Final Summary of Regulatory Subgroup P-MACT meeting of September 4, 1997

I. Purpose

The purposes of the meeting included the following: (1) allowing the EPA and industry to review the presumptive MACT (PMACT) status; (2) reaching a consensus on the industry sectors to be covered by the MACT standard; (3) reviewing available information on HAP emission sources and control options with the goal of identifying potential affected sources to be covered by the MACT standard; and (4) discussing technical issues and approaches to resolution.

II. Date and Place

September 4, 1997
U.S. EPA
Environmental Research Center
Research Triangle Park, NC

III. Attendees

See attached list of attendees (Attachment 1)

IV. Meeting Summary

The meeting followed the agenda (Attachment 2) that was distributed to stakeholders with the meeting announcement. Mr. Paul Almodóvar of the U.S. Environmental Protection Agency chaired the meeting and opened the discussion by thanking participants for their ongoing assistance. He then briefly reviewed the next steps in the PMACT process, which are to take the current information, refine it, and come up with PMACT options for new sources. The goal is to have some options available by early October.

After Mr. Almodóvar's introduction and review, Mr. Steve York of the Research Triangle Institute (RTI) presented the information in the briefing document (Attachment 3) concerning the preliminary subcategories and known HAP emission sources and controls. Mr. York noted that the material in the briefing document represents the information that the MACT team currently has, and solicited comments and input from meeting participants. For topics that were discussed by the group, the following paragraphs present summaries of information provided, issues raised, and consensus reached. The page number presented parenthetically with each topic refers to the

corresponding page in the attached briefing document.

PRELIMINARY SUBCATEGORIES (Pages 4 and 5 of 18)

Mr. York observed that the preliminary subcategories are broad subcategories based essentially on how the industry has characterized itself previously through the American Textile Manufacturers Institute (ATMI) (i.e., basic textiles) and the Carpet and Rug Institute (CRI) (i.e., carpets and rugs). Polymeric coating of supporting substrates is broken out as a subcategory because there is a NSPS covering this source category and a CTG that has been adopted into many State regulations. The "other industry groups" are industry segments that ATMI has indicated might not be well represented through the ATMI MACT survey.

Mr. York stated that in the case of hosiery, the Regulatory Subgroup has agreed that hosiery & socks shouldn't be covered by the standard in this source category due to lack of significant HAP sources. However, Paul Almodóvar noted that these are preliminary findings, and hosiery is subject to being covered if we get subsequent information that suggests they ought to be regulated. Mr. Almodóvar also stated that at present EPA's decision is not to regulate and that this would probably be handled through an exclusion from the requirements of the MACT standard. Mr. Tommy Thompson of Sara Lee Hosiery, on behalf of the National Association of Hosiery Manufacturers (NAHM), presented information to EPA (Attachment 4) representing the 1996 air emissions inventory for the largest domestic hosiery production facility, comprising 4.74% of total sheer production in the United States. The facility totals show HAP emissions of approximately 320 pounds for calendar year 1996.

Mr. York put forth that currently there seems to be no reason to treat the narrow fabrics industry as a subcategory since narrow fabric manufacturing uses the same processes as other woven fabric manufacture; narrow fabric is simply broad woven fabric that is 12 inches or less in width. Regarding the tire cord and fabric industry, Mr. York noted that the biggest source of HAPs in tire cord manufacture seems to be polymeric coating, which is covered by NSPS and would be included in the polymeric coating subcategory. Therefore, the MACT team currently believes that tire cord does not need to be treated as a separate subcategory.

The MACT team will be looking for more information about the non-woven adhesive/chemical process, and will investigate whether a subcategory is needed for this process.

A question was posed as to whether thread manufacturing would be covered as a subcategory. In response, Mr. York noted that filament production, which according to current information does result in HAP emissions, is covered under another MACT standard. The MACT team currently does not believe that the manufacture of spun thread includes unique HAP emission sources that would warrant subcategorization, but will look at what extent there are HAP emissions from the spun thread manufacturing process. The process of coating thread will clearly fall within the MACT under the polymeric coating subcategory.

There was discussion of ways that the subcategories and exemptions could be handled: Paul Almodóvar noted that there are several ways that an exemption might be handled, e.g., specific types of processes could be exempted or processes with HAP emissions below a specific threshold level could be exempted. Similarly, the subcategories could be handled in a number of ways, but, at this time, the MACT team has not decided what is most appropriate to this industry.

