

RESPIRATOR RESEARCH - WHERE IT NEEDS TO GO

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The theme for our panel, "Respirator Research, Where it Needs to Go," asks a question which has a simple answer. The purpose of any research in this area is to better protect a worker's health and life. As many of you know, I am a history buff on respirator protection. Thus, I would like to take a brief look at where we have come from before looking at where we are going, to see if we are indeed heading toward better protecting a worker's health and life.

With the possible exception of powered air purifying respirators, every type of respirator we use today was invented and used in the 19th century, including all of the air purifying and supplied-air devices we still depend on. We have improved the technology in most areas, such as better means of compressing and regulating air supplies, but the basic types are still the same.

Then in 1919, in the United States, the Bureau of Mines began approving respirators, according to test schedules that were developed with the then available technology. When NIOSH took over the testing and approval of respirators in 1972, only minor changes were made in approval schedules. For example, supplied-air respirators were first approved in 1932, under Schedule 19, which had revisions in 1937 and 1955. In 1972, this Schedule became Subpart J, with the only changes made being that better air quality was required and type C respirators were restricted from IDLH atmosphere. Basically, we are using supplied-air respirators approved with tests based on 25-50 year old technology. Respirator research, before the 1960's, was more or less limited to the manufacturers, The Bureau of Mines, and the military, and was centered on product development. In the 1960's Ed Hyatt at Los Alamos, Bill Burgess at Harvard, and a few others, began investigating how well a respirator protected an individual, resulting in the fitting problem questions, the protection factor concepts, and quantitatively defining technical problems with the respirators themselves.

The 1970's were highlighted by the formation of NIOSH and OSHA, which directly or indirectly led to two characteristics of the past decade in regard to respiratory protection. The first characteristic was an increased interest in respirator protection, increased funding for research, and increased concern over problems in respirator use.

The second, but negative, characteristic of the 70's was the rise of adversary roles between the various organizations with an interest in respiratory protection. The informal exchange of information at meetings between the Bureau of Mines and the manufacturers has been replaced by formal confrontations with legal representation often present. OSHA and NIOSH have their own interagency disagreements. Unions and management have their disagreements, often leading to law suits over common sense things such as beards. Instead of a uniform respirator standard, OSHA has different respirators regulations in each health standard promulgated. Part 11 use requirements and OSHA regulations now look like they came from separate countries, certainly not from the same government. The various states also have vastly different regulations. Product liability suits have greatly increased, the joint AIHA-ACGIH Respirator Committee split into separate committees, NIOSH withdrew membership from national standard committees on respiratory protection, and many of the respirator regulations have been or are being challenged in the courts by manufacturers and industry.

While these adversary **positions** and legal wranglings may be quite lucrative to respirator consultants and the legal **profession**, they **don't** do much for protecting **worker's** life and health. **Therefore**, my first recommendation for the future has to be for efforts made in cooperation between all concerned in respiratory protection. I don't know anyone knowledgeable in the technical aspects of respiratory **protection**, from government agencies to industry to **manufacturers**, who **isn't** concerned first and foremost in worker protection. While not all of our problems have simplistic answers, several do or don't enhance a **worker's** protection, and common sense should prevail in those cases.

To further this aim, we need a mechanism to find out who is doing what. Our professional societies cover too many areas to do this effectively in a once-a-year conference, considering everything else that is going on. I commend **NIOSH** for organizing this conference, as I think it is a very good step forward, particularly with the international aspects. I also hope that the word, "**First**" in the title indicated future workshops. In addition, I also believe that with the number of people involved in respiratory protection, we should organize an International Respirator Association for a better exchange of information.

Another recommendation is that those organizations with research funds, those doing research, and those setting regulations need much broader based advisory committees than they presently have, with representation from all segments with an interest in respirators. The broad-based steering committees could greatly reduce conflicts and act as communication channels between the various organizations.

While there are still many technical problems to solve in respiratory protection, I believe we are slipping further behind in some of the practical aspects. Those of us involved with respiratory protection research are generally technical or **scientific** by nature and have become quite provincial in our outlook. By that I mean we keep trying to improve the existing respirator types themselves, but don't look beyond them. Despite OSHA, respirators are still being badly misused or not used when needed, due to a lack of effective training or lack of knowledge about chronic diseases by the user or employer. Traditional biases still exist, such as the "being a sissy" attitude for wearing a respirator, or workers preferring comfort to wearing a respirator and taking a chance (using the same rationale a smoker **does**). Therefore, I would like to see some R & D funds diverted to some specialties for assistance. **Psychologists**, for example, would perhaps be much better in preparing training manuals and working with user groups than we are. They might find out why hard hats are very acceptable, but respirators aren't. Physiologists are needed, not just to measure stresses on existing respirator types, but to take a positive role in assisting in design of new devices that will improve comfort and effectiveness. Physiologists should also be active in helping solve fitting problems.

I mentioned earlier that **present-day** types all date back to the 19th century. I would like to see some research funds diverted to a "think tank" to investigate the possibility of new approaches. Most of us are probably too devoted to **present-day** types to imagine new concepts, but some ingenious outsiders without being quite so restricted with tunnel vision, may come up with more acceptable approaches for users that are also technically feasible now.

There are still many areas of technical research on existing devices that need investigation. We have heard many of these from the other panelist and from the various shopping lists that are around. Personally, I am still unhappy with existing fitting methods for many reasons and would certainly endorse Dr. Froines' suggestion on research for in-mask sensing devices. Special uses such as Mary-Win O'Brien mentioned, the fire service, and others, need R & D. However, I would like to see some semblance of order in regard to priorities made.

Test and approval schedules in the U.S. are woefully out of date. Manufacturers design old-style devices to meet the old requirements in these schedules, but our technology has moved ahead sufficiently to make improvements in these 25-50 year old test procedures. New schedules and additions to existing schedules are needed and information is available now. Examples are the procedures that Los Alamos developed for testing supplied-air suits, or methods Livermore uses for testing fire fighters' SCBA, or for measuring chemical cartridge break-through times. Some of these test methods could be used now. Others may need refinement. Establishment of broad-based advisory committees or requests to standards-setting organizations to formalize some of these methods into formal approval procedures would reduce NIOSH efforts required, give the procedures better credence with broad-based support and less challenge, if any, in a public hearing, and utilize talents that are available in the private sector. Additional R & D in perfecting some of the new test methods may be necessary and can be accomplished according to set priorities and funds as available. In addition, standards and test methods from different countries should be thoroughly reviewed and applicable ones adopted for updating procedures in those countries with less stringent requirements, providing of course, that they will better protect the user.

In conclusion, then, I would summarize my general recommendations for respirator research for the 1980's as follows:

1. Reverse the adversary nature of the '70's.
2. Improve communications between organizations and countries, such as this workshop is doing.
3. Encourage the elimination of inertia by some organizations and, unrealistic goals of others.
4. Collect and analyze all R & D of the past decade and use what is immediately applicable in Part 11 and refine what is incomplete, by priority.
5. Set priorities on where R & D efforts must go through a broad-based cooperative effort.
6. Coordinate what is being done and I suggest NIOSH as this pivot.
7. And finally, enlist the help of others outside of our technical areas or expertise to improve the practical side of respirator use and hopefully introduce new and better ways to provide respiratory protection.