RAD/CHEM ORGANIZATION STUDY

For

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INTRODUCTION

Commonwealth Edison Company requested SAI to examine the need to reorganize the radiation protection/chemistry (rad/chem) departments at its nuclear power plants. As part of a previous assignment, SAI had become familiar with CECO's radiation protection program. The objectives of this analysis were to become familiar with the chemistry program and make whatever recommendations that seemed warranted concerning the rad/chem organization. Interviews were conducted with rad/chem department personnel at each plant (including LaSalle and Byron), Maywood and headquarters. Upper plant management personnel were also interviewed when available. This report is divided into four parts. The first is an evaluation of the problem. The second is a discussion of rad/chem organizations including the one currently used at CECO and several alternative ones. The third is a discussion of other steps which could improve rad/chem functions. The last section gives our recommendations.

THE PROBLEM

There is a belief on the part of some CECO management personnel in Chemistry that the results of chemical and radiochemical analyses would be improved if technicians who run the analyses were more familiar with the equipment and procedures. Because of the practice of rotating technicians through all jobs in radiation protection and chemistry, the duration on any one job can be short and the frequency low. Furthermore, the problem may become more acute as the analyses become more sophisticated, e.g., high resolution gamma spectrometry, atomic absorption spectrophotometry, etc. This concern is not as wide spread among management personnel in radiation protection, maybe because the equipment in that area is not as complicated. However, with the introduction of whole body counting, respiratory fitting machines and TLDs, radiation protection instrumentation is becoming more complicated.

Apparently the chemical analysis problem is being compensated for because we were unable to obtain objective evidence that incorrect analytical results were

being reported for effluent or process samples. One of the solutions to the problem being used is "hand holding" of the technicians by management chemistry personnel. This practice is wasteful of the chemists' time and could lead to a false sense of security were that technician called upon to carry out the analysis without the chemist being present, for example, in an emergency.

One of the ways to increase the proficiency of technicians performing the chemical analysis is to split the technicians into two groups; one dedicated to chemical analysis, the other to radiation protection. This would involve an organizational change.

The NRC has taken no official position of which we are aware with regard to the organization of radiation protection and chemistry personnel. NUREG-0731* states that "...radiation control and health physics shall be provided by the assignment of a radiation protection technician on site at all times..." and "...chemistry and radiochemistry should be provided by an additional qualified person available to each shift." Of course, both technicians could come from the same department. The report gives an example of an organization in which radiation protection and chemistry are separate but says that it is only a suggestion. It goes on to state that "minimum shift staffing and competence is determined by the capabilities considered essential for short term accident response" and that among other things "...the capability of a utility to operate a plant safely...will depend upon having a solid, workable, safety-conscious organization".

With regard to the rest of the industry, there is no consensus on a "right" radiation protection/chemistry organization. There are almost as many different organizational structures as there are utility companies running nuclear power plants. At most plants chemistry and radiation protection work closely because radiochemistry analyses are vital to radiation protection.

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* Guidelines For Utility Management Structure and Technical Resources, F. R. Allenspach and L. P. Crocker, A draft report for interim use and comment September 1980.

ORGANIZATION

This section sets forth organizations for the chemistry and radiation protection functions at nuclear generating stations. Arguments are given for and against each organization assuming it were to be put in operation at CECO stations.

Present Organization

The basic organization of the rad-chem departments system-wide is shown in Figure 1. The organization evolved during the operation at Dresden 1. Apparently, the functions of plant chemistry and radiation protection started in separate organizations but were later combined to spread the work load during outages and power operation.

Solid lines show line authority. Dotted lines show functional authority.

We see three strong points for the present organization.

1. There is considerable flexibility and efficiency in the use of RCTs. They are given both chemistry and HP (health physics) assignments and can be shifted as needs arise. This flexibility is not fully realized, however, at plants where shift preference is practiced.
2. The organization helps compensate for the relative inexperience in nuclear power plant operation and as supervisors of many of the Lead Chemists and HPs. The Chemists and HPs are able to concentrate on technical matters.
3. The organization is flexible. We noted that, depending on the station, the dotted lines are darker or lighter. That is, the HPs and Chemists can be given a greater or lesser role in day-to-day rad/chem activities depending on individual circumstances. Furthermore, at Quad Cities and Dresden stations a foreman for chemistry has been incorporated into the organization.

