REPORT CONCERNING THE USE OF DEGREASERS
AND TRICHLOROETHYLENE (TCE) AND THE USE OF DEGREASERS
AT THE PLANT IN HATBORO, PENNSYLVANIA

March 19, 1987

Dr. Ralph G. Smith
27411 Tudor Lane
Franklin, Michigan 48025
At the request of Mr. George Lieberman, attorney for Raymark, I have offered technical assistance concerning the case entitled United States of America, et al. v. Raymark Corporation, et al., U.S.D.C., E.D. Pa., Civil Action No. 85-3073, involving alleged contamination of the groundwater by trichloroethylene (TCE) from the Hatboro plant. In arriving at my opinion, I met with Mr. Lieberman on several occasions and discussed the particulars of the case. On January 20, 1987, I visited the plant in Hatboro, Pennsylvania, to look at and study the existing facilities, and to discuss the past usage of degreasers by the plant with Mr. Richard Walker, President, Penn Fasteners, and Mr. Jack Thomas, presently employed by Penn Fasteners and a former employee of Milford Rivet since 1956.

There is presently no degreaser in use at this plant, nor has there been one since 1980 I am told, but I did examine rather thoroughly the location where previous degreasers had been used, and looked at the surface drainage system, the sump in which a former degreaser had been located, the outside location where holding tanks for TCE used to be located, as well as the pipes now remaining, the waste treatment plant elsewhere on the property, and the remainder of the plant. I talked at length with Mr.
Thomas, asking him many questions about the three degreasers said to have been used at the plant, and receiving from him information on their approximate size, methods of use, work practices, distillation of used TCE, delivery of TCE, return of used TCE, and other matters of relevance. Mr. Thomas' recollections formed the primary basis for some of my factual information, although additional information has been derived from some other sources. These other sources are documents made available to me by Mr. Lieberman, including an Amended Complaint, Supplemental Responses of USA to Interrogatories of Raymark, sketch diagram of facility, blueprints of plant, expert reports and transcripts of depositions of Penn Fasteners employees and portions of the deposition transcript of Dr. Giegengack.

It is my understanding that a degreaser was installed and used possibly as early as 1948, and that this degreaser was probably made by Detrex Corporation; that a new Detrex degreaser was acquired in 1963; and that this unit was replaced in about 1976 by another degreaser made by the Baron Blakeslee company. It is Mr. Thomas' recollection that the original degreaser was perhaps 4-5 feet wide, 5-6 feet long, and approximately 8 feet deep. This degreaser was said to have been placed
in a pit or sump which was about three feet deep. Mr. Thomas is uncertain whether or not there was a still used in connection with this unit.

The degreaser installed in 1963 was 5-6 feet wide, approximately 13 feet long, and 5 feet deep. It sat on the floor, rather than in a pit. Also, in 1963, a 500 gallon storage tank was installed outside the building, and in 1964 or 1965, another such storage tank was also installed.

The Baron Blakeslee, Inc., degreaser installed in 1976 was approximately the same dimensions according to Mr. Thomas, except that it was slightly deeper. Both of the latter two units were used in conjunction with stills.

Mr. Thomas' memory is at least partially confirmed by literature from the Baron Blakeslee company concerning the degreaser actually installed in 1976, and the dimensions he recalls are essentially the same as those in that literature. Specifically, according to the Baron Blakeslee literature, the unit was 14'3" long, 9' wide and 12'6" deep. It was also stated by Baron Blakeslee that hoods and enclosures were supplied with the unit, thus implying that exhaust ventilation was used to prevent excessive vapor exposures.
Mr. Thomas outlined procedures for using the degreasers, as well as cleaning both the degreasers and the stills. In summary, it is his statement that oily TCE from the still was removed periodically and transferred to 55 gallon drums, which were then picked up by the TCE supplier, who reclaimed the TCE if possible and reimbursed the company. Mr. Thomas estimated that, on the average, 8 to 10 drums of TCE-containing liquid were returned to the supplier. About twice a year, according to Mr. Thomas, it was necessary to clean the degreaser itself and this was done with a hoe which removed the sludge and metal parts, etc., after the liquid TCE had been completely removed. According to Mr. Thomas, this sludge was put into 5 gallon containers and disposed of with ordinary refuse.

