

Can Scrap be Beaten? A Strategy for 2014 and Beyond

by **Gray McQuarrie**
GRAYROCK & ASSOCIATES

Disobedience, the rarest and most courageous of the virtues, is seldom distinguished from neglect, the laziest and commonest of vices.

~George Bernard Shaw

Is the key to beating scrap simply following process instructions and procedures? No! Scrap can't be beaten. Well, maybe, if we had really easy boards to build or very similar part numbers run at very high volumes or better equipment that was more up to date; maybe then we would have a lower scrap rate. But that isn't what is going on today. Look at what we have to contend with: different materials, more complicated sequential processing, and ever-greater densities, spacings, and geometries.

So we missed that important order. What did you expect? So we didn't make money this month. Again, these things happen. With the missed delivery came the missed quick-turn bonus and the inability to ship enough product to

cover our costs. It's time for our investors, corporate owners, board members, the bank, and Wall Street to understand that a high scrap rate is just a fact of life in this business. Our excuses for lack of performance driven by unpredictable scrap events, over which we have no control, needs to be accepted without question. In fact, nobody in this industry is doing any better. If there were a solution to scrap, it would have already been found. So, end of story, end of this month's column. Thank you for reading.

Throughout 2013, as technology continued to advance and our processes became even more complex, this was our excuse dialogue. Many of us are hoping in 2014 for some sort of outside technology miracle cure. I for one am not banking on this, because I believe our true salvation in beating scrap already exists. I talk about the solution to any chronic problem we face being within our four walls in my book, [You Have a DAM Problem](#). This is good news if we are will-



ing to fundamentally shift our focus away from excuses, take accountability for the problem, and change our approach to almost completely the opposite of what we are doing today. This backwards thinking approach has a very positive precedent, as described in the book, [What-ever You Think, Think the Opposite](#). The solution being within the four walls of our business, and thinking and doing the opposite of the conventional approach is exactly what led to my rapid success at defining the true source of the registration problem and reducing registration scrap back in the '90s. Moreover, these two truths have always been there for me since my earliest days in the industry.

I remember back in the early 1980s when I first set foot in a PCB factory. The extremely frustrated general manager said to me, "Gray, this would be a great business if it didn't have any people in it. What I need is a factory without people and a bunch of obedient robots. Then all of my problems would go away." I was speechless. And yet, I have heard this very thing recited to me in different ways, again and again: the unquestioning belief in the need for total, rigid obedience by staff, a total lack of faith in this possibility due to "bad" employees, and the completely impossible task of finding "good" employees.

My first job in this industry was at a modest-sized manual electroless line, where I began to see that a lack of obedience created serious quality problems. The first problem I encountered was that operators were expected to take the samples, perform the titrations and chemical tests, and make the adds to the tank. This was a disaster. Quality and yields were horrible. What I did was take full responsibility for doing the chemical analysis and making the adds, and I simply followed the instructions. Within a couple of weeks, yields improved by more than 20 yield points. I was

considered a bit of a miracle worker, and yet the only thing I did was follow instructions. Even though these tasks were menial and boring for me, the value my chemistry and chemical engineering education provided was a full understanding of the consequences and health and safety risks related to not following the instructions.

Within a month or two, I began to see why the general manager had lost his faith in humanity and decided to place his faith in the machines; perhaps he desired everyone to be wired up like in [Star Trek's Borg](#). If we were short a line operator for several weeks, I operated the line myself. It was no surprise that the quality level was extremely high, because I prided myself in following the instructions exactly. This, of course, couldn't continue, so I trained a person who was intelligent and capable

of operating the line. I walked him through the line multiple times showing and telling him exactly how the boards were to be processed. Guess what happened? Within a couple of hours, he was improvising!! Yes, he was making crap up! I was speechless.

This disobedient behavior is the reason why anyone in our industry groans when they hear of a shop operating a manual plating line. No matter how many engineers you hire, because of the fantastical way human beings can make stuff up instead of follow instructions, you will rarely find the true root cause to a plating problem or for that matter any quality problem. And if you do find the cause, it all can be traced in some way to not following instructions, or a process operating

outside of specifications. What this means is scrap isn't (as popularly believed) a technical problem. Scrap is absolutely a people problem; it is a cultural problem.

