The roving can be dampened by wet rollers or mist spray prior to spinning to lower the exposures. During the spinning and other processing steps, however, the strands often break and release asbestos dust as the ends whip around the spindles. Yarns are coated to produce thread, and are braided into cord, rope, or tubing. Depending on the characteristics of the final product, a damp or dry loom can be used during weaving operations.

In the wet process, the asbestos fibers are mixed with water and chemicals. The resulting slurry is extruded directly into strands. This method eliminates the carding operation, a major source of emissions during the conventional process. The strands are then spun and go through the subsequent processing steps which are similar to those of the conventional method. According to some of the developers of wet processing equipment, the balance of the processing steps are performed wet or with the fibers bound, thereby reducing exposures [Exhibit 323].

Local exhaust ventilation is the primary engineering control used to reduce levels of asbestos dust in plants using dry methods to produce asbestos textiles. It is normally provided at the bag opening and fiber introduction stages, and during the willowing and blending, carding, and winding operations. Dust control measures are particularly stringent in plants that blend cotton into the fabric, due to health hazards associated with exposure to cotton dust.

As none of the four post-1980 studies on wet operations at primary textile plants (2 from RTI survey and 2 from OSHA MIS files) show exposures in excess of 0.1 f/cc, OSHA has determined that it is feasible for these operations to comply with a 0.2 f/cc PEL. Other data submitted by the Amalgamated Clothing and Textile Workers Union (ACTWU) [Exhibit 280–A] and obtained by RTI during a site visit to a Raymark Corp. plant [Appendix B of the RIA] show that exposures during dry operations generally exceed 0.2 f/cc. Consequently, OSHA does not believe it is feasible for the dry operations of carding and spinning to comply with the 0.2 f/cc without the supplemental use of respirators. Data in the Bragg report [Exhibit 235–A, Tables VI and XVII] also indicate that these operations will have difficulty achieving average exposures below 0.2 f/cc without the use of respiratory protection.

The AFL–CIO also believes that using dry methods in the manufacture of asbestos textiles is a problem area and that some operations will have difficulty in achieving the PEL [Exhibit 335, p. 44]. The AFL–CIO has stated that it is feasible for the textile industry to comply by switching to wet processing. OSHA has determined, however, that this is not a viable option in most cases because wet processing changes the nature of the textile. RM Industrial Products Company, Inc., one of the suppliers of wet processing technology, acknowledges that the wet process "is not a complete substitute for conventionally prepared asbestos yarn products" [Exhibit 323, p. 3].

OSHA's experience with cotton textile operations has shown that a careful work practice and housekeeping program is effective in reducing cotton dust levels in the plant. Dry cotton textiles operations are similar to asbestos yarn manufacturing and OSHA believes the adoption of the controls developed for cotton dust, such as frequent vacuuming of floors and machine parts, can be used successfully in asbestos textile manufactures. OSHA expects that dry asbestos textile manufacturing will use the latest control strategies available, and should be able to reduce worker exposure to below current levels. For carding and spinning operations in dry mechanical asbestos textile manufacturing, respirators will be used to achieve the PEL.

Vinyl/Asbestos Floor Tile

During the manufacture of vinyl/asbestos floor tile, opened paper or unopened plastic bags of raw asbestos fibers are dumped into a mixer along with other dry ingredients. The mixer combines the ingredients into a hot plastic mass that binds the asbestos fibers, thus reducing the potential for exposure. The hot mix is dumped onto a conveyor and transported under negative pressure to a two-roll mill. The mill presses the plastic into a continuous slab which is passed through a series of calender rolls to achieve the desired thickness. The warm sheet next passes through an embosser which imparts a surface design if desired. After cooling and waxing, the sheet is cut to size, inspected, and packaged for shipment. Cutting scraps are returned to the mixer for recovery.

Local exhaust ventilation is provided at stations such as fiber introduction and cutting which potentially may have high exposures. Mottling granulation and scrap grinding may be isolated in enclosed rooms. Housekeeping is performed continuously to clean up spilled dry material.

Table 14 summarizes the exposure data that forms the basis for OSHA's feasibility determination for vinyl/asbestos floor tile. As shown in the table, the reported exposures at each of the three jobs were less than 0.2 f/cc. OSHA, therefore, has determined that it is feasible for this sector to comply with the 0.2 f/cc PEL. This determination is consistent with 1984 data submitted by Dr. Bragg, which showed that for operations other than fiber introduction, exposures range from 0.01 f/cc to 0.2 f/cc.

TABLE 14.—EXPOSURE DATA FOR THE MANUFACTURER OF VINYL ASBESTOS FLOOR TILE

Job classification/process	Mean 8-hr TWA exposure (f/cc)	Standard deviation	No. of observations
Fiber introduction [1]	[2] 0.014	0.022	14
Dry mechanical [3]	[4] .105	[4] .095	[5] 15
Other [3]	[4] .105	[4] .095	[5] 72

[1] OSHA MIS period 1979–1984.
[2] All observations were less than 0.1 f/cc.
[3] RTI site visit to Amtico Flooring, Lawrenceville, N.J.
[4] Ranges were from 0.01 f/cc to 0.2 f/cc, and the means and standard deviations were based on an assumption of a symmetrical distribution.
[5] Number of employees who were represented by the average exposures was used as data on the number of samples were not provided.

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis.

Gasket and Packings

Asbestos-based gaskets and packings are used to prevent the leakage of fluids in process equipment. Asbestos is an effective sealant because it generally does not react with machine fluids and is heat resistant. In the manufacture of gaskets, raw asbestos fibers are either introduced by emptying bags or are added in unopened pulpable bags. The fibers are then mixed wet or dry, with fillers and bonding materials. During mixing, the raw fibers are encapsulated by binders and solvents which reduce the potential for fiber release throughout the rest of the manufacturing process. The mixture is rolled into sheets which may be further processed on-site or may be packaged for shipment to secondary fabricators or to suppliers of replacement parts for industrial equipment.

Asbestos-based packings can be manufactured by a number of processes. The most common production method involves the impregnation of dry yarn with a lubricant. The coated yarns then are braided into continuous lengths and calendered to specific sizes and shapes.

Exposure data upon which OSHA based its feasibility determination were obtained by RTI during a site visit to the Stratford, Connecticut, plant of the Raymark Corp. [see Appendix B of the RIA] and from two facilities responding to the RTI survey [see Appendix C of the RIA]. All three plants reported exposures at various work stations (e.g., wet mechanical, dry mechanical, etc.),