

A.

*Rejected by Linda
Schneider*

Elinore S. Thomas

Occupational Health Monitor Article

PLAINTIFF'S
EXHIBIT
AL-1141

Man-made mineral fibers (MMMFs) will play a part in Alcoa's future in advanced materials production. Under some circumstances, they may be harmful to workers exposed to them. That was the message made clear at a recent meeting of Alcoa physicians in Pittsburgh.

Alcoa intends to become a premier producer of advanced engineered materials, components and systems. Through research and development at Alcoa Laboratories, we are establishing a technological base for new businesses, building upon our historic strengths in manufacturing and aluminum technologies. We're moving into production of other metals, ceramics and polymers, and various composites made possible by combinations of these materials. In some of the final products, MMMFs will be used.

Man-made mineral fibers are relatively new. Until roughly the 1940s, according to Dr. Morton Corn of Johns Hopkins University, we had no experience in dealing with them. He and Dr. Philip Enterline, of the University of Pittsburgh, addressed the physicians and others concerned with occupational health issues, reviewing the emerging evidence of risk associated with producing MMMFs.

These fibrous materials are ubiquitous, Dr. Corn said, and we don't even know yet the full extent of their use. Most of them

were developed as substitute materials for asbestos, when it was found to be carcinogenic. Now the replacement materials are suspect.

Several animal studies were conducted in the 1970s, for example, to determine whether fiber glass was causing pulmonary tumors and/or fibrosis. According to Dr. Corn, the studies did not demonstrate adverse health effects and a false sense of confidence grew about the safety of using this material. More recently, concern has grown about the toxicity of glass fibers. And scientific concern about all MMMFs has intensified.

A man-made mineral fiber is produced in a laboratory or factory -- as opposed to being mined as asbestos is. The potentially harmful fiber is defined as being three times longer than it is wide. The relationship between length and diameter of fiber particles is extremely important, according to Dr. Corn and Dr. Enterline. Animal studies have shown that the longer and smaller in diameter the fibers are, the greater the number of tumors "harvested." Durability is also important. Durable fibers are able to remain in our bodies a long time and harm our lungs.

In the mid-1970s, Dr. Enterline undertook a mortality study that investigated 17 U.S. old, large, and dirty plants where fibrous materials were produced. That study included 17,000 white male workers who had been exposed to respirable fibers. At roughly the same time, a European study was investigating 13 plants in seven countries where 21,000 workers were employed in producing MMMFs.

Both were concerned with such fibrous materials as mineral wool (rock or slag wool), glass wool (fiber glass) and glass filaments (used in textiles) and their effects on the health of laboratory animals and production workers. A third but much smaller study was also done in Canada.

The findings were disturbing. They concluded that MMMFs frequently cause pulmonary irritations, and oftentimes malignancies. All three studies demonstrated a higher incidence of lung cancer among workers than would be expected, based on standardized mortality ratios. The Europeans categorically decided that exposure to respirable man-made mineral fibers causes lung cancer, Dr. Enterline said. U. S. industry, he believes, has not yet reached such a decisive conclusion.

The jury is still out in determining the full extent of risk from MMMFs alone. Other factors, such as smoking in conjunction with exposure, need additional investigation. From studies conducted so far, Dr. Enterline said, there does seem to be a "multiplicative" effect from smoking. That is, smoking is believed to multiply adverse effects from exposure to MMMFs. And perhaps particular environmental conditions also play a role.

To Alcoa the message should be clear. Care must be taken to ensure that Alcoa's environment is safe for employees as we move increasingly into the production and use of all man-made fibers. We are now producing fibers to reinforce ceramic parts. Though the health data are sparse for ceramic fibers, there is concern

about their toxicity. Fibers are effective in reinforcing molten aluminum and polymers as well. We're producing ARALL, which is a laminate formed by bonding aluminum sheet and polymer fibers to produce a material with superior properties in combination. Researchers at Alcoa Laboratories are experimenting with production of single crystal silicon carbide fibers.

Ceramic refractory materials, which we buy, are used to insulate our ingot furnaces. They also are under suspicion because of their ceramic fiber content. In most user applications, such as refractory materials, there appears to be no danger unless or until the material is crushed or ground up and small particles become airborne. Then they can enter the chest and lungs and possibly cause respiratory disease.

Many of the new fibrous materials are magnificent, Dr. Corn concluded, but the question is, can we use them without danger. Legislation regulating their production and use probably will be enacted in the next few years, he said.