Mr. Thomas described what I believe to be normal operating procedures for a degreaser, which I will not repeat here, but they were such as to make it highly improbable that liquid TCE would be spilled as a result of normal degreasing operations. For example, there was never any occasion for leakage from the degreasing tank itself, and with normal usage, solvent was not removed from the tank. The baskets of rivets being degreased were normally maintained in the vapor until hot, and upon
removal, were hot and dry and did not contain liquid TCE. Similarly, the normal operation of the still was accomplished with a plumbing system which ensured the retention of TCE within the degreaser, the still, or the storage tanks. Mr. Thomas had no recollection of the system leaking and was firm in his belief that there were no leaks during the years of his employment. Also according to Mr. Thomas, the drumming of the spent TCE was accomplished very simply, without any leakage onto the floor. Further, he also had no recollection of any accidents, leaks, etc., during the loading of the storage tanks by the supply truck.

On March 7, 1987, I visited the Brake Systems Industries (BSI) plant in Stratford, Connecticut, and met with Mr. Steve Mayo, corporate industrial hygienist, and Mr. Gary Smith, work leader. I examined in some detail a degreaser which is currently used at this plant. This degreaser was a Detrex degreaser model VS-800-S and had the following dimensions: length - 60", width - 36", depth - 62". The degreaser was located in a sump similar to the one believed to have been used in the Hatboro plant, and was connected to a still and further connected to two large outdoor storage tanks. The method of using this degreaser and distilling the TCE, storing it, returning
it to the tank, etc., were described in detail and other information related to work practices, etc., were discussed at length. (At present, this degreaser does not use TCE, but, rather, uses a solvent known as 1,1,1 trichloroethane.)

This degreaser was of interest for several reasons. First, it is possible, although not proven, that it is the degreaser that was first used in the Hatboro plant. As noted, the dimensions of this degreaser are essentially as remembered by Mr. Thomas. Even if it were not the same degreaser, it is very probably of the same vintage, and being of the same dimensions, serves as the best model available for understanding the usage of the degreaser actually used. The method of usage and work practices in general were conventional, in my opinion, and will not be outlined here, but several facts are of importance. First, at present, this degreaser handles high density steel parts used in brake systems, with an average through-put daily in excess of 15,000 pounds. It was emphatically stated that in the normal course of degreasing, there is absolutely no carry-out of liquid degreasing solvent, and no spillage whatsoever of solvent onto working surfaces or the floor. The actual level of solvent is far below the edge of the tank, and only vapors normally escape from the degreaser. This degreaser...
had a slot exhaust ventilation system in place, and it was stated that it is normally used to prevent solvent vapor exposures to the workers. The system for distilling the solvent, storing it in the outside tanks and returning it to the degreaser was explained to me in detail, and I was assured that in normal circumstances, this is a closed system with no possibility of spillage of solvent. The persons interviewed were unaware of any accidents or leaks which could have resulted in spillages in the past. It was also stated that the average usage of solvent currently is 4,000 gallons per year, with about 400 of these gallons being contained in drums returned for credit. Thus, the net loss of solvent is 3,600 gallons per year, or 90% of the solvent which is purchased.

There are no data concerning solvent consumption by the Hatboro plant as a result of using the first degreaser, but it can be assumed that similar losses might have been experienced. The actual consumption of solvent is a variable determined by the degreaser characteristics, the particular solvent used, the amount of work going through the degreaser, the density or surface area of the work, the rate at which it is removed from the tank, the existence of exhaust ventilation, cross-currents, etc., and, perhaps, other variables. For that reason,
it cannot be stated with certainty that one degreaser will consume precisely the same amount as another, but the figures from the Connecticut plant offer some information of value.

