# 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!
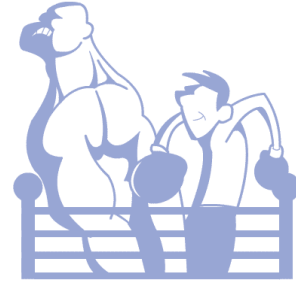
In this corner – bottom-up defect elimination
In the dynamic benchmarking simulation, bottom-up teams have the following features. The number of teams that we target is two teams for every site employee per year. That translates to teams equal to 40% of the site population assuming our standard 5 person 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 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 let's 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 1,000person 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 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.

See next page for 2013 update

2013 Addition to the Original Article

A licensee of The Manufacturing Game, Andrew Fraser – Reliable Manufacturing who conducts workshops in the UK, Europe, the Middle East, etc. made a significant addition to the defect pyramid that we have used over the years. We think it is a great depiction of why and how defect elimination of small random defects should be coupled with existing major projects that eliminate the big defects. We hope that the significance of this diagram will be helpful to organizations in realizing that each method has merit but both are needed in the long run since they attack different spectrums of defects. However the top down approach tends to be reactive (eliminating bugs that have already caused losses) whereas the bottom up is more proactive (eliminating bugs before they cause losses).