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WORKING PROTECTION FACTOR STUDIES ON
SINGLE USE RESPIRATORS FOR DUSTS

Background information and the procedure for field studies on the effectiveness of single use respirators for asbestos containing dusts are attached for your information. Studies will be done during the last quarter of 1982.

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366-5277

SWD/dar
Attachment

DU 030426

DUP 0913761

WORKING PROTECTION FACTOR STUDIES
SINGLE USE RESPIRATORS FOR DUSTS

Background

- On August 25, 1980 NIOSH issued a "Notice to All Respirator Manufacturers" which was subsequently published in the December 1980 issue of the AIHA Journal (attached). This notice questioned the effectiveness of air purifying dust fume and mist respirators (particularly single use) for asbestos and other carcinogenic substances. Two concerns were raised:
 1. The ability of the filter media to effectively remove the particulate.
 2. The amount of leakage around the facepiece to face seal.
- In this letter they stated, "It is not our position that single use dust respirators will provide adequate protection against the cancer causing potential of asbestos." This proclamation raised serious questions on the status of current NIOSH approvals for these respirators for asbestos as a "fibrosis producing dust."

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- Subsequent to this, one manufacturer of single use respirators, the Norton Company, issued a notice to users of their respirators on May 22, 1981, which stated that their single use dust respirator should not be used for protection against asbestos dust but that an elastomeric half mask or full facepiece respirator with high efficiency cartridges should be used (attached).
- S. W. Dixon contacted 3M, American Optical and MSA about their respirators and summarized findings in a November 5, 1981 letter (attached). No other manufacturers followed Norton's example but continue to recommend any respirator with current NIOSH approvals for asbestos. Though no filtering efficiency tests have been run for asbestos, they feel that it should be easier to filter asbestos dusts, consisting of rod shaped particulates, than the 0.4-0.6 μ m silica dust which NIOSH had used to test their respirators.
- Little data is available on facepiece to face seal leakage for disposable respirators.
 1. A study done using a sodium chloride aerosol of 0.7 μ m mass median diameter showed protection

factors of 2 to 10 (mean of 5) for the 3M-8710
and 5 to 100 (mean of 20) for the AO-R-1050.¹

2. A working protection factor study on carbon
setters in the aluminum industry for aluminum
oxide, fluoride and carbon particulates showed
protection factors of 2-1041 (mean of 16) for
the 3M-9010.²

3. No studies have been done on asbestos dust.

- Though the performance of the filter matrix against
long, thin asbestos rods would logically be as good
as for the small particulates studied in the above
studies, no experimental data is available to demonstrate
effectiveness.
- A protection factor of five has been assigned to single
use dust respirators, based on the studies above. Thus,
protection would be afforded for up to 10 fibers/cc for
chrysotile and 2.5 fibers/cc for amosite, based on their
1982 TLV's.
- Protection factors of greater than 5 are likely to be
obtained by persons who are fit tested and properly trained

in use of disposable respirators as required by OSHA standards and Du Pont guidelines. This would particularly be true for better fitting single use respirators such as the AO-R-1050 and 3M-9920.

- Working protection factor studies will be done to determine WPF's for single use respirators for a good respirator program and to demonstrate effectiveness in response to NIOSH's notice.
- As a basis for comparison, studies to determine the WPF's for elastomeric half face air purifying respirators will be done to provide a basis for an alternate recommendation, should disposables prove ineffective.
- The objective of this work is to ascertain the types of respiratory protection which are effective against asbestos containing dust, to confirm that Du Pont practices are consistent with preventing occupational illness.
- Cost, maintenance and practical advantages of single use respirators favor their use if effective.

Procedure

- Train and fit test wearers using NPCA and 3M-F10 methods.
- Sample inside and outside of probed respirators during use (AO-1050, 3M-8710, 3M-9920, MSA Comfo II).
- Use 0.8 μ m cellulose ester filters at a 2 Lpm sample rate. Analyze for asbestos fibers using the standard phase contrast method. Special cassettes from Glass Rock will be used to obtain uniform sample deposition for closed face cassette sampling (confirmed by laboratory studies).
- Check three pairs of inside and outside filters for small fibers ($< 0.5 \mu$ m diameter) by transmission electron microscopy.
- Calculate WPF as - $\frac{\text{fiber concentration outside}}{\text{fiber concentration inside}}$
- Define WPF distribution and determine a safe assigned protection factor.
- Study sites: Glenolden (insulation removal), Corpus Christi (caustic/chlorine cell work) and Kingston (insulation removal).

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- Sample size: minimum of 3 WPF for each of 3 test subjects for each respirator, additional WPF for best candidates .
- Based on the WPF study results and a review of Du Pont site airborne asbestos levels, an AEL may be needed to resolve discrepancies in limits for asbestos by OSHA and ACGIH.

References

1. Lowry, P. L., Hesch, P. R. and W. H. Revoir, "Performance of Single Use Respirators," AIHA Journal, 38(9):462-467 (1977).
2. Fergin, G. S., "Respirator Evaluation for Carbon Setters," presented at American Industrial Hygiene Conference, Cincinnati, Ohio, June 9, 1982.

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