The purchases of TCE by the Hatboro plant are documented for the years 1972 through part of 1980. Obviously, for the years 1972 through somewhere in 1976, these figures reflect the use of a Detrex degreaser concerning which Mr. Thomas supplied information. From that date until late in 1980, when the use of degreasers was discontinued, the degreaser in use was the Baron Blakeslee unit previously noted. We have considerable information about this unit, including exact dimensions, extensive instructions for its proper use, use of the still, etc. The Detrex records show that during the period 1972–1980, variable amounts of TCE were purchased annually, ranging from a low of 3,953 gallons in 1975, to a high of 9,655 gallons in 1973. The average consumption throughout this period was 6,179 gallons. If it is assumed that there are approximately 250 working days in a year, then the consumption of TCE ranges from a low of 16 gallons per day to 39 gallons per day. One may conjecture that the "unaccounted for solvent" was routinely lost in such a manner that it entered floor drains within the plant,
or entered the ground in any of several locations. I, of course, have no personal knowledge of whether or not there was any discharge of liquid solvent into the sewers or earth, but it is my opinion that the amount of TCE purchased by the company is entirely reasonable, and can be fully explained by normal operating losses of TCE vapors. Although there are some difficulties in comparing one degreaser with another, it is still useful to make such a comparison and I offer the following observations. First, it is reasonable to believe that because the Detrex degreaser in use until 1976 was of approximately the same dimensions as the Baron Blakeslee degreaser, it should have consumed similar quantities of TCE. The TCE purchase records confirmed this prediction, and this observation alone strongly supports the conclusion that the solvent losses were due to vapor emissions, for it seems unlikely that a totally new installation with different and presumably new plumbing, still, etc., would leak liquid in exactly the same manner as the degreaser which it replaced. Further, when the substantial solvent usage noted for the plant in Connecticut is examined, and it is realized that these losses result from a tank of only a little more than 12 square feet of area open to the atmosphere, it is very reasonable to expect that much
greater vapor losses would occur at the Hatboro plant from the two large degreasers with cross-sectional areas of around 125 square feet. The Baron Blakeslee specifications for the degreaser state that it was designed to handle 60 pans of rivets, at a rate of 2,000 pounds per hour, and a maximum loading of 50 pounds per pan. This rate would, obviously, result in the usage of approximately 16,000 pounds of rivets per day. It is my opinion that these figures are compatible with vapor losses which would require the purchase of the amounts of TCE actually purchased during the period 1972-1980, for I would expect that baskets of rivets having a net density substantially less than that of the solid steel parts degreased in the Connecticut plant, would have considerably more surface area and would result in substantially greater vapor losses than would degreasing of solid steel parts.

The following section of my report is concerned with the subject of using vapor degreasers, and in particular vapor degreasers utilizing TCE, rather than other solvents. My own experience with such devices and with trichloroethylene dates back to 1946, during the years that I worked for the Detroit Bureau of Industrial Hygiene. At that time, and since that time, the use of
vapor degreasers has been widely practiced by industry throughout the United States, and, indeed, throughout the world. These devices are extremely useful and efficient in removing oil and grease from metal parts, and in many industries are almost indispensable. Although I do not have any statistics, I am certain that many hundreds of thousands of degreasers of all size have been used and a great many are still in use. The concern with such usage has always been the potential for harm to the workers operating them, primarily due to the inevitable vapor losses associated with their usage. During my career as an industrial hygienist, I have made many investigations of such exposures and have actually made measurements, using instruments or suitable sampling procedures, to determine the vapor concentrations to which workers were exposed, and then have made recommendations for improved work practices, local exhaust ventilation, or other measures deemed to be appropriate. I have watched many degreasers in use, and can state than when properly used, there is no spillage of solvent to the premises.

It is reasonable to ask why a solvent such as TCE must be used when it is currently considered a suspect human carcinogen, and according to some studies, has caused cancer in laboratory animals. In this regard, it should
be noted that although it has been known for many years that trichloroethylene, like all other organic solvents, possesses certain qualities which make it toxic, suspicions that it may cause cancer were only aroused when the National Cancer Institute issued an alert warning in 1975 based on the production of liver tumors in mice. There was no evidence then and, to my knowledge, there is still no evidence that it is a human carcinogen. Moreover, the animal data are mixed, in that some species develop tumors when administered high quantities of trichloroethylene and others do not. A general review of the toxicity and carcinogenicity of trichloroethylene is contained in the documentation for TCE prepared by the American Conference of Governmental Industrial Hygienists (ACGIH) TLV Committee justifying its current TLV of 50 parts/million. This documentation cites 40 references which relate to these matters, and it will be noted that the final paragraph explains that the current TLV of 50 parts per million is recommended to control certain subjective complaints, based on effects to the nervous system. Even today, the TLV Committee does not consider that the evidence is sufficient to justify considering TCE as a human carcinogen. Although the ACGIH TLV's are not legal standards nationally, they are adopted
by many states as standards, and the 1968 TLV's were adopted for inclusion as the Z-2 list in the Occupational Safety and Health Act. The official permissible exposure limit (PEL) for the United States, therefore, is the OSHA PEL of 100 parts per million, which was the value recommended by the TLV Committee for many years.

I am aware that this litigation concerns the contamination of a water supply system with TCE. In my opinion, the use of TCE in a proper manner such that it is contained within the system, without excessive exposure to those employed in the plant, and no substantial spillage into the sewer systems or into the properties on which they are used, poses no threat to human health. The proper use of TCE can be accomplished without difficulty, and to the best of my knowledge, the plant in Hatboro, Pennsylvania, conducted its operations in a normal manner and in such a way that there is no reason to believe that it routinely allowed TCE to contaminate the adjacent soil. My extensive experience and investigation lead me to conclude that the presence of TCE in adjacent soils, if found, cannot be attributed to the normal operating procedures of the plant.