

# FROM BUST TO DUST: PROTECTIVE MASKS ON TRIAL

A stringent new proposal to limit asbestos in the workplace raises thorny questions of protection. Are masks enough?

By DEBORAH FRANKLIN

A defective brassiere cup came off a Minneapolis assembly line in 1972 and gave rise to a burgeoning industry. Someone with a bright idea at 3M Corporation clipped an elastic band to the fiber cup and produced the first disposable dust mask which, with some modifications, now claims the largest share of the multimillion dollar market for industrial respirators, designed to protect two million of the nation's workers from noxious inhalable particles.

Although valued as marvels of engineering ingenuity, the bra cup progeny have come under heavy scrutiny in recent months from labor unions, industrial hygienists and several congressional agencies. The central issue: Should such fiber cups, or any other form of protective mask, be approved as a way for industry to meet the more stringent asbestos limits proposed by the Occupational Safety and Health Administration (OSHA) (SN: 11/12/83, p. 311)? Or should efforts focus instead on reducing the actual levels of asbestos in the workplace?

Currently, OSHA requires employers to make sure that workers face no more than 2 fibers of asbestos for every cubic centimeter of air (2f/cc). The more stringent limits currently under consideration

are 0.5f/cc, 0.2f/cc and 0.1f/cc. Slivers of the flame-retardant mineral are known to lodge in the lungs and linings of the chests and abdominal tracts of exposed workers, leading to cancer as well as other diseases. OSHA estimates that by reducing permitted levels to even 0.5f/cc, the number of cancer deaths related to 20 years of asbestos exposure in the workplace could be reduced from the current 4,392 per 100,000 male workers to 1,123 per 100,000. At a limit of 0.1f/cc, the estimate of cancer deaths drops to 226.

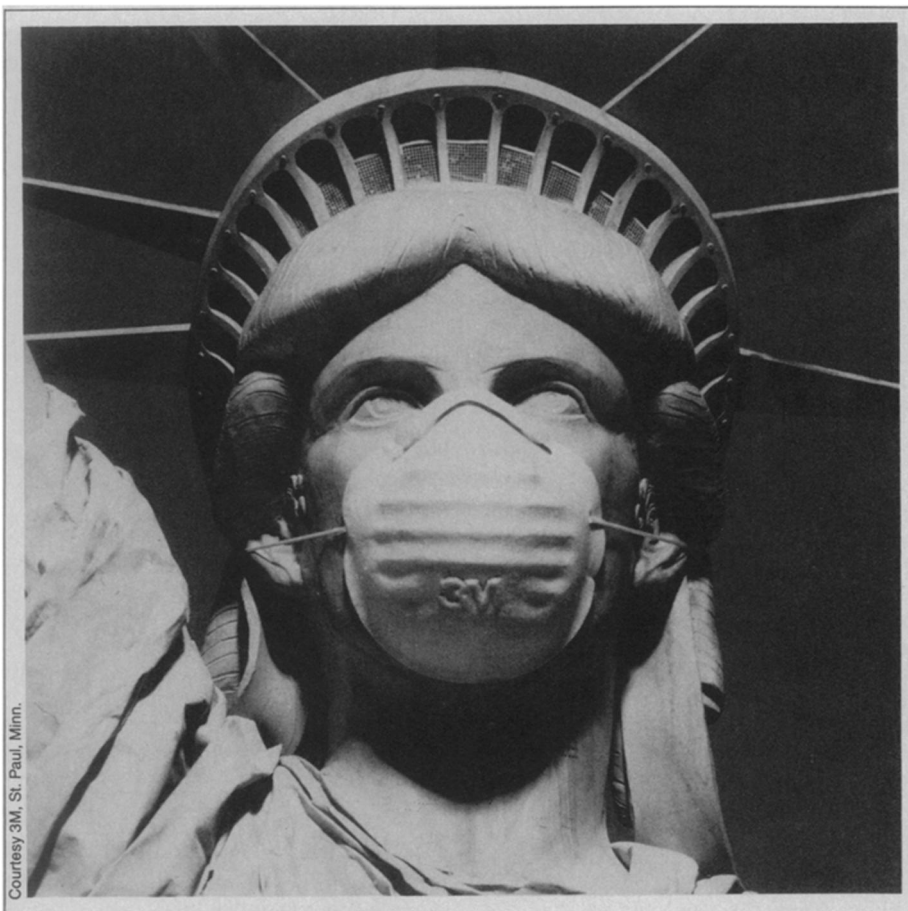
The immediate concern is protecting the

its use in recent years.