We perceive three drawbacks in the current departmental structure.

1. The RCTs are not proficient at operating the more sophisticated equipment promptly upon assignment. Some RCTs perform certain

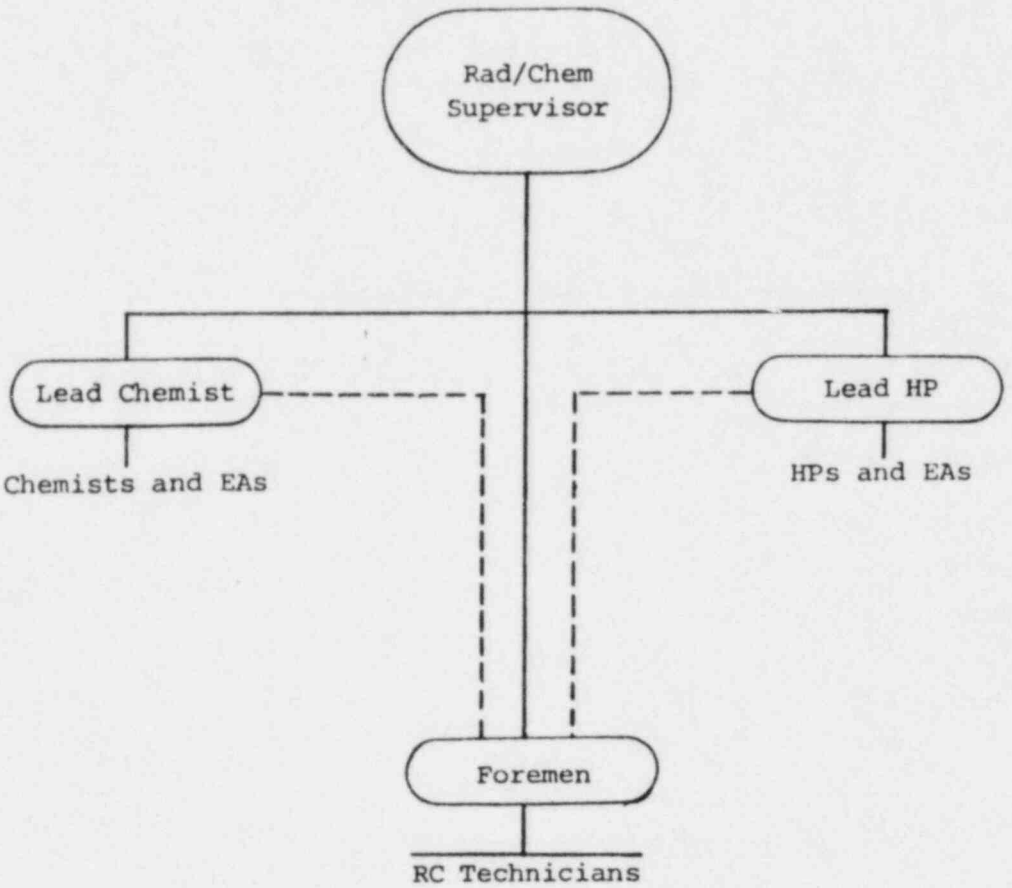

Figure 1. PRESENT ORGANIZATION OF CECO RADIATION PROTECTION/CHEMISTRY DEPARTMENT

tasks only once a year because of the large size of the RCT pool or sometimes never because jobs are traded and shift preference is practiced.

2. The Rad/Chem supervisor can become immersed in the niggling details of daily routines, lessening his ability to deal with larger and longer range issues. At one station he was observed manning the shift foreman's desk and taking incoming telephone calls.

3. At those stations where the Rad/Chem supervisor also holds the position of Radiation Protection Manager (RPM), chemists are virtually blocked from becoming the Rad/Chem supervisor because they cannot readily quality to be the RPM.

Most plant management personnel and the great majority of RCTs interviewed were negative toward the idea of changing the organization to provide more specialization among the RCTs.