KNOWN HAP EMISSION SOURCES AND CONTROLS (Beginning on Page 6 of 18)

Mr. York related that the information in this section of the briefing document is brought together from the literature, conversations with industry and the Regulatory Subgroup, and the ATMI survey. Some inconsistencies in the briefing package information have been found by the MACT team in preparing for the PMACT meeting. Mr. York told attendees that he would point out these inconsistencies and wanted to hear of any additional inconsistencies or inaccuracies found by the stakeholders.

Basic Textile Manufacture

The review of the basic textile manufacturing preliminary subcategory covered the manufacturing processes identified from the ATMI survey results as potentially having significant HAP emissions. These processes will be further evaluated to determine if they should be included in the affected sources that will be subject to requirements under the MACT standard.

Slashing (Page 6 of 18)

Discussion of HAP emission sources in slashing brought up the following points:

- Slashing is unique in that it has a discreet type of equipment associated with it -- unlike other textile processes, which are often conducted using multi-purpose equipment (e.g., tenter frames).

- The fact that recovered PVA has no methanol in it implies that all of the methanol in PVA is emitted during the slashing process (from the size cooking operation and/or from the slashing/sizing process itself).

- Several industry participants pointed out that it is inaccurate to say that natural fibers are exclusively slashed with starch: often a PVA-starch mixture is used on cotton fabrics. The PVA adds strength to the yarn. Paul Almodóvar noted that if the PVA is necessary for some applications of sizing to natural fibers, then MACT may just require low-methanol PVA to be used (rather than prohibiting PVA size for use on natural fibers).

- Recovered PVA can be used in some non-integrated mills. Paul D'Andries noted that his company trucks recovered PVA to other facilities within the company. Further, not all vertically integrated mills can recover PVA.

- There was discussion about the concentration of methanol in PVA. ATMI members noted that suppliers generally will guarantee a methanol content of less than 1%, but the actual amount will vary by supplier and in some cases may be less than 0.5%. Some small suppliers still provide PVA with methanol content greater than 1%.

Preparation (Pages 7 and 8 of 18)

Steve York noted that the MACT team needs more information about the preparation processes regarding what is included in each step and where one step in the preparation process ends and another step begins. This issue will be discussed further under the topic of developing process definitions. Regarding the equipment and chemicals listed in the briefing document, Roger Settlemeyer noted that steam cans should be included for drying in the bleaching process description.

David Dunn declared that preparation is the most difficult part of the textile process to define as a block; the preparation block is different at each site and the terminology also differs by site. Chip Moore offered ATMI's assistance in defining the preparation process block.

In discussion about the preparation process, Mr. York mentioned that some chemicals appear in the briefing document that are not shown by any respondents to the ATMI survey under preparation, e.g., 1,4 dioxane and formaldehyde were not reported in scours by ATMI survey respondents. These chemicals probably came from literature sources; the source will be checked. Industry participants commented that most HAPs in preparation chemicals do not appear on MSDS sheets because they are in such low concentrations. Roger Settlemeyer stated that some bleaching processes have isopropyl alcohol (IPA) in the wetting agents.

Gary Moore noted that there might be some confusion in the use of the term "heat setting". When used in the context of the preparation process, "heat setting" applies to the greige process, and no chemicals have been applied to the fabric yet. However, the term heat setting is also sometimes used to describe a curing/setting finishing process that is used after chemicals have been applied to the fabric.

Gary Moore also submitted that it would be quite difficult to directly measure HAPs in a preparation room, because there are no vents or stacks. In addition, most washers are enclosed, and most of the chemicals used in the washers are water soluble, and therefore, probably are not going to appear as air emissions. Paul Almodóvar stated that we need to come to an agreement on how mass balances will be done in calculating HAP emission. In particular, we need to figure out how much is going to go to the water, and how much comes off in the wastewater treatment plant. We also need to establish emission estimation techniques so that all facilities which are covered by MACT can make consistent calculations. Roger Settlemeyer commented that he used Simms equations on his dye equipment to calculate volatility. He found that the HAP emissions came partly from padders and partly from steamers.

A participant asked if there are likely to be prohibitions on the use of particular preparation technologies written into the rule. Paul Almodóvar replied that in the PMACT process, the MACT team is looking at the best technology for new facilities. In the full MACT process, the team will look at the best 12% of what industry is achieving, and MACT will be defined based on that. David Dunn voiced the opinion that it is possible to subcategorize based on the existence or lack of engineering controls, and therefore preparation could be simplified because there seem to be no controls installed in the preparation area.

