RECOMMENDATIONS CONCERNING THE REDUCTION IN THE USE OF RESPIRATORS

Respiratory protection is often worn when performing radiological work to prevent the inhalation of airborne radioactive particulate. The DOE Radiological Control Manual, DOE/EH-0256T, emphasizes in Art 316 that:

1. "Engineering controls, including containment of radioactive material at the source wherever practicable, should be the primary method of minimizing airborne radioactivity and internal exposure to workers".

2. "Administrative controls, including access restrictions and the use of specific work practices designed to minimize airborne contamination, should be used as the secondary method to minimize worker internal exposure."

3. "When engineering and administrative controls have been applied and the potential for airborne radioactivity still exists, respiratory protection should be used to limit internal exposures. Use of respiratory..."

4. "The selection of respiratory protection equipment should include consideration of worker safety, comfort and efficiency. The use of positive pressure respiratory protection devices is recommended wherever practical to alleviate fatigue and increase comfort."

Assessments of many of the work practices used in the past have shown that often times respirators are worn when there was little or no attempt to use engineered controls or use work practices that would reduce or eliminate the presence of airborne particulate. Often times respirators would be specified simply to ensure personnel did not contaminate their face by touching it with contaminated gloves. After many years of wearing respiratory equipment many personnel believe it would be difficult to change the workers' mind-set that wearing a respirator ensures you will not take any contamination home with you after work. Many workers insist it is their right to wear respiratory protection.

Studies performed on workers wearing respirators have shown the following results:

a. There is a 25% loss of worker efficiency when wearing a respirator.[1]

b. An average loss of worker efficiency when wearing a respirator was about 20% for most activities and a 40% reduction when wearing the respirator in addition to waterproof outer garments.[2] This added protective equipment effected personnel in two ways:

(1) Alteration of the physical relationship between the workers and their environment - Workers move differently, almost like robots, when wearing respirators.

(2) Deterioration of the physiological condition of the workers - the consequences from conditions which effect the worker's health may be more adverse than being exposed to the radiological conditions.

c. Additional stress on respirator users' was related to eight factors:[3]

(1) Increased breathing resistance
(2) Increased dead air space (worker has to breathe in more oxygen-rich air to replace oxygen deficient air trapped in the mask
(3) Additional weight
(4) Ergonomic concerns (worker enlarges, balance is effected and simple tasks are more difficult)
(5) Restricted vision
(6) Restricted communications
(7) Psychological distress (anxiety level increases)
(8) Physical discomfort

In order to reach the goal of reducing the number of times respirators are used, companies must first increase their ability to use engineered controls to remove any airborne particulate before it reaches the worker's breathing zone. Actions necessary to accomplish this include:

a. Increase the use of HEPA filtered "localized" ventilation to draw airborne particulate away from the worker.

b. Consider purchasing "shrouded" tooling that has an adapter to connect a vacuum cleaner hose directly to the tool.

c. Increase the use of glove bags and teach the workers how to perform work in glove bags.

d. Evaluate spraying work areas with strippable latex decon paint or other "fixants" before starting work to fix high levels of contamination in order to reduce the risks of spreading contamination and possibly reducing the protective clothing requirements for the radioactive work.

d. Revise training to emphasize how to prevent airborne contamination, i.e., use of fixant, "spritzing" area with water, laying damp cloths in the work area, frequent wipedowns of contaminated surfaces, how to position ventilation, etc.

e. Revise work procedures to include detailed radiological control requirements written in the work steps.

Radiological controls personnel can increase the air sampling in the worker's breathing zone to assure the actions taken are sufficient to prove that no airborne contamination is being created during work. If the respiratory equipment has been specified simply to keep the worker from touching his/her face, clear face shields can be worn instead.

If a facility has a "certified" breathing air system or is willing to set up a compressor to provide breathing air, personnel can use air-fed hoods instead of respirators on many of those jobs that require respiratory protection, as long as the length of hose will not restrict the worker's movements. Air-fed hoods are available through several vendors and are cheaper than procuring and laundering respirators. The air-fed hood encloses the worker's head and an inner flap can be tucked inside the protective clothing. The air entering the hood then passes down through the protective clothing and cools the worker's body. A vortex breathing air cooler[4] can be added which will cool the incoming breathing air of up to four workers by up to 50 degrees fahrenheit. This would not only improve the worker's comfort but also eliminates heat stress problems. The air fed hood is popular with workers with long hair, who aren't clean shaven, or need to wear their own eye glasses.

Discussion with radiological control personnel at a commercial nuclear power plant shows they have practically eliminated the use of respirators during maintenance shutdowns. They have expanded the use of engineering controls and established better work practices that reduce the possibility any contamination will become airborne. Workers were briefed in advance on the reasons for reducing the use of respirators and there has been an overwhelming response in favor of using the engineered controls and applying good work practices.

If a company makes the choice to expand the use of engineered controls, modify their training and improve their work procedures they can reduce the number of times workers have to wear respiratory protection. This will involve the commitment of money up front to repair, replace or purchase the proper engineered controls. Once the radiological work can be performed faster and safer without respirators, the companies should recover the money invested.

Convincing the work force they will no longer be required to wear respirators to perform certain jobs will take some effort.[5] The company will need to approach the workers in a way they do not become alienated and willingly accept the need for change. These changes should first be discussed with employee unions or work leaders in order to obtain input on how to disseminate the information to the involved workers. Management and labor will have to work together to plan and analyze the following points:

a. How is the job going to be performed now as opposed to the past?

b. Who should inform the workers of the change?

c. How will this change effect current training and safety policies?

d. How and when the information should be presented?

Because organizations and companies differ in many ways, how this information is presented may vary. However the general approach should be basically the same-Improve the working conditions by reducing the possibility of airborne contamination by using engineering and administrative controls. Train the workforce on methods to use to eliminate airborne contamination. Take extensive surveys in the worker's breathing zone and gradually drop the respiratory requirements when you can prove that no airborne contamination has been detected.

[1] "Respiratory Protection and Worker Efficiency", G. S. Kephart; Radiation Protection Management; Vol II, No. 4, July/Aug 1994

[2] "The effects of Respiratory Protection on Worker Efficiency", R. Lee; Radiation Protection Management, Vol II, No. 5, Sept/Oct 1994

[3] "Combating the Stresses of Respirator Use", E. F. Gee and J. P. Hale; Radiation Protection Management, Vol 6, No. 4, 1989

[4] Automatic Vortex Breathing Air Cooler can be purchased from Innovative Systems, Bremerton, Wa (360) 698-9418

[5] "Workers' Perception of Respirator Use and Internal Dose - A Humanist's Perspective", L. M. Dooley and F. L. Barresi; Radiation Protection Management, Vol II, No. 6, Nov/Dec 1994

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