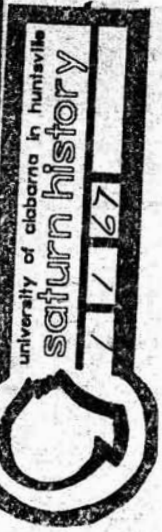


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A 'Think Clean' Training Program

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A "THINK CLEAN" TRAINING PROGRAM

by

Harvey F. Heuring
Sr. Associate Engineer, Tool & Process Engineering Department

INTERNATIONAL BUSINESS MACHINES CORPORATION
Federal Systems Division
Space Systems Center
Huntsville, Alabama

INTRODUCTION

This paper outlines steps involved in preparing and presenting an instruction course on clean rooms. The training area, personnel, equipment, and program outline will be described. A summary of the results obtained over the first year of operation will be presented.

Why Clean Room Training

When the first clean room was built at IBM Huntsville, it was somewhat of a curiosity. Everyone was interested in the new area, which soon made it apparent that not only would it be necessary to restrict the clean area to "authorized personnel only," but that the authorized personnel would have to be trained in clean room dress and department. The Manufacturing Engineering Department drafted a set of clean room requirements, using Marshall Space Flight Center Standard 246 as a guideline. The Quality Control Division was given the responsibility for enforcing it.

As new personnel were hired, it was found that some had no clean room experience, some had slight experience, and some had experience which was not applicable to

our operation. At this point the decision was made to set up a clean room orientation program, and teach everyone the same basic clean room practices.

Manufacturing Engineering Approach

The original concept of the clean room orientation program was to have four hours of intensive training, which would prepare the student for activities within the clean area. The response to this course was such that it became necessary to add an expanded program of twenty hours for those persons requiring detailed clean room training.

It is mandatory that anyone entering any of the clean rooms, whether portable or fixed, must have had at least the four-hour training course.

Clean Room Orientation

The four-hour orientation course is designed to impress upon the student the vital necessity for cleanliness. He is taught that "think clean" is a way of life, and he is shown the reasons behind this.

The student learns the proper method of dressing before entering a clean area, and how to conduct himself while in such an area.

Two films are shown, dramatizing the disasters which could occur if rigid contamination control is not followed.

A lecture supported by a series of slides is also used to familiarize the student with the problems of keeping a clean area clean. The Manufacturing Engineering Instruction document is discussed, and a question-and-answer period closes out the course.

The names of all personnel completing this indoctrination are placed on an "approved" list. Persons whose names appear on this list are entitled to request a

"clean room card," which authorizes their admission to the clean room. The request for a card is reviewed by either manufacturing engineering or quality control, and if approved, a card is issued. In this way, traffic in and out of the clean area is controlled.

Further Training Required

After the four-hour course had been in use for some time, it became apparent that it was excellent training for those having an occasional need to enter the clean room. This included government representatives, maintenance men, inspectors, supervisors, and quality control personnel. However, for those persons whose duties required full time in the clean room, four hours were not sufficient.

As a result, the expanded clean room applications program was engendered.

Motivation

The first step in any type of training, and especially clean room training, is to create a strong motivating factor, or student interest. There are several approaches which can be used, but for our purpose a simple truth sufficed.

"Clean room people are special" is the theme behind the program. This fact is impressed upon all personnel. They are given to understand that as special people, they will work in a special area, with special tools and equipment, doing a special job under extraordinary conditions. They are made to feel important because they are important. Once the student realizes that he is receiving attention befitting his special position he readily accepts the "think-clean" philosophy.

CLEAN ROOM APPLICATIONS

The clean room applications program was built around four specifications, and six questions. The four specifications are those which have to do with clean areas, equipment, and hardware, and are listed as follows:

Marshall Space Flight Center Drawing No. 10419906 — Covers the cleaning and inspection procedures and the cleanliness level requirements for disassembled parts of gas bearing and sloss measuring systems.

Marshall Space Flight Center Specification 164 — Covers the cleanliness levels for component parts used in oxygen, pneumatic and fuel systems.

Marshall Space Flight Center Process 195 — Covers the cleanliness requirements for gas bearing supply and sloss measuring systems.

Marshall Space Flight Center Standard 246 — Covers the design and operating criteria for controlled environment areas.

The six questions are basic to anyone seeking knowledge; they are: what, when, where, why, how, and who.

With these as a starting point, the course was divided into 20 sessions of one hour each. These are presented in two-hour sessions on an every-other-day basis, to a class of 20 students.

COURSE SCHEDULE

The first six hours of classwork cover the basic cleanliness requirements, which include why clean, what gets cleaned, when do we clean, and the two processes dealing with the air bearing system and the liquid coolant system.

The need for clean parts is explained, along with what the parts are, and the points at which cleanliness becomes critical. Interpretation and application of the

government specifications are also taught, and the student is given a written test to determine how well he is progressing.

The next eight hours are devoted to the main fundamentals of clean room technology which include, where do we clean, how do we clean, who cleans, clean room safety, equipment and materials, MSFC Standard 246, and a follow-up on parts from drawing board to final assembly.

During this period we cover the clean room itself, including construction, special features, and safety equipment and practices. In addition, the student is shown different sample parts, and the various methods of achieving contamination free surfaces are discussed. A laminar flow bench is demonstrated and the use of filters is shown. This section concludes with a discussion of the problems involved in producing, cleaning and installing the various special parts which go to make up the Instrument Unit. A written test is included at the end of this section.

The last six hours are spent elaborating upon the care and handling of clean parts, including packaging, the use and function of test equipment, assembly and removal of parts under clean conditions, portable clean rooms and MSFC Specification 195. After a final written test, there is a discussion on the cost of carelessness, both in dollars and in human lives, upon which point the course is concluded.

TRAINING AIDS

The training aids utilized for this course include three reels of movie film, two taped lectures, approximately 100 slides, and 130 cartoon-type view foils. In addition, the various clean room garments are displayed, including a demonstration on proper donning and removal techniques.

Mechanical demonstrations include ultrasonic cleaning, particle filtering, a laminar flow clean room bench, tubing assemblies, and packaging of clean parts.

When the concept of a clean room training course was first originated, it was suggested that a tour of the clean room complex be included as part of the course. However, this would not only contaminate the area by overcrowding, but would destroy the concept of one of the clean room rules which is, "If you have no business in the clean area, stay out!"

As an alternate to the tour, a series of slides was prepared, and the students are shown these with an explanation of why the tour is not permitted. Since most of the clean area is visible from outside, the slides serve as a memory aid, in addition to showing areas not visible through the windows. It has also been found that the relaxed atmosphere of the classroom encourages the student to ask more questions than would be forthcoming on a tour.

CONCLUSIONS AND RESULTS

As of this writing, the four-hour indoctrination course has been presented to over 150 persons, including a great many who had no actual need for clean room training, but felt that a better understanding of clean rooms would be beneficial on the job. Management encourages this type of thinking because at IBM Huntsville "cleanliness is everybody's business."

The expanded course has been presented twice, meeting with great enthusiasm each time, and more classes are scheduled.

One direct result of this activity was a marked increase in clean room type improvements submitted to the IBM Suggestion Committee immediately after the

training was initiated. This has continued to date. Also noted was a drop in contamination problems and fewer parts being rejected for failure to meet cleanliness requirements.

While the effects of this training are difficult to measure in concrete form, it is readily discernible that the graduates are more alert to the danger of contamination, and take pride in their accomplishments. "Think clean" is a part of their daily routine, and they are not likely to forget it.