Division of Technicians and Foremen

A. This organization is depicted in Figure 2. The present RCTs would become either Chemical Technicians (CTs) or Radiation Protection Technicians (RTs), and a foreman would normally supervise only CTs or RTs. This kind of alteration was regarded as desirable by most of the chemists we talked with because they would have so-called dedicated technicians. The strong points of this arrangement are:

1. Each technician would have fewer tasks to master, and would perform them more frequently. This organization would make better use of chemists' time because increased RCT proficiency would reduce the amount of time required of chemists to ensure high quality analyses. This argument may also apply to radiation protection work because of the trend toward greater complexity in some radiation protection jobs, such as mask fitting, whole body counting and TLD processing.

2. This organization presents the potential for better supervision because each foreman would have fewer jobs to keep track of at any one time. Foremen may be able to spend more time supervising RCTs than they currently do.

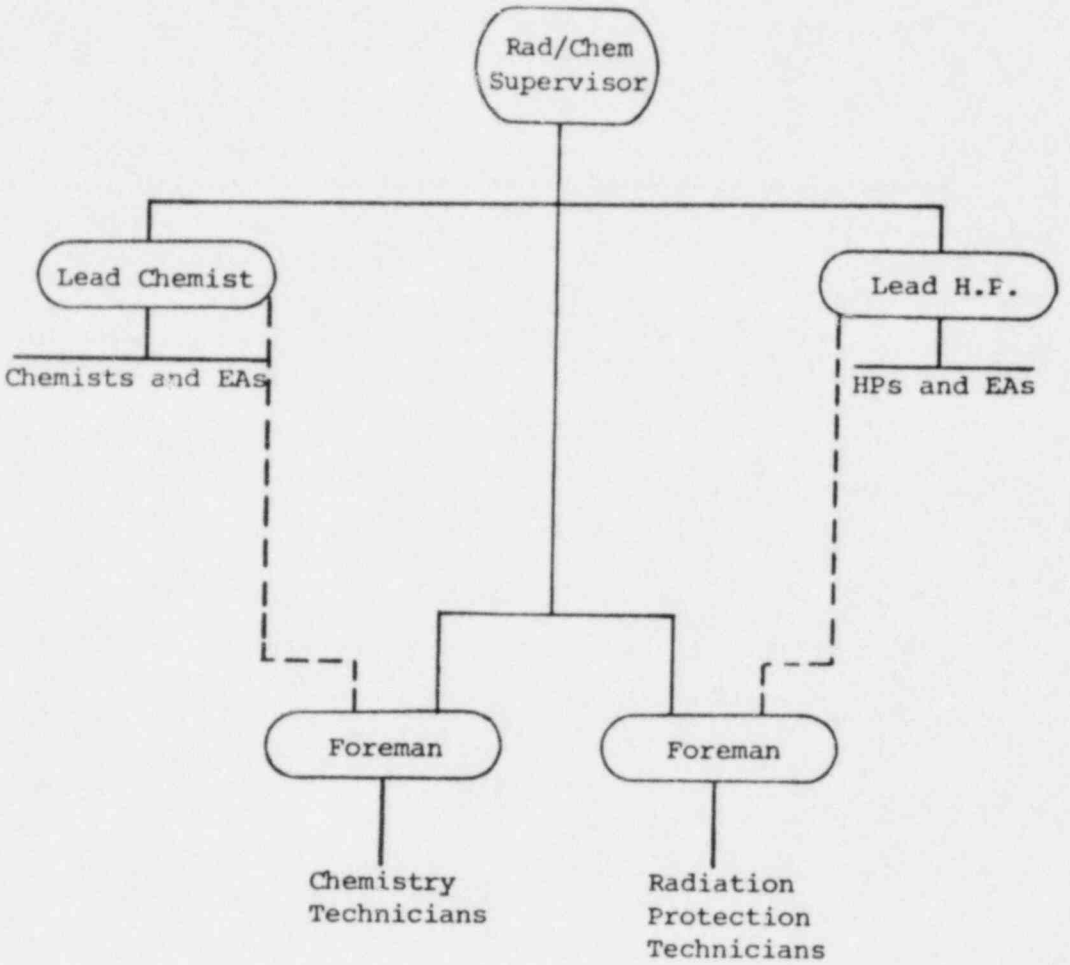

Figure 2. DIVISION OF TECHNICIANS AND FOREMEN IN ONE DEPARTMENT

The apparent weak points of this arrangement are:

