise as people go through the personal agony of changing their work habits. Most of us remember the Heroes' Journey from the classics we read while at college – Homer's Odyssey or the adventures of the Scandinavian warrior Beowulf, or perhaps from the modern versions as portrayed in The Wizard of Oz, Star Wars or Field of Dreams. In a nutshell, the Heroes' Journey is a personal journey of learning, moving through three stages, facing obstacles and challenges along the way, and breaking through two thresholds to reach the end. To be successful, a person or organization must master each of the stages and cross the thresholds.

In Stage 1 the organization is unfrozen, and must become more open to change. People must see a new goal as a motivation to make the change and get out of their comfort zone to make the change, which can create fear and anger. Organizations cannot get out of this first stage until they have articulated a challenge or crisis that is more compelling than the fear of change. Gathering the right allies to pursue the new challenge creates the feeling of safety to make the change. The empowerment process for manufacturing improvement is launching improvement activities on a wide scale basis to get the involvement of a large number of people. This is a process like building muscles for the organization. By giving people an opportunity to exercise new skills in a small way, they build capability and confidence to tackle bigger things. The leadership process in Stage 1 primarily deals with creating a vision; generating and rewarding successful actions; removing organizational barriers.

Stage 2 is where the acceleration occurs, the big change comes as more people get involved and the new work practices become widespread. In our approach performance improvement comes from eliminating the many defects in the equipment, practices, and policies of the organization. The focus changes from launching action through some formal process to nurturing self-generated action by the work force. The measure of success, or business driver, of this stage is the volume, quality and impact of these self-generating efforts. To empower and encourage self-generating improvements, the organization must publicize successes of action teams, reward and recognize the teams that accomplished the successes, provide the freedom to form new teams and remove barriers that limit team performance. The leadership must devise systems that make the new work more efficient than the old and change how decisions get made to include more people and make them responsible for implementing their own solutions instead of making recommendations. The leadership should also create a common vision and set boundaries on the improvement efforts so that people understand clearly what areas they are free to operate in and which areas are off limits. Another key to success is changing the role of the supervisor from a role of managing the status quo to leading change.

In Stage 3, the main work is to institutionalize the best practices by putting in systems to support the new way of working. In this stage, best practices learned from other organizations are often installed. Unfortunately, this is where most organizations want to start their improvement program. While the best practices and the systems to support them are in fact the right things to do, you can't install those until people are ready and able to use them. Stages 1 and 2 are necessary preparation for these new best practices to succeed.

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In Stage 3, the work place needs to return to the efficiency that existed before the change but focused on the new work practices. The business driver is adherence to the new standards and established best practices. People, in general, follow the path of least resistance so empowerment is mostly focused on making the new way of doing work the easiest way. If you keep the old systems, the work will return to the old ways. The empowerment that workers need at this point is the right to do their work in the new ways. From a leadership standpoint, all of the activities that were started in Stages 1 and 2 should stop. Those activities were essential to change and that is now done. The organization in Stage 3 is transitioning away from leading change and moving back to managing results. The focus should be on pushing authority out into the organization and on orienting new people at all levels to the new process.

See more on Heroic Change on our website under publications.
www.manufacturinggame.com/docs/HeroicChange.pdf

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taken the easier routing to the flare header.

Further investigation found the common vent valve to flare was icing up indicating a restriction across the valve even though the valve was indicating open.

By removing the valve handle and turning the valve stem several times the valve was eventually moved to the fully open position and there was an immediate positive effect on the flows to the oil traps. The loss of oil became negligible.

The source of the problem was the previous turnaround. When the compressor was de-isolated the common vent valve to flare from the sour oil traps would have been lined up and locked in the open position. This valve however was faulty and was in fact almost fully closed. The valve was eventually opened and although it is open it indicates closed.

The root cause of all this trouble was therefore a faulty valve that will now be changed out in the summer shutdown.

The Result

It would be easy to simply accept this conclusion, but it was only discovered due to the hard work and persistence of Hugh and Willie. They relentlessly pursued the various possible causes and put a considerable amount of effort into finding the actual root cause as opposed to one of the early possible causes.

In addition to saving the cost of using 25 gallons of lube oil each day until the summer shutdown, they have more significantly removed the need for a costly overhaul of the compressor. There will also be a significant reduction in the HSE risks of carrying out this work. Less activity means less risk.

The big figure the team should be recognized for is the approximate cost in the region of £100,000 to overhaul the compressor, a vast saving.