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# SPC Training: Doing It Right

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As we close out the 80s--a decade that gave a whole new impetus to quality improvement in this country, it is prudent to look back over the ground we covered. In terms of sheer numbers, training was a leading activity during this period. Number of people trained, number of trainers who opened shop, number of charts displayed, and, hardly least of all, number of dollars spent. Education and training for Statistical Process Control (SPC) in the automotive industry alone has run into the billions of dollars. Common sense must question spending so much to teach adding, subtracting, averaging, ranging, and plotting graphs. Especially in light of this key question: **What have been the hard, verifiable results of this enormous training investment?**

My experience suggests that many middle managers and even top managers say they are committed to SPC, yet don't understand some of the basic concepts, such as the meaning of process capability or the difference between control limits and specification limits. In a word, they fail to make the distinction between committing to SPC budgets and getting directly involved in SPC implementation.

## A LOOK AT DECISION MAKING

During the 80s, management often remained silent during initial SPC planning, allowing training and other key decisions to be guided by the most articulate staff argument. Commitment by management thus often goes only as far as the allocation of money without necessarily participating in the micro-strategies of spending that money. For example, top management may assume that how to execute SPC in real time is included in SPC training, whereas most SPC training to date has been concept and method oriented. That is, academic rather than practical.

Based on my personal experiences with industry in general, the following scenario is typical of how SPC has been, thus far, ineffectively implemented in too many companies. In this first scene, I am talking with different groups of production personnel in a large company on how to execute SPC ideas successfully in the production environment.

Them: This is great stuff! We would love to do it. But do you think our bosses will understand what this is all about?

Me: Well, I'll round up your supervisors and have a talk with them.

After talking with the supervisors on the same subject:

Them: We need something like this. We knew there had to be a better way and this looks like it. The only obstacle we see is that our managers may not understand the need like we do.

Me: I'll try to get a session with your managers and see if I can get them excited about this. They wished me luck. After talking with the managers on the subject of SPC implementation:

Them: This looks like what we've been waiting for! We should get everybody involved. We think we can somehow work it into the budget; but, before we go too far on this, we better have an overview session with the directors. No more than an hour. It's difficult to get them together for one hour on any subject.

Me: I'll condense all these ideas into an overview.

With a great deal of effort, we were able to round up the directors. My highly condensed presentation must have gone well:

Them: These ideas look sufficiently different from the ones we've been practicing for years now. It appears this approach can solve some of our tough problems and also reduce the cost of investigations. But some inherent changes in the way we report to our superiors will be required; so, the executive staff must be exposed to this and approve the change schedule.

The directors put together an executive staff meeting for which my presentation was further condensed to 30-45 minutes. By this time, of course, I was very familiar with the company products, problems, and culture. Everyone was therefore appreciative of the simplicity and brevity with which I communicated SPC concepts to the executives.

The president responded that the ideas looked very good and that he would commit to their implementation. His form of commitment was to seek an action plan from the vice president of each division. My subsequent conversations with the vice presidents revealed that they were asking their directors to provide the details for the action plans as soon as possible.

The directors, in turn, enthusiastically responded that they would ask their managers to provide the working formats for these action plans. The managers said they would issue directives for their supervisors to provide implementation details; their initial thoughts were to train everybody in this new thinking. The supervisors concurred that the production workers needed to be exposed to the new ideas via--what else?--training. I was hired to do the training.

In this common scenario, important ideas traveled from the production personnel all the way up to the president and then back down again to the plant floor, without any strategic decisions having been made about the implementation of those ideas. I began to wonder whether the executive staff was really committed to SPC. Did I fail to understand how commitment is defined at upper management levels? Or did I fail to communicate what sort of commitment is needed to really make SPC work?

## A LOOK AT MASSIVE TRAINING

In another experience, I met a Ph.D. scientist at a Quality conference in Mexico. He had trained 500 personnel in SPC, but he was beginning to doubt if the training had benefited his company. It was amazing to learn that he assumed successful SPC would automatically result from his massive training effort. Suffice it to say that his disappointment has been experienced in other companies many times over. The moral of these stories is simple: **Massive doses of SPC training are nonstrategic in nature.**

My article "SPC Training: Is Your Investment Paying Off?" was featured in the March 1987 issue of Quality and contains several points I am restating here. Of note, more recent articles in publications devoted to the Quality field have been critical of massive training programs.