1. A decrease in the flexibility of assigning tasks to the technicians, which would be particularly disadvantageous during outages. This decrease in flexibility would add RCTs to the regular plant staff. Based on estimates given at each plant, the RCT ranks would have to be increased 15 to 20%. The estimates ranged from 0 to 30% depending on the plant. More foremen would be needed as well.

2. A great majority of the RCTs said they like the diversity of their job, and for that reason reducing the scope of the job might adversely affect morale. On the other hand, some chemists and foremen interviewed thought that, with the increasing number of tasks to be performed in both chemistry and radiation protection, there would still be sufficient diversity in separate RT and CT positions.

3. A possible disadvantage of this organization is that there would not be enough RCTs among which to divide the radiation exposure. However, except for one year at Quad Cities when the average individual exposure of the Rad/Chem department was approximately 4 rem, we could find little evidence of RCTs approaching the annual limits. There may have been problems with quarterly limits which are not evident in the annual averages. Quarterly limits will be a thing of the past when the proposed revision to 10 CFR Part 20 becomes law.

B. A variation of this organization is to have the chemistry foremen report to the Lead Chemist, and the radiation protection foremen report to the Lead HP. In Figure 2, the dotted lines would be replaced by solid lines and the solid line from the foremen to the Rad/Chem supervisor would be deleted. This arrangement changes the nature of the jobs of Lead Chemists, Lead HPs, and department supervisor, and is a bigger change of the organization than that just outlined.

The following advantages are in addition to those listed above.

3. The department supervisor is freed to devote more time to larger issues.

4. The Lead Chemist and HP positions will provide better training for future department supervisors because they would have more experience with day-to-day plant operation.

The following additional disadvantages accrue to this arrangement.

4. Coordination between the chemistry and radiation protection functions may deteriorate. Some tasks may thereby take longer to perform.

5. Currently there is insufficient experience within the company at the Lead Chemist and Lead HP positions to permit this reorganization to be carried out with CECO personnel. Furthermore, because of an industry-wide shortage of these skills, it is doubtful that the positions could be filled from outside the company.

Separating Chemistry and Radiation Protection Departments

Some utilities have separate chemistry and radiation protection departments in their nuclear generation stations. At CECO stations this would amount to the organization B above except that the Lead Chemist and HP would report to a different supervisor. This organization would have all the advantages and disadvantages of the organization B above. The disadvantage of poorer coordination would be greater because the two functions are joined further up the organizational ladder. The likely outcome of such an organization would be duplication of sample counting equipment and some of the corresponding labor. On the other hand, this organization may provide an additional career path for the chemist.

Changes in Union and Management Roles

In addition to the above organizational changes, consideration was given to changes in management and union roles. For example, proficiency in performing chemical analysis could be improved by assigning these tasks to specialized EAs and taking the tasks out of the current rotation of the RCTs. The consensus among the RCTs we interviewed was that if there was a proficiency problem (and many did not think so) it was the fault of management for not training them properly. Given this belief, it is almost certain that removing such tasks would cause large union-management problems.

Any alternatives involving the removal of jobs from the union presents union-management problems. By taking radiation protection technicians into management, the already difficult problem of maintaining a cooperative atmosphere

between operations and maintenance on the one hand and radiation protection on the other is made worse.

In our opinion, the technical problems involved here are not large enough to warrant serious consideration of altering the union/management interface.

ALTERNATIVE ACTIONS

There are alternatives to making organizational changes and these alternatives should be examined in some detail. All the possible actions to be examined below have a cost associated with them in the form of added manpower costs, new program costs, management time, and administrative costs. These new costs must be compared to the benefits to be gained from the actions taken. These benefits are not necessarily limited to the benefit attendant to solving the target problem. Many of the outlined actions offer the promise of better morale, an improved working relationship between management and the bargaining unit, improved productivity, and better control over the quality of work being performed.