Now, of course, you can start a quality improvement initiative such as using a fishbone

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diagram, or cause-and-effect matrix, or mental map, or any tool of this type.

Allow me to lead you through this with some questions. How much of your scrap problem has to do with people? How much of your scrap problem has nothing to do with people? You might not like these questions and you might even decline to answer them. You might at this point stop reading and turn off your computer. So let me ask another question. What percentage of scrap has to do with operators not following procedures and the process not operating to specifications? If you are irritated with my one-track mind and feel compelled to be disobedient to this line of questioning, I understand.

My services were being considered in a shop not long ago where managers were greatly frustrated with their yields, and they felt they needed to go on a very expensive engineering campaign to figure out narrow, specific technical reasons for their scrap. They were hoping I might tell them what data they should collect that would reveal the answer. Instead, I told them I wouldn't collect any data; I would go talk to the operators. I didn't get the job. However, when I asked how much their scrap rate would improve if the operators followed instructions and the process was operated to specification, the managers said this would account for a third to half of their scrap. This was a company that has a \$1 million/month scrap problem. Instead of hiring me they hired a DMAIC expert. Their hope is that they will see a small, incremental improvement in scrap of a few percentage points. Why was their target set so low? Because they had lost faith. They no longer believed they could beat scrap. And that loss in faith, though they would never outright admit it, had everything to do with their loss in faith with people. Since they didn't know how to address their people problem, they chose an alternative path that

gave them a false sense of control over their world.

What few of us in our industry realize is that we are absolutely in the people business. Dividing our sales by our total head count is one quick way to prove this. Because we are in the people business, without people following instructions and the process operating within specifications, people aren't a 30% or more contribution to scrap; people are 100% of the source of our entire scrap problem. If you can fix the people problem, then you can beat the scrap problem. Is there a real world example where obedience to process instructions solved a large scale quality problem?

I have read thick books that attempt to explain why the Japanese had such a fast turnaround to become the envy of the world for their high quality. I have been inside a handful of factories in Japan, including a couple of Hitachi factories outside of Tokyo, too. So, I have seen firsthand what they do in production and how their engineering teams respond abruptly and en masse when a process starts to produce defects. What I have come to realize and understand is this: In the 1960s, the Japanese had horrible quality. A lot was made of W. Edwards Deming and others going to Japan and playing a significant role in their [rapid monumental improvement](#). But what made Deming successful and what made this rapid shift possible was Japan's rigid, obedient culture. Without it, the shift would not have happened.

A nation full of obedient people is great when it comes to a uniformity of production. And the quality from such production will be outstanding provided the process procedures and instructions as well as the factory design and equipment are good. But as good as obedience may be in manufacturing, a rigid, unquestioning, unthinking obedience has a dark and destructive side. World War II and the need to

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drop two nuclear bombs is just one tragic case of how difficult it is to get an entire rigidly obedient nation to change course. A more recent tragic case took place in Japan just a few years ago. The Fukushima Nuclear Accident Independent Investigation Commission (NAIIC) said, “its fundamental causes [for the accident] are to be found in the ingrained conventions of Japanese culture: our reflexive obedience; our reluctance to question authority; our devotion to ‘sticking with the program’; our groupism; and our insularity.” If that doesn’t make you think twice about the potential problems around obedience I am not sure what could change your mind.

When Japan’s methods were brought over with high expectations of improving the quality of U.S. manufactured goods, like PCBs, they fell well short of expectations.

Why? We Americans aren’t an obedient people. We never have been. Disobedience, after all, is how our country was founded: “Live free or die!” A Japanese culture cannot be injected into the United States. The problem is that management tries to force-fit these systems that are not to be questioned, be it the quality circles of the 1980s or more recently Six Sigma, DMA-IC, or Lean. And the companies that finally get their workforce to conform may have improved their quality, but they wind up with serious sales and profit growth problems; just consider Motorola, the former AlliedSignal, and GE. It’s not that the tools are bad, it’s the expectation that we are supposed to be obedient slaves to these tools that ultimately proves damaging. It’s no wonder some people think of these initiatives as cults. I found this quotation on a blog: “Six Sigma is a cult, kinda like Dianetics. Once you’re in it, you can’t change without reprogramming.” Scary.