Industry has time to gather the information it needs and to put into place appropriate engineering controls or other strategies to manage exposures...in order to minimize, or ideally eliminate, risk from the production and use of man-made mineral fibers.

B.

Elinore S. Thomas

Occupational Health Monitor Article

Man-made mineral fibers (MMMFs) will play a part in Alcoa's future in advanced materials production. Under some circumstances, they could be harmful to workers exposed to them. That was the message made clear at a recent meeting of Alcoa physicians in Pittsburgh. It was made equally clear that Alcoa is committed to protecting employees as the company moves into new materials development. ✓

Alcoa intends to become a premier producer of advanced engineered materials, components and systems. Through research and development at Alcoa Laboratories, we are establishing a technological base for new businesses, building upon our historic strengths in manufacturing and aluminum technologies. We're moving into production of other metals, ceramics and polymers, and various composites made possible by combinations of these materials. In some of the final products, MMMFs will be used.

Man-made mineral fibers are relatively new. Until roughly the 1940s, according to Dr. Morton Corn of Johns Hopkins University, we had no experience in dealing with them. Both he and Dr. Philip Enterline, of the University of Pittsburgh, addressed the physicians and others concerned with occupational health issues on the possible risks associated with MMMFs.

These fibrous materials are ubiquitous, Dr. Corn said, and we don't yet know the full extent of their use. Most of them were developed as substitute materials for asbestos, when it was found to be carcinogenic. Now the replacement materials are being scrutinized.

Some animal studies were conducted in the 1970s, Dr. Corn said, to determine whether fiber glass was causing pulmonary tumors and/or fibrosis. The studies did not demonstrate adverse health effects. But concern grew about its toxicity. And scientific concern is growing about other fibrous materials, pointing to the need to gather more concrete data.

A man-made mineral fiber is produced in a laboratory or factory -- as opposed to being mined as asbestos is. Such a fiber is defined as being three times longer than it is wide. The relationship between length and diameter of fiber particles is extremely important, according to Dr. Corn and Dr. Enterline. Studies have shown that the longer and smaller in diameter the fibers are, the greater the number of tumors "harvested" in animals. Durability is also important. Durable fibers are able to remain in the body a long time with the potential to harm the respiratory system.

In the mid-1970s, Dr. Enterline undertook a mortality study that investigated 17 U.S. old, large, and dirty plants where fibrous materials were produced. That study included 17,000 white male workers who had been exposed to respirable fibers. At roughly the same time, a European study was investigating 13 plants in seven

countries where 21,000 workers were employed in producing MMMFs. Both were concerned with such fibrous materials as mineral wool (rock or slag wool), glass wool (fiber glass) and glass filaments (used in textiles) and their effects on the health of laboratory animals and production workers. A third but much smaller study was also done in Canada.

The studies indicated a higher incidence of lung cancer among the workers than would be expected, based on standardized mortality ratios. But the jury is still out in determining whether malignancies occurred because of exposure to MMMFs alone. Other factors, such as smoking in conjunction with exposure, need additional investigation. From studies conducted so far, Dr. Enterline said, there does seem to be a "multiplicative" effect from smoking. That is, smoking is believed to multiply any possible adverse effects from exposure to MMMFs. And it is likely also that particular environmental conditions play a role.

To Alcoa the message is nonetheless clear. We have always been conscientious in protecting the health and safety of employees. Care must be taken to ensure that Alcoa's environment remains safe for employees as we move increasingly into the production and use of all man-made fibers.

We are now producing fibers to reinforce ceramic parts. Though the health data are sparse for ceramic fibers, there is some concern about their toxicity. Fibers are effective in reinforcing molten aluminum and polymers as well. We're producing ARALL,

which is a laminate formed by bonding aluminum sheet and polymer fibers to produce a material with superior properties in combination. Researchers at Alcoa Laboratories are experimenting with the production of single crystal silicon carbide fibers.

Ceramic refractory materials, which we buy, are used to insulate our ingot furnaces. They are coming under suspicion because of their ceramic fiber content. In most user applications, such as refractory materials, there appears to be no danger unless or until the material is crushed or ground up and small particles become airborne. It is important then to ensure that the particles do not enter the chest and lungs and possibly irritate the respiratory system.

Many of the new fibrous materials are magnificent, Dr. Corn concluded, but the question is, can we use them without danger. Legislation regulating their production and use probably will be enacted in the next few years, he said.

Alcoa and other concerned companies ~~should~~^{must} not wait. We must put into place appropriate engineering controls or other strategies to manage exposures...in order to minimize, or ideally eliminate, risk from the production and use of man-made mineral fibers.