In Quality Engineering this year (Volume 1, Number 3), Jac I. Ford and Christopher R. Leader related their experiences at the Saginaw Division of GMC in an article focused on "Integrating Human Dynamics and Statistical Process Control." These authors admitted: "At first, Saginaw Division was similar to many other American companies. Attracted by the apparent efficiency of statistical process control (SPC) tools, Saginaw introduced them to the workforce through mass training, with limited management support. Although these early steps achieved some success, in many cases they failed."

In the May 1989 Quality Progress, William F. Roth, Jr. opens his "Get Training Out of the Classroom" by asserting: "Training is misused in most quality improvement efforts. While it is a critical part of such efforts, it is not the only part, and it should not be the initial concern of organizers. The traditional up-front focus on training is one of the reasons so many quality improvement efforts start out with promise and enthusiasm but end up producing very little."

Jeffrey H. Hooper begins his February 1989 Quality Progress article, "Making Statistical Training Effective," with an uncomfortable fact: "Industrial statisticians are increasingly being asked to develop statistical training programs to promote quality improvement. But while these programs train large numbers of employees, follow-up surveys often show that only a small percentage (about 10% to 20%) of those trained actually use what they have learned on the job."

From a different perspective, Roland A. Dumas offered a comprehensive critique on "Organizational Quality: How to Avoid Common Pitfalls," also in the May 1989 Quality Progress. Based on research, Dumas reported: "We found that about 80% of expenditures went for technical training and installing new systems. Less than 20% was related to management leadership and involvement in the programs. When respondents were asked where the major problems were, the ratio reversed. Eighty percent of the problems were associated with management leadership, support, and involvement, and 20% related to technical skills. In other words, the Pareto principle was stood on its head: 80% of the effort was going to fix 20% of the problems."

It is clear from these sources and others that a consensus is starting to form about the waste

incurred with up-front, shotgun training efforts. It remains to be seen what new fad will take over in the 90s if management succumbs once more to a "bandwagon" approach to quality improvement. Instead, management must provide **strategic guidance** for all phases of SPC execution, including SPC training decisions.

## A LOOK AT TRAINER SELECTION

A fundamental management concern should be the quality of any SPC training judged necessary. Two decisions are crucial: Who will be entrusted with the training and how should they accomplish it?

With all the SPC training options that emerged in the 80s, management should approach trainer selection with some hard questions. For example: How relevant to our operations are the credentials of any training source under consideration? Have our trainer candidates solved any real-life production problems using SPC? Would a prospective trainer be willing to solve one of our current problems before being given a training contract?

Despite their enthusiasm, most SPC trainers on the market have little if any implementation experience with SPC; they possess no first-hand knowledge of the plant floor. At the same time, there is an acute need in industry for SPC trainers who are fully equipped to deal with the variety of problems and processes encountered during typical SPC execution.

Looking at various floor layouts, machine arrangements, material handling schemes, and machine utilization schemes, it's apparent that traditional process engineering has not taken into account the ease with which SPC sampling can be done. As a result, after having defined a process as a statistical entity and determined the necessary sample, getting an authentic and real-time signal could be next to impossible. In such cases, any training at all would be impractical since the newly trained, inexperienced SPC user would only be frustrated in trying to execute SPC. Given the realities of the plant floor, therefore, it is essential that trainers possess a broad repertoire of SPC skills. Too many trainers emphasize a few favored tools to the exclusion of others that may be far more appropriate in any given situation.

Through careful trainer selection, management can stress that the execution strategies and skills critical to successful SPC implementation are not sidestepped in the training effort. SPC trainers should understand the processes that SPC will serve, should be familiar with the actual requirements of SPC execution, and should be ready to use SPC in demonstrating solutions to real-life process problems. Without such a background, SPC experts can offer only philosophy and methods.