I have had VPs and general managers of some of our biggest board shops in this country

ask me if it is possible to be too Lean. What they are really asking is, is there any wiggle room with the Lean rules, because we are beginning to suspect that following them rigidly and obediently—with no means to question, challenge, and experiment with them—may be hurting our business. They are right to feel uneasy about the rigidity of many Lean experts and practitioners.

So if all of our scrap can be attributed to people not following instructions and in this country we live in a culture where workers won’t be unquestionably obedient, what can we do? Well, first, if you have made it this far and see some merit to what I am saying, then you have come very close to defining the true source of your scrap problem. Congratulations, because

only when you have defined the true problem can you design and implement an effective solution. We can’t get into this solution in depth in this month’s column. However, if you understand people, know what motivates them, and are mindful about how they think about their work, then you can design a work environment where quality will be high. This is what Zappos, IDEO, and Pixar have done.

Let me give you a couple of rules and a few ideas to try. First are the rules.

1) If you tell people what do and threaten to use force to get them to comply, they still will not comply 100% of the time. This is because doing what you want them to do will make them feel insignificant.

Therefore, either consciously or subconsciously, they will break the rules in order to meet their need for significance. This is what I call the “Live Free or Die” rule. And what you have become as the enforcer of the rules is the common enemy, just like the British were to the colonies in 1776.

2) Breaking the rules is part of a theory called Broken Windows, which I cited in my

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column, [Standards are DAM Important](#) (August 2013). When someone breaks a rule, like throwing a rock through a window, and they are not caught and the window is not repaired, others are compelled to throw more rocks and break even more rules. Their reward? Recognition and respect within their counterculture peer group. Yes, this is the basis of gang violence that existed in New York City before the Broken Windows theory was applied. And this is why the eradication of graffiti on the subway system helped to drive crime out.

So those are two very important rules that give you huge clues on what you can do to start managing your company culture so that it delivers much lower scrap rates. Now consider trying the following ideas:

1. Set high standards and enforce them, not the rules to be followed. The standard could be a measured compliance on how well each department is following process instructions.
2. Describe this new activity as an important mission vital for the success of the company. If you wish, you can get people to sign up publicly and display the signatures very close to the front door, for all to see: customers, vendors, investors, managers, and workers.
3. Measure specific work teams' performance for following the instructions. Create a competition. If you can, create a common enemy that unites everyone even more deeply to the mission and creates a burning need within the teams to be successful.
4. Reward the outstanding teams with a ceremony defined and conducted by their peers spontaneously and on the spot.

The last one, and how it is conducted, is crucial. Why are gangs so strong? It is because of peer pressure and the recognition and resulting significance they receive from their peers.



Formal celebrations, in which people are recognized by upper management, are not going to be as powerful. The other crucial point is that people have complete and total control of what they are being held accountable to. For example, if you hold people accountable for scrap, but they have no control over what someone else upstream or downstream does (bad board design, defective material that entered into the process, etc.), no matter how much you threaten, or how great the incentives for improvement, nothing will be improved and sustained. That is why a key part to Honda's and Toyota's quality improve-

ment was giving operators the ability to shut down the line if they observed anything out of compliance.

I don't expect you to be obedient to what I am saying here. I can only hope I was provocative enough to spur your mind to think and restore your faith in yourself and your people. Scrap can be beaten.

It comes down to your choice. Are you willing to accept that the solution to your scrap problem is within your four walls? That you can do things much better in 2014 than you did in 2013? Instead of treating scrap as almost entirely a technology problem, are you willing to create an environment for your people that motivates them to follow instructions and operate the processes within compliance? Yes, beating scrap is that easy and that hard. **PCB**



Gray McQuarrie is president of Grayrock & Associates, a team of experts dedicated to building collaborative team environments that make companies maximally effective. To read past columns, or to contact McQuarrie, [click here](#).