The major headings of the alternative actions are:

- Communications
- Training
- Supervision
- Level Progression

Although these subjects are all interrelated and depend to a greater or lesser extent upon one another, the following discussion will consider each separately for the sake of clarity.

Communications

Under the heading of communications are included the relationships between line supervision and the technicians, and between the professional staff and the technicians.

There is an evident need to improve the flow of information from management personnel (both line and staff) to the technician group. There is also a need to facilitate the flow of information and viewpoints from the technicians

upward through the organization. There is a great deal of variation in the extent and quality of these communication lines among the plants, but without exception these lines could be improved with considerable benefits.

The first instance of a communication problem that came to light concerned the manner in which technical inform... pertaining to changes in the technicians' tasks were promulgated. Many technicians interviewed had a favorite anecdote to illustrate the breakdown in communications. Generally stated, the information is simply not getting through to all the people who need it.

One way to improve communications is a formal and rigorous program of lectures, demonstrations and discussions to ensure that technicians, without exception, receive the up-to-date information they need to do their jobs. Time should be set aside each week during which line supervision or some staff professional presents those changes that are being implemented, contemplated or just being discussed within management, that will affect the technician group. Attendance at these meetings should be recorded and checked against the group roster to ensure that all the technicians receive the information in a timely fashion. This will require that some members of management conduct face-to-face meetings with back shift crews to ensure complete coverage. At the present time, some plants conduct day shift lunch-time meetings in an attempt to disseminate information, but this program does not go far enough to make sure that those individuals on vacation, back shift, or just absent for some reason get the information.

Scheduled meetings should be held even if management has nothing to impart because the RCTs may want to discuss an issue. The meetings can be as brief as a few minutes and there should be a definite time limit. Unresolved issues are continued at the next scheduled meeting. A brief outline of what happened at the meeting should be written for the record with a copy posted on a bulletin board. For the back shifts, regularly scheduled meetings should likewise be held to allow the back shift technicians to take part in the dialog.

The meetings should take place regardless of plant conditions, excepting emergencies. Meetings can be scheduled immediately before or after regularly

scheduled work breaks. More than one session can be scheduled when all technicians cannot be brought together at one time.

In regard to the target problem, new procedures and new techniques for existing chemical analyses can be presented, or problems in old procedures can be reviewed and corrected. Such a program should reduce the incidence of situations where technicians are attempting to perform analyses using outdated procedures, set points, data or techniques.

Another advantage of this sort of program is the improvement in relations between management and the union when the RCTs see a sincere effort being made by management not only to keep them informed, but to listen to their complaints, seek their opinions and consider their judgments.

Over the long run, the RCTs should experience an enhanced feeling of belonging to the company when they perceive that they are being kept informed of actions being contemplated, discussed or planned. At the present time, common complaints among RCTs are that "They (management) never tell us anything," or "We didn't know anything about that equipment until some one carried it into the lab in its shipping crate,", or "Management considers us to be so stupid and inconsequential that they never ask us our opinions or bother to tell us about things that can affect us on the job."

Without getting into a discussion of whether or not these observations are accurate, it is clear that a sincere effort by management to conduct such a formal program of meetings will reduce the incidence of such complaints and improve the attitudes of the technicians. Improved attitudes should result in improved performance.

Training

A second course of action open to the company is to improve training. Much was said about training during the plant interviews, both by management and the RCTs. It is obvious that the company is making an effort to improve RCT training. However, management's dedication to training is not coming across to the RCTs. During our interviews, RCTs described situations where retraining sessions had been cancelled or postponed. This has left the impression that management places little emphasis on retraining.

Another example is the training technicians received on a Ge(Li) gamma-ray multichannel analyzer. There was general agreement among management people at the plants that the technicians had received "adequate" or "good" training on this equipment. One individual emphasized that the training of the RCTs had been "one-on-one". The RCTs agreed that training had taken place, that the instruction had indeed been on an individual basis, but that, in most cases, total instruction was less than one day, in some cases only a few hours. The technicians came away from this instruction knowing which buttons to push in which sequence, but without an understanding of how the equipment operated.

