

**How to Manage Your Data Instead of Your Data Managing You:
Lessons from Dr. Deming's Red Bead Experiment - 11430**

Steven S. Prevette, Anthony M. Umek
Savannah River Nuclear Solutions, Aiken, SC 29803

ABSTRACT

Many topics have been presented at Waste Management conferences about performance measures and management of performance. Few have provided insight into how to understand the performance data in order to make better management decisions. This session will demonstrate Dr. Deming's "Red Bead Experiment" for use as an enlightening audience-participation exercise. This is a "hands-on" role playing exercise, with ten people chosen from the audience to perform the roles of "willing workers", "quality inspectors", and a "data recorder". The exercise helps attendees be successful in using their performance data for success. It demonstrates to attendees the need for understanding the interaction between statistics and human behavior. The exercise is targeted for managers and analysts of all experience levels who make use of (or are affected by) performance data. Attendees learn how to control and improve their numbers, rather than their numbers controlling them.

DR. DEMING AND THE RED BEAD EXPERIMENT

The "Red Bead Experiment" was an interactive teaching tool that Dr. Deming made use of in his four-day seminars. It is described in his writings, and videos made of his four day seminars given across the United States starting in the 1980's until his death in 1993. [1] In the experiment, a corporation is formed from volunteers from the audience. These volunteers include "willing workers", quality control personnel, a data recorder, and a foreman. The corporation's product is white beads, which are produced by dipping a paddle into a supply of beads. The paddle has 50 holes in it, and each hole will hold one bead. Unfortunately, there are not only white beads in the bead supply, but some defective and unsafe red beads. The production of the beads is strictly controlled by an approved procedure. Each worker produces beads once per "day".

Various techniques are used to ensure a safe and quality (no red bead) product. There are tabulated inspection results, causal analysis, feedback to the workers, merit pay for superior performance, performance appraisals, procedure compliance exhortations, posters, safety and quality programs. The foreman, inspectors, and the workers all put forth their best efforts to produce a safe, quality product. Fluctuations in the results are singularly reacted upon. The experiment allows the demonstration of the ineffectiveness of the various methods used, many of which are in common use in American corporations. In effect, the foreman and workers have been managed by the data, rather than managing the process and driving improvement in the results and data.

In desperation, the foreman fires the "below average" workers based upon the first three days of experience. The remaining superior workers are placed on "double shift" in order

to keep up production. The end result is the various exhortations and actions from the foreman had no effect on the results – at no time was the number of red beads versus white beads in the bead supply changed. Inevitably, the corporation goes out of business after four days of operation.

STATISTICAL PROCESS CONTROL

At the end of the experiment, a Statistical Process Control (SPC) [2], [3] chart is utilized to examine the results of the experiment. A series of charts are made from the results - bar charts, moving averages, color coded bar chart, and a control chart. The differences in interpretation of the results using the different methods are shown to the attendees. The attendees are introduced to the concepts of SPC, including how to detect a trend or shift in the data that is not likely to be due to random noise. The control chart provides the best characterization of the Red Bead Experiment data - that there were fluctuations from result to result, but overall the results are stable at a predictable average, and a predictable variation. The conclusion also shows that several of the actions taken (which are commonly seen every day in the workplace) were detrimental to the employees and the workplace, and had no improving effect on performance or the underlying process. The concluding comments point out the hazards of misuse of performance data, and how to properly use performance data in a safe, quality manner in order to achieve continual improvement.

THE RED BEADS AND THE U.S. DEPARTMENT OF ENERGY

The authors have made use of the Red Bead Experiment at the U.S. Department of Energy (DOE) for training in Feedback and Improvement for the Integrated Safety Management System (ISMS). A script customized for use in ISMS training is available through the internet.¹ A video of a session held in Richland WA for the DOE Hanford site may be found on “YouTube”.² More than 2,800 persons have attended sessions given by the authors, including a Washington State Department of Transportation session where the Secretary of Transportation was “fired” as a below average worker.

The “hands-on” demonstration using audience members in the corporation has proven to overcome the perceived barriers against statistics and SPC. The experiment does play on the emotions of the willing workers and the audience, while providing the technical justification for the use of SPC in conjunction with performance metrics. The experiment has also worked well to demonstrate the principles of the DOE Voluntary Protection Program, especially Worksite Analysis. The YouTube video will be available for viewing during the poster session at Waste Management 2011.

¹ http://www.hanford.gov/rl/uploadfiles/VPP_Red_bead_script.pdf

² http://www.youtube.com/view_play_list?p=8E522DD542C4CA69

REFERENCES

1. W. E. DEMING, "The New Economics For Industry, Government, Education", Massachusetts Institute of Technology Center for Advanced Engineering Study, Cambridge MA (1993).
2. S. S. PREVETTE, W. H. PREVITY, "Implementing Performance Trending at Two Department of Energy Sites", WM 2009 Conference, Phoenix, AZ, <http://www.wmsym.org/archives/2009/pdfs/9330.pdf> (2009).
3. INSTITUTE OF NUCLEAR POWER OPERATIONS, "Performance Assessment and Trending", INPO 07-007 (2007).