As in A/C pipe production, OSHA recognizes that it is difficult to reduce exposures during the cutting operation to below 2.0 f/cc. Technological improvements demonstrated in construction activities, however, have led to reduced exposures during cutting to below the PEL of 0.2 f/cc. OSHA believes that there is a strong likelihood that similar developments will occur in the manufacture of A/C pipe and sheet and in the production of other primary asbestos products. Other innovations, such as shrouded tools used in field cutting, might be applied on a larger scale to current cutting practices in factories. As suggested by Dr. Bragg, the local exhaust ventilation and good housekeeping used in the processing steps of A/C pipe could be successfully applied to A/C sheet processing. Mr. Alfred Netter of Supradur Manufacturing Corporation recognized in his written testimony the importance of good housekeeping when he stated the following:

> Work practices—merely keeping the floors clean—reduce greatly the amount of dust in the air created by the movement of equipment. When used properly, this and other housekeeping chores can provide very effective dust control. [Exhibit 91-16, Section I, p. 9].

OSHA, therefore, concludes that with a combination of engineering controls and work practices it will be feasible for this sector to comply with the 0.2 f/cc PEL for all operations except sanding, where supplemental respiratory protection will be used to achieve the PEL.

Friction Products

Asbestos friction products include drum brake linings, disc brake pads, and clutch facings for automobiles, as well as materials for industrial and commercial applications where motion must be controlled. Although each of these products is manfactured by a unique process, the basic order is fiber introduction, wet or dry mixing of the asbestos with other ingredients, and production forming, curing, and finishing.

OSHA has determined that it is feasible to achieve exposure levels below 0.2 f/cc during all operations except grinding, by using engineering controls and work practices. For grinding, supplemental respiratory protection will be required.

Friction products are molded using a wet-mix or a dry-mix process or a combination of the two methods. Dry-mixing is generally used for disc brake pads and brake blocks, whereas wet-mixing generally is used to mold drum brake linings and clutch plates used in automatic transmissions. Compared with the slurry processing for drum brake linings, exposures tend to be higher during the processing of the more friable dry-mix used to make disc brake pads. Both dry-mix and wet-mix processes are used in the manufacture of clutch facing. These steps of fiber introduction and mixing closely resemble those of other primary manufacturing processes (e.g., A/C pipe).

Following mixing, the dry mix is fed through a compression molder and the wet mix through an extruder. Then, formed strips are cut and bent into various widths and lengths. Dry-mixed formulations are transferred to pressing molds where slabs are formed, sometimes after a pre-heating step. The slabs are hot pressed, are sawed into specific parts, and are then sent to a curing oven. Following curing, the parts undergo finishing steps to produce the final product. These steps include sawing, grinding, drilling, tapping, and boring.

In the friction products industry, finishing operations generate the greatest quantity of emissions, with as much as 30 percent of the asbestos in the products being ground away as dust. The Friction Materials Standards Institute claimed that a 0.2 f/cc TWA PEL is not feasible [Exhibit 90-180]. OSHA has determined, however, that although there are some operations for which the 0.2 f/cc PEL is not yet feasible, it is feasible for most operations to comply with the 0.2 f/cc PEL using engineering controls and work practices. This feasibility determination is based on exposure data obtained during an RTI site visit to the Raymark plant in Stratford, Connecticut [see Appendix B of RIA].

The Raymark plant is a primary producer of friction materials and sheet gasketing and is the second largest producer of friction products of the plants in the RTI survey. The exposure data reveal that most of the workers involved in the manufacturing of friction products are exposed to less than 0.2 f/cc of asbestos. Exposures for the 15 employees involved with fiber introduction for asbestos friction materials ranged from 0.03 f/cc to 0.21 f/cc, which is similar to the exposure data in A/C pipe manufacture. OSHA, therefore, believes that 0.2 f/cc PEL is feasible for fiber introduction. Exposures for the 28 workers involved in wet mechanical operations, in which the various products are prepared for curing, ranged from non-detectable to 0.3 f/cc, with most appearing to be below 0.2 f/cc. OSHA, therefore, concludes that it is also feasible for those activities to comply with a 0.2 f/cc PEL. This determination agrees with the hearing testimony by Dr. Franklin Mirer of the United Auto Workers (UAW) who ascertained that current technology has the ability to lower exposure levels for these practices to below 0.2 f/cc [Hearing Transcript of July 2, 1984, p. 94].

Exposures for the employees involved in dry mechanical operations, however, ranged from 0.07 f/cc to 1.7 f/cc. About one-third of the workers were regularly exposed to levels above 0.2 f/cc during the grinding of drum brake linings and the pressing and machining of clutch facings. The difficulty of controlling exposures for these dry mechanical operations is consistent with data presented by Dr. Bragg which show that exposures at many of the dry mechanical operations average between 0.3 f/cc and 0.7 f/cc. Dr. Bragg referred to the impracticality of using wet methods during these particular practices because of their detrimental effect on the final friction product [Exhibit 235-A, p. 79]. Dr. Mirer of UAW acknowledged the high exposures during the manufacture of friction products and suggested the use of substitute materials [July 2, 1984, Transcript, p. 92]. The AFL-CIO also has stated that the production of asbestos friction products is a problem area in terms of exposures [Exhibit 335, p. 44]. Thus, it appears that supplemental respiratory protection will be required to comply with the 0.2 f/cc PEL during grinding operations.

Textiles

Asbestos textiles are manufactured by either wet or dry processing. Not all asbestos textile products can be made by the wet process because chemicals used in the wet process alter the characteristics of the fiber making it undesirable for some applications. Likewise, although some operations of the conventional "dry" method could be run using dampened fibers, some fiber qualities required by the final textile product exclude the use of dampening techniques.

In the dry process, the asbestos fiber is debagged and dry blended. Cotton, rayon, or other natural or synthetic fibers can be added to impart strength and other characteristics. Following the standard textile processes, the carding operation, which is one of the problem areas for exposures, combs the fiber mix into a web of parallel fibers which is then divided into strips known as roving. The roving is spun and twisted to produce single or plied asbestos yarns. Due to the high velocity of the spinning operation, this processing step has been a source of high exposures.