In the 13 years since its inception, OSHA has ruled industry with an "engineering first" philosophy: Try to remove hazards from the workplace by modifying the environment. For example, concrete pipes containing asbestos can be cut with saws attached to local exhaust systems that suck up the resulting dust before it disperses in the air. Only when such measures haven't worked have employers been permitted to use some sort of protective device for the individual worker. The rationale for such priorities, Schneider says, arose because

more than 375,000 U.S. workers exposed to asbestos. But many critics see the asbestos issue as representative of a major philosophical switch within OSHA. The proposal, they say, is the first attempt by a regulation-shy Reagan administration to shift responsibility for safety in the workplace from employers to workers — a shift labor unions don't like.

"I think the AFL-CIO and OSHA have drawn lines in the dirt over this issue," says Scott Schneider, an industrial hygienist with the Carpenter's Union. Members of his union are frequently exposed to asbestos at work, despite attempts by regulators to minimize



Courtesy 3M, St. Paul, Minn.

even the best protective equipment, scrupulously cleaned and replaced as needed, tends to leak in the wear and tear of the workplace. A worker's sweat, facial hair and movements all can alter a face mask's fit and hence effectiveness. In addition, researchers and health officials agree, the biggest reason respirators don't work is that workers don't wear them.

Why not? Morton Corn, who served as Assistant Secretary of Labor in charge of the National Institute of Occupational Safety and Health (NIOSH) under Gerald Ford and is now at Johns Hopkins University in Baltimore, says the main problem is most masks' bulky design, which hasn't taken advantage of current technology. "Until recently, most of the respirators on the market were 1940 respirators," Corn says. The heavy rubber face masks cover the nose, mouth and sometimes the eyes, and contain removable cartridge filters specific to different types of contaminants. They were first designed for use in World War II to protect soldiers from chemical warfare. Under the best circumstances, Corn says, such respirators provide a protection factor of about ten. (The protection factor is defined as the ratio of the

exposure limits that has been proposed. But, they report in a statement published in the April 10 FEDERAL REGISTER, slightly more sophisticated masks "may provide acceptable protection when an employer establishes stringent procedures concerning the use of respirators and then carefully supervises their implementation on a continuous basis."

A research team from the Congressional Office of Technology Assessment (OTA), enlisted to review the issue, is not so sanguine. As part of a report soon to be published in "Health and Safety Controls in the Workplace," OTA staffers analyzed the literature on personal protective equipment and concluded that "the effectiveness of many of these devices, especially under conditions of use in the workplace, has not been demonstrated."

"Instead," they say, "many devices have been tested only in laboratory situations that do not duplicate and may not even approach workplace conditions. The overall impression is that test results tend to exaggerate the effectiveness of personal protective devices."

