

The Red Beads:

They have more to do with safety than you might think

By Thomas A. Smith

For over 45 years Dr. W. Edwards Deming would teach some major points of his management theory doing what he called “a stupid experiment” but he promised it would be one “you would never forget.” He carried his Red Bead experiment out over four days. It was a simple yet powerful demonstration of just how perverse the American management system is and how it prevents continual improvement by overemphasizing maintenance of the status quo.



He sets up the audience for a role playing experience by asking for volunteers to participate. He calls for six willing workers and two inspectors. He explains how in his imaginary company they do everything the wrong way by keeping over staffed and adds a chief inspector. Deming played the role of the foremen since they have nobody available who knows their job and then explains to the willing workers their job is to make only white beads.

Deming then explains “the rules.” The first rule is, everyone must put forth their best effort. Then he tells them they have procedures they must follow and shows them how to handle a paddle they will use to dip into a container filled with both red and white beads. He provides every worker with the exact same instructions of how to dip their paddle into a container that is filled with 3,200 white beads and 800 red beads. He selects one willing worker to be “average.” He constantly reminds the workers their job is to “make white beads only.” If they can’t make only white beads management will close the plant down.

The willing workers are told to follow the strict procedures. They dip their paddles and then have the results recorded. When a worker produces a higher number of red beads Deming chastises him. If a worker produces a lower number Deming heaps praise on them. He tells the workers who made a higher number of red beads to do better. After each willing worker’s results are announced Deming praises or chastises them based on whether they have made more or fewer red beads. At the end of each day’s work he talks to the workers and reminds them they must improve. At the end of the fourth day he explains he can’t see any improvement and the plant will have to be closed. He thanks the willing workers and tells them to pick up their checks on their way out.

Deming then reviews and reflects on the results. Below are figures from an actual Red Bead Experiment¹:

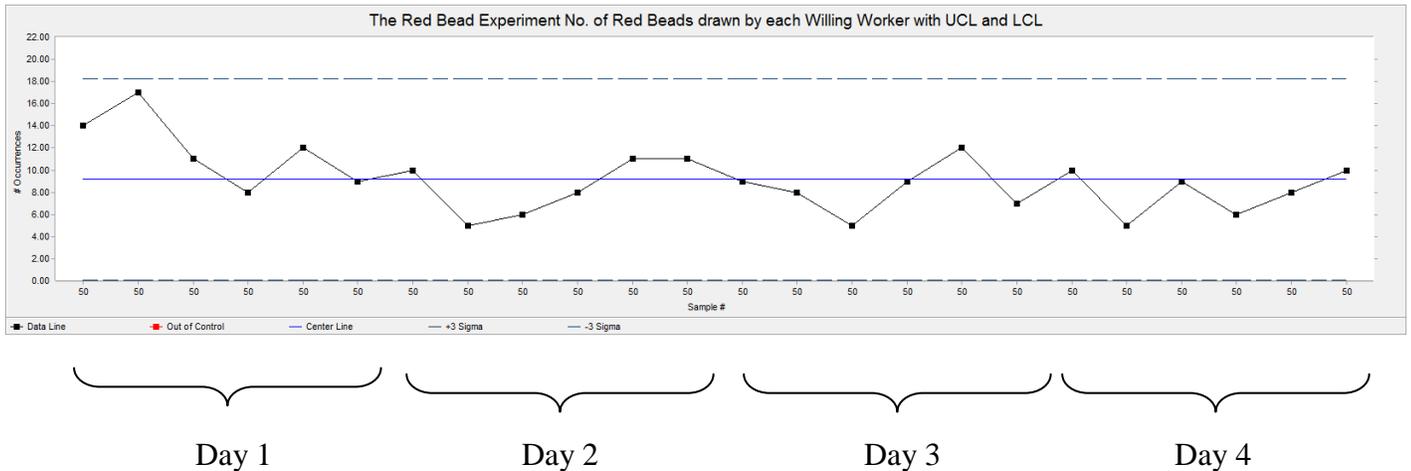
Name	Day 1	Day 2	Day 3	Day 4	All 4
Dick	14	10	9	10	43
Pat	17	5	8	5	35
Bob	8	8	9	6	31
Steve	12	11	12	8	43
Horst	12	11	12	8	43
Dave	9	11	7	10	37
All 6	71	51	50	48	220
Avg (x-bar)	11.8	10.2	9.6	9.2	9.2

Deming starts to analyze the results. He points out that some worker’s results are above average and some are below. On the first day Steve was The Man of the Day. On the first day Pat had 17 red beads

but improved to be number one with only 5 on day two. He feigns dismay with their effort. He just can't understand what went wrong.