## A LOOK AT TRAINING APPROACHES

The second SPC training issue concerns how it's conducted. A key principle in adult learning is relevancy. Without a doubt, adults respond best to training that is immediately relevant to the problems facing them on the job. The more closely abstract principles can be translated into concrete, familiar applications, the better adults learn.

Industry cannot afford to invest in general training presentations when real problems are going unaddressed on the plant floor. While the articulation of textbook knowledge may perk the interest of adult learners, it is a form of training that cannot provide sufficient motivation or guidance for profitable SPC implementation. The best instructional model for adults builds on the specifics of a "live" problem to communicate general concepts. I know from experience that most fundamental SPC concepts can be taught in front of live problems, rather than in isolated classrooms.

A model of what I call **stratified training** represents the massive training efforts discussed earlier. The objectives of stratified training stress "who" should be trained in "what." Throughout the '80s the automotive industry has assumed that once everybody was trained, problem solutions would be under way. The disappointments following such an assumption have already been pointed out here.

An alternative, more productive approach to training is recommended for the '90s. For several years now I've successfully worked with an **infusive training** model. There are multiple, interactive objectives for infusive training: fostering teamwork, educating staff, and solving chronic problems.

The infusive training approach stresses the formation of teams because most difficult problems require teamwork to find their solutions. Teamwork cannot be created in hypothetical classroom settings; it can only be cultivated in realistic, meaningful situations.

A second concern is the education of staff. The language of productively solving or preventing problems is statistics--not statistical methods per se, but statistical thinking. A course or two in statistics, however, is hardly a match for what is required to solve an actual problem. With infusive training, the use of statistics can be taught with a simple vocabulary while simultaneously solving a live problem. In contrast, the stratified training approach relies on the smoothened articulation of problems in the classroom, with no assurance that the knowledge can or will be carried over into actual practice on the job.

The third and most important emphasis of infusive training is to actually solve problems in order to reinforce the value of both teamwork and statistical education. The key ingredient is a real-life problem. Teamwork principles and the applicability of statistical methods will remain questionable if presented in a vacuum. As a hardly insignificant side benefit of this approach, the training investment pays for itself with every problem solved.

A few specifics will help clarify the process of infusive training, which has as its the focus the execution of quality improvement projects instead of training in quality improvement concepts. The process begins with the selection of a real problem, most likely based on waste, inefficiency, or other improvement indicators. Next, team members are chosen who are directly or indirectly involved in controlling the process and product variables. At the heart of the team activity is an experienced facilitator, someone who trains team members in the use of statistical methods and guides the problem-solving project at the same time. In this dynamic context, SPC is presented as

a problem-solving tool--one of many at the disposal of the team--and not as a system to be installed and maintained.

## A LOOK AT PRIORITIES

Another fundamental management concern should be how much improvement can be expected from effective SPC implementation. There has been ample confirmation from experts in the field that 15% of all production problems are operator-controllable (i.e., resulting from assignable or special causes), whereas 85% are due to the system (i.e., resulting from common causes) and are thus only solvable through management effort. Yet, the heavy investment in SPC training has been aimed at the operator--a decision addressing only 15% of the total problems. The Dumas article cited above verified this imbalance attack on problems.

Solving the 85% of system-related problems demands a more comprehensive approach than emphasis on SPC or any other specific statistical tool. Such an approach is found in the use of statistical problem solving, or SPS. As a proven process for reducing common cause variation, SPS follows a logical, least-cost path to permanent problem resolution. It strategically applies those statistical methods that are appropriate to each stage of the problem-solving process, for each particular problem situation. Statistical process control, for instance, is an especially valuable tool at the problem definition step.

Like infusive training, SPS relies on team effort led by a facilitator who is skilled in statistical methods and experienced with group problem solving. With SPS, the focus is on the problem, not on training. As such, SPS can both productively guide **and** instruct teams in permanently solving chronic problems, a process in which SPC often makes a significant contribution. Management's challenge as we begin a new decade of quality improvement is to understand and apply the statistical problem solving process as a whole, not getting sidetracked by the implementation of specific statistical techniques per se.

Good ideas come and go not necessarily because they represent prevailing fads, but because we fail to appreciate and execute them effectively.