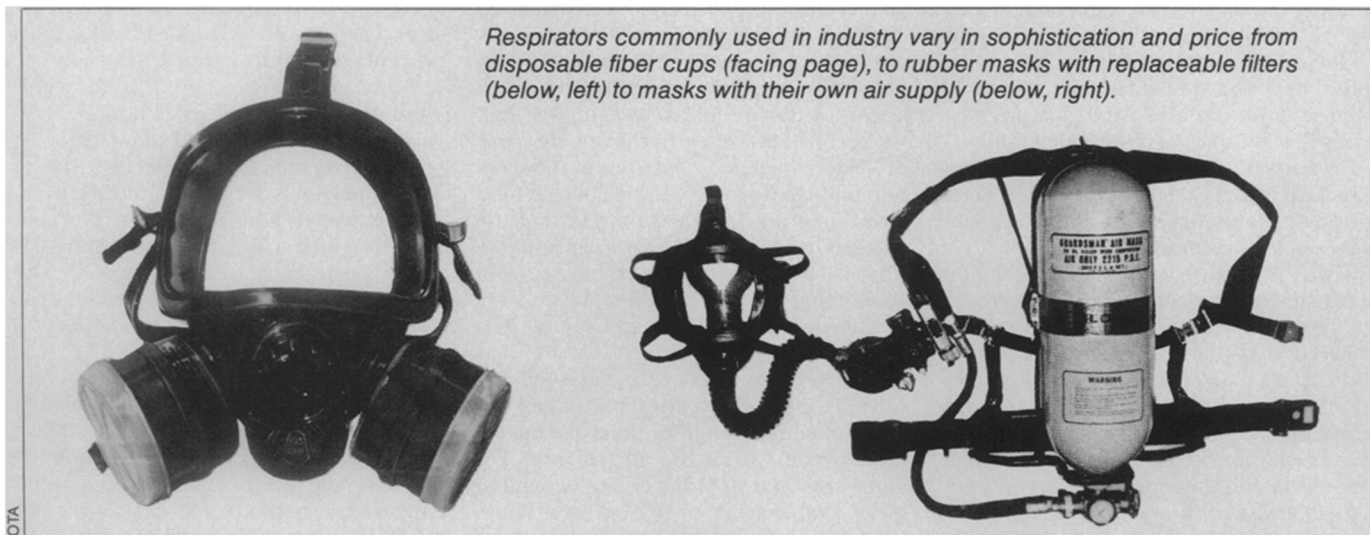
Donald Wilmes, an industrial engineer and researcher at 3M, agrees that not

particles begin to break through the mask's seal are not used, he says. Even switching the test contaminant from silica to one with smaller particles, Wilmes says, would be more accurate in extrapolating to the contaminants most workers now face.

Respirators certified for deflection of paint spray rely primarily on 1950 lacquers that aren't even on the market anymore and have a very different composition from those sold today. In addition, from among the "tens of thousands" of organic chemicals now used in industry, only one — carbon tetrachloride — represents the whole class in the testing lab, Wilmes says.

Wilmes places most of the blame for the creeping pace of regulatory reform at NIOSH on inadequate funding — a total budget of roughly \$55-65 million each year must support research to develop criteria that OSHA can use to construct health and safety standards, to evaluate health hazards, and to develop educational programs to get the word out once such hazards have been identified throughout industry.

One solution to the problem would be to shift responsibility for testing the devices



*Respirators commonly used in industry vary in sophistication and price from disposable fiber cups (facing page), to rubber masks with replaceable filters (below, left) to masks with their own air supply (below, right).*

concentration of contaminant outside the mask to the concentration inside.) The protection factor for the more comfortable disposable masks is a subject of debate, though most researchers place the value somewhere between 5 and 10. A third class of mask, which uses a pump to force purified air through a hood or helmet covering the worker's face, is estimated to be 10 to 100 times more protective than the disposable mask. The disposables cost less than a dollar each, the hoods that rely on motorized pumps, about \$100. Respirators that include a portable supply of pure air can cost more than \$500.

OSHA officials say they recognize many of the shortcomings of respirators that have been pointed out in the past. Indeed, the disposable dust masks may not be adequate, they say, to reduce a worker's exposure to the tenfold decrease in asbestos

enough research has been done to document the effectiveness of each type of respirator. "But whether the tests done in the laboratory mirror workplace conditions is always going to be subject to question," he says. More damaging than the lab/workplace discrepancy, Wilmes says, are the outdated certification standards used by NIOSH for new respirators.

"Those regulations are atrocious," he told SCIENCE NEWS. "They haven't changed in 12 years." For example, one test of a dust mask's ability to filter out particles involves placing a masked mannequin for 90 minutes in a room clouded with large flecks of silica dust. A pump within the mannequin sucks air through the mask to simulate breathing. After the test, researchers weigh the dust that collects in a filter behind the mask. Instruments that today can measure exactly when the first

to industry, but Corn and union representatives have questioned the fox's ability to keep the henhouse safe. Suggestions that third party organizations be encouraged to take over the task have met similar criticism, stemming from concern that manufacturers could unduly influence such organizations.

OSHA estimates that the total industry costs for using respirators to meet the most stringent asbestos standards under consideration (0.1 fiber/cc) would be about \$610 million the first year, and \$547 million each year thereafter. Corn thinks the costs of making certain that the right respirators are used in ways that provide maximum protection could be higher.

"Many of us wonder," Corn says, "if this might not be a more expensive form of protection than engineering the environment." □