He goes on and the message becomes clear. Even with the same identical tasks, tools, instruction and talent production outcomes will vary. He has done this experiment hundreds of times and the results are always the same. Some of the workers are above and some are below average. Put different people in the system and the results are always the same.

He then displays a control chart that establishes the limits of variation. The chart is shown below:



Deming then explains there are no patterns in the data. It is a nearly perfect constant cause system displayed on the chart. You have statistical stability in the sense what happens in the future will be pretty close to what has happened in these twenty-four points.

The moral of the red bead experiment is the following:

- Variation exists in every process. You can never eliminate all of it.
- When you plan something you must include making a prediction about how things will happen. Past performance guarantees nothing in the future.
- The work system has things in it that are beyond the workers control. It is the system, not the skill of the workers that determines how they will perform.
- Management are the only ones that can change the system. It is best for management to enlist the help of the workers to do this.
- Some workers are above and some are below average. There's nothing you can do about it and the difference may not mean anything.

The relationship of the Red Bead experiment to safety management

The Red Bead experiment is a good example of how bad management leads to bad results. Most people understand the foremen (Dr. Deming) is committing some really stupid mistakes. Ironically they are exactly what American managers do every day. He starts with employing extra layers of managers to watch what the workers do and report the results. Then he holds the workers accountable for their mistakes for which they have no control. The audience can see the red beads are built into the system and beyond the control of the workers. But the foreman cannot. He forces the workers to follow rigid procedures. In short, he is the perfect command and control manager.

Deming conducted this experiment for over forty-five years. People who use it today report managers truly believe they have no other option when it comes to managing people. It started with Frederick Taylor in the 1890's. So what does the experiment have to do with safety?

Let's start with the fact safety management takes its lead from command and control. Managers still believe employee injuries are the result of the unsafe actions or at-risk behaviors of workers. They either ignore or deny variation exists in workers and treat them as though they are identical bionic machines.

Managers are ignorant about variation of common causes in the system that results in accidents.¹ They believe holding workers accountable for their own safety is good management. They keep motivating workers to stay on guard and be alert. The Red Bead Experiment shows the folly of this line of thinking.

The foreman's role could be easily adapted from lecturing workers on the perils of making red beads to warning them about having an accident. Management tells workers they are responsible for their own safety and will be held accountable for any accident or safety violation. This allows management to ignore any deficiencies that exist in the system. Management tells workers to stop committing unsafe actions or at-risk behaviors and accidents will cease.

They can't see how this approach parallels what Dr. Deming is doing wrong when he admonishes the workers for making red beads. Managers ask "Can't workers control their own actions?" as though it is a rhetorical question. They don't understand employee injuries are the same as the red beads in the experiment. The workers did not create red beads. Most accidents like the red beads are built into the system. All processes have by-products that include waste, scrap, defects and employee accidents.

Dr. Deming was the first management expert to understand the majority of accidents occur due to variation of common causes in the system. This thinking is contrary to traditional command and control theory which blames most accidents on unsafe behaviors of workers. The assumption being everything else in the system is OK.

Peter Senge said "*When placed in the same system, people however different, tend to produce similar results.*"² It's important to understand management and remember structures actually create behaviors. Systems thinking helps you realize why it is necessary to look beyond individual mistakes or misfortunes to truly understand safety problems. To understand a system you need to look beyond single events. If employees are guilty of committing unsafe actions it is more than likely they do so because of the system.

This isn't to say people aren't responsible for their own actions or some accidents are indeed the result of special causes the employees can control. But the fact is employees don't design the work system - management does. Therefore management must own up to its responsibility and accountability for the outcomes of the system which includes accidents. People who stay focused on event explanations, such as unsafe actions, are always going to work from a reactive mode and never get to this higher level of understanding. They will mistake symptoms, in this case unsafe actions,

1. William Shewhart who introduced Dr. Deming to the thinking of statistical process control defined common causes as those causes that are inherently part of the process (or system) hour after hour, day after day and affect everyone working in the process.

for causes.

Four Levels of Safety

Basically there are four levels of safety management each one having structures that drive the thinking and actions of managers and workers.

The first is called the superstitious level where managers pay very little attention to safety. As far as they are concerned accidents are a result of fate, chance, luck, or magic. At this level managers believe all it takes for workers to be safe is a little common sense.

