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APPLICATIONS AND EXAMPLES OF QUALITY CONTROL TRAINING SOFTWARE

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ABSTRACT

This session is a demonstration of several different programs that have been developed in the area of quality control simulation and training. They are computer simulations of physical equipment and associated exercises commonly used in teaching quality control. The programs all run on an IBM PC compatible computer with at least one floppy disk.

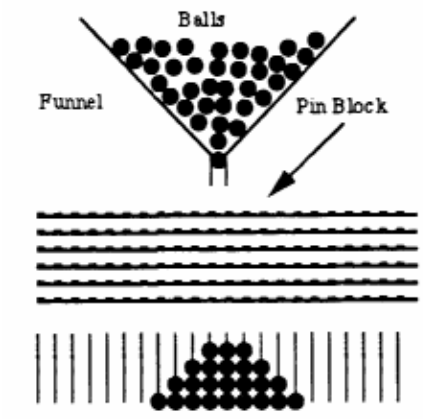
Each of the programs have been tested in the classroom with good success.

We will also demonstrate programs for the OC and AOQ calculations that produce appropriate graphs for OC and AOQ curves and control charts for means, ranges and attributes.

THE PROGRAMS

The following is a description of three of the programs in the series. These programs will all run on an IBM PC compatible computer with at least 640k and a single floppy disk drive

QUINCUNX
The first exercise is a simulation of a QUINCUNX. The QUINCUNX is used teaching quality control to demonstrate the underlying normality of many physical situations. The program QUINCUNX graphically reproduces an active animated simulation of the fall of the beads through a pin matrix to form the normal distribution.



The QUINCUNX program provides total counts for each collecting column as the simulation is running. The user can interrupt the process at any time to reduce or increase the speed of the process. While tilting the physical device can vary its speed somewhat, this does not have the flexibility and speed provided by the simulation program. With the simulation the number of balls dropped can also be changed easily.

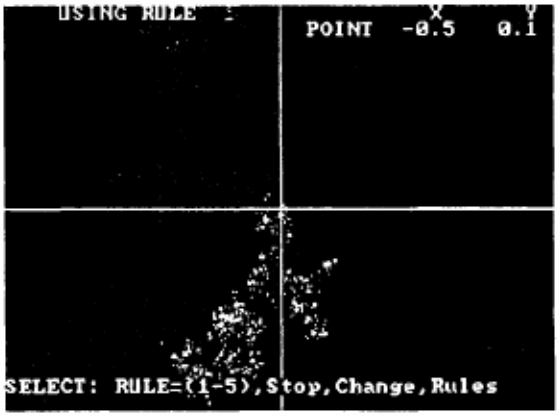
The simulation program has the capability of storing the output of 4 different runs, so the results can easily be compared in any order.

Funnel
The second exercise is taken from Gitlow, et al 1(1989). This experiment consists of a funnel mounted on a stand through which a ball is repeatedly dropped. The position of the funnel can be left stationary or moved after each drop.

Five different control rules commonly used in practice for control of processes can be demonstrated. The thrust of the exercise is to demonstrate the problems of over control. The program simulates this process and displays it to the participants in graphical real time.

Bead Box

The third exercise is described in Walton[2] (1986) when she describes the use of this exercise in the seminars put on by Dr. William Edward Deming. The exercise consists of a box of beads of two colors and a paddle with some number of bead depressions in it.



Students take turns inserting the paddle in the box and withdrawing beads. Beads of one color are labeled good and the other color bad. The students are to attempt to withdraw all good beads. The moderator acts as the supervisor using typical methods to exhort the workers to produce good product. The main idea behind the exercise is to demonstrate that real improvement of quality comes about only by change in the process. You cannot 'manage or somehow browbeat your employees into better quality.

Using this program one performs the same task electronically.

Other Programs
Programs will also be demonstrated relating to control charts. Programs are available for control charts for means, ranges, and attributes. All programs demonstrate the calculations by showing the formulas for the control charts, the substitutions, and finally the answers. Control chart plots of the data are also provided.

In the area of acceptance sampling, a program is provided that will calculate the operating characteristic (OC) curve and the average outgoing quality (AOQ) curve. Results are provided in tabular and graphical form.

The last program is a simulation of a production process where students can use control charts in deciding whether to correct a process or not. Interactive and situation specific feedback will be provided at the end on when they made good or bad choices.

SUMMARY

The three physical devices described in this paper are excellent tools for demonstrating various quality control principles. These tools provide clear and convincing evidence of the underlying principles; however, they are frequently slow, cumbersome and limited in flexibility. They perform none of the calculations needed by the user. By using computer simulations of these devices one can cheaply, easily and quickly demonstrate the principles, make the calculations necessary and present results in tables or graphs. The computer programs here provide more flexibility for several features than are provided by the physical device.

Ideally the physical device and the computer programs can be used together to provide the clarity of the physical device and the flexibility of the computer. Reducing training time for companies clearly reduces company cost of that training.