In an increasingly complex and technical area of work, training programs must be designed to teach more than a (sometimes) memorized sequence of mechanical actions. To obtain optimum performance from a person working in a highly technical area, that person should have a fundamental understanding of the forces at work around him. A measuring device should be more than a black box with a switch and a meter. The operator should know enough about his tools to be able to detect and evaluate abnormal situations. It can be convincingly argued that the damage and expense associated with the now-famous accident at Three Mile Island was directly attributable to a lack of operator understanding of how complex pressurized steam-and-water systems behave in abnormal situations. The major consequences of the accident could have been prevented, then, by better operator training.

The components of an adequate training program for RCTs are:

1. A schedule of irreducible time periods dedicated to training, interruptible only for true emergencies.
2. Formal lessons complete with lesson plans, skilled and practiced instructors and rigorous testing.
3. Hands-on instruction.
4. A commitment by management to support the training program with the time, people, and resources, and
5. An individual vested with the responsibility for the program, its quality, and its results.

Supervision

Interviews with technicians and foremen at the plants reveal that the foreman's job is principally one of administration. The foremen make job assignments, review and file records, and negotiate with other groups for radiation protection coverage. Rarely do they supervise work on the job. There are efforts being made at some plants to establish positions and job descriptions for foremen to allow some of them to get out to the work sites for direct supervision. We think that this effort should be expanded and extended to provide better supervision of the technicians on all working shifts.

Related to this subject of supervision is that of discipline. It was mentioned during the interviews at two plants that there are a few individuals who may be responsible for the majority of the chemistry problems because of their poor work habits and negligent attitude. Yet, the report is that they go largely uncorrected. This not only contributes to unreliable chemistry data, but it is also bad for technician morale.

Management should undertake to discipline those individuals whose performance is obviously substandard by enforcing existing company regulations and rules. Continuing to do otherwise removes an incentive from the bulk of the technician group to maintain high personal standards of performance, for an individual who perceives himself as belonging to a group in which the accepted norm is poor loses his pride in his work.

RCT Level Progression

In our interviews, both management personnel and RCTs said that progressive pay and experience levels for RCTs would be beneficial. Some of the RCTs indicated that progressive levels would have given them something to look forward to in their careers. Management personnel, particularly in chemistry, said that RCT progression levels would permit identification of proficient RCTs to be responsible for the more sophisticated analyses. We think technician levels would be a means for upgrading overall RCT competence.

The B level RCT, after the initial training and testing period, would be allowed to perform alone all tasks except certain more demanding ones, to

be designated as such by the Rad/Chem supervisor. Attainment of the A level would depend on passing proficiency tests and demonstrating the ability to perform the more demanding tasks, in addition to being at the B level for two years.

RECOMMENDATIONS

Organization

We recommend that the current organization be maintained. The organization has the flexibility to accomodate some change, and it is changing in favor of more supervision in the chemistry area. The consensus at the plants appears to be against major organizational change. For this reason, the disruption which accompanies any reorganization would be amplified. In our view, the advantages for major organizational change do not sufficiently outweigh the disadvantages.

There are other courses of action to improve performance. Four have been discussed above. We wish to stress the following three courses of action. They are listed in descending order of importance with the first two being considered to have almost equal importance.

Supervision

We recommend that more extensive use be made of the Rad/Chem foremen. The foremen's administrative and clerical duties should be assigned to EAs and clerks, freeing the foremen to provide closer supervision of the RCTs. There should be a foreman on all shifts. Additional foremen may be needed to provide adequate supervision. One foreman should not supervise more than about 10 RCTs.

Level Progression

We recommend that B and A levels be established for the RCTs. The progression between levels should be based on competence, as demonstrated by tests and daily performance, in addition to seniority.

Communications

We recommend that a foreman be assigned the responsibility for organizing and running regularly scheduled meetings of the Rad/Chem department. These meetings would be used to improve communications and would include discussions and demonstrations on items of current interest.

The fact that the recommendation concerning training was not included does not mean we consider it less important. Training is important and contributes to the success of each of the other three recommendations.