The second level is the referred to as the Neo or New Taylorism level. This is a little more sophisticated than the first level but not too much so. At this level managers focus on events and end up taking action after an accident happens. They are content to believe this is being proactive. Their safety credo should be: *There's never enough time to do things right but always plenty of time to do things over.* Most companies operate at this level.

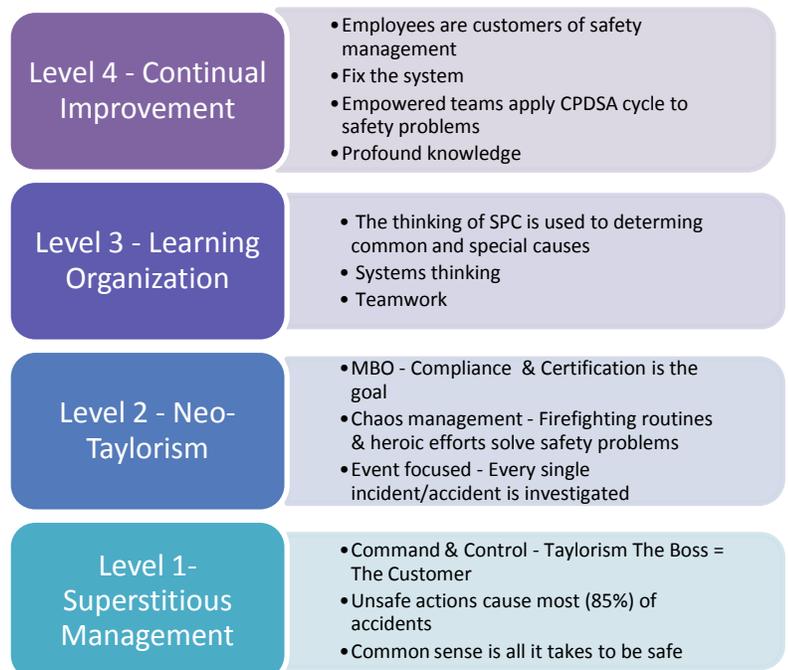
The third level is the beginning of what is called a learning organization. At this level managers are starting to understand systems and the thinking of SPC. They try to identify common and special causes but their knowledge is limited so they alternate between Level 3 and Level 2 sending mixed messages to workers.

And finally there is Level 4 where managers have attained what Dr. Deming referred to as profound knowledge and look at safety through a different lens. At this level managers and workers work together on teams to constantly fix the system so accidents are kept to an absolute minimum.

Deming estimated that as much as 99% of causes of accidents stem from common causes in the system and only 1% from carelessness. These kinds of accidents will not be eliminated until the system is corrected.³ The only place the system is being worked on is Level 4.

In his experiment the red beads represent defects created by the system. But they could just as well be accidents. Focusing on fixing a defect or changing an unsafe behavior would be similar to a doctor prescribing an aspirin for a headache caused by a brain tumor. Instead we should be looking at the common causes in the work system to determine how their variation results in employee accidents.

In the Red Bead experiment participants start to realize x-bar of the red beads is dependent on variations in the paddle and the beads. Things not easily identified at first like the diameter and roundness of each of the 50 holes in the paddles and the beads themselves.



The Four Levels of Safety Management

When managing safety we should first ask, are accidents a result of common causes or special causes? The only way to make any kind of valid determination is with the aid of statistical thinking which ultimately is what Dr. Deming is telling us to do. Look for the patterns of things that cause the red beads (employee accidents) in your operations. Then have teams use the Check, Plan, Do, Study and Act cycle to study the system and find ways to prevent them in the first place. That's what continual improvement is all about.

To learn more about how your company can manage your safety program for continual improvement contact *Thomas A. Smith* at Mocal, Inc. Mr. Smith works with management and hourly employees to help them learn about new theory of management to obtain team skills and work on culture change. His book; *System Accidents: Why Americans Are Injured At Work And What Can Be Done About It* has received high praise and can be obtained at Amazon.com. He can be reached at tsmith@mocalinc.com or his company website at www.mocalinc.com or (248) 391-1818.



End notes:

¹ Walton, Mary, *The Deming Management Method*, Perigee Books, 1986, p. 46

² Senge, Peter, *The Fifth Discipline, The Art & Practice of The Learning Organization*, Doubleday, 1990, p. 42

³ Deming, W. Edwards, *Out of the Crisis*, MIT, 1995, p. 479.