Regarding the small number of facilities in the ATMI survey reporting the use of incinerators/afterburners in the heat-set or 'other' operations categories, based on Gary Moore's comment (above), the heat-setting is probably actually a finishing process. Industry participants agreed that any controls that are in place are used for opacity control. A question was raised about the impact of visible emission controls to co-control HAPs. Paul Almodóvar declared that if co-control is occurring, then visible emissions controls could be considered in the MACT floor determination. The MACT team will investigate the extent to which co-control is occurring and whether opacity controls would limit HAP emissions.

Dyeing (Pages 8-10 of 18)

Steve York reviewed the briefing package and noted that toluene and methanol should be added to the types of emissions reported in quantities greater than 1 TPY. Regarding the HAPs emitted from dyeing, David Dunn submitted that he believes that ethylene glycol is chemically similar to glycol ether. He asked if the MACT Regulatory Subgroup had pointed out that states are exempting pressurized dye vats from State Title V programs. Steve York replied that this had been noted in the Regulatory Subgroup meeting.

Jimmy Summers declared that in a pressurized beck, which is not open to the atmosphere, there is less opportunity for chemicals to volatilize, regardless of what chemistry is being used for the dye. Gary Moore remarked that in addition, pressurized dyeing can eliminate the need for certain toxics. For example, dye carriers used in atmospheric dying of polyester are not needed in pressurized dying of polyester. Roger Settlemeyer noted that many firms use both types of machinery, replacing atmospheric equipment with pressurized becks when new equipment is purchased. Pressure becks are a major investment, and are not generally purchased unless a company can get good return on investment. Gene Roberts explained that there are two good reasons for beck dyeing: (1) it is faster than atmospheric dyeing, and (2) it allows you to eliminate carriers. It is also useful for dyeing samples, the quality of which are very important to a textile plant's business. Jimmy Summers asked if there are any applications that require atmospheric dyeing. Gary Moore replied that it might be required for fleeces and stretchy fabrics, such as Lycra®, which typically cannot be dyed using jet equipment.

Steve York asked about the flow of chemicals in pressure dying: if the chemicals are not emitted to the air in the pressure dying process, where are they emitted? Roger Settlemeyer responded that Fieldcrest has a heat recovery system, where the temperature of the dyed fabric goes from

160 degrees Fahrenheit to 100 Fahrenheit. There may be some volatilization there. Gary Moore answered that in a closed beck, it is likely that all the organics end up in the wastewater, because the actual dyeing process is closed to the atmosphere.

David Dunn asked whether there is any need for MACT to require controls on dyeing, since it seems that batch dyeing is not a big emission source. Gary Moore noted that when fabric is processed through atmospheric batch dyeing, it is not dried at the dye range; it is sent to finishing and may be finished wet or dry. However, for continuous dye operations, drying is almost always done in the dye range. Gary Moore expressed the belief that it is worth looking further at potential HAP emissions from continuous dying. However, batch dyeing will probably use just small amounts of water-soluble chemicals, and the dying process is always in an enclosed vat, even if that vat is not pressurized.

Ron Beegle agreed with Gary Moore's comments. He asked that the MACT team consider eliminating drying as any part of the dyeing process. He noted that in batch dyeing, there is no drying step. More importantly, no HAPs will be emitted by driving off water from fabric that has only been batch dyed, since in practice all the chemicals have been completely rinsed out before the fabric gets to the drying step. However, HAPs may come off the drying process because of finishes that have been added to the fabric in the finishing department after dyeing.

Ron Beegle further noted that continuous dyeing presents the same drying issues; the fabric has been well rinsed, so HAPs should not be emitted from the drying of continuous dyed fabrics. He explained that at their facility they thoroughly wash fabrics before doing any drying because they would never want to dry a fabric with any un-reacted chemical or loose dye on it. However, there is potential for HAPs to come off the fabric in the wet steps.

Roger Settlemeyer asked about Thermosol dyeing, in which the substrate has to go through several work stations, and the thermosetting process is hotter than the normal drying process. None of the participants provided an answer.

Printing (Pages 10 & 11 of 18)

Steve York noted that, under printing, styrene and cumene should be on the list of HAPs emitted during application, drying, and curing operations shown in the briefing package on page 11. Mr. York also noted that the HAP emissions number shown in the briefing document for ATMI survey results for printing operations is incorrect. The correct information is that the ATMI survey shows that less than 5 TPY of any one HAP are emitted from printing processes.

Regarding pollution prevention opportunities, Mr. York stated that according to information from the Basic Textiles short course taught by the N.C. State University College of Textiles, ink jet printing is very slow and heat transfer printing is economical for short runs, but is slow and used primarily for polyester. Therefore, either of these printing methods would seem to have limited commercial applicability. Additional pollution prevention possibilities were noted by participants:

work practices to reduce use of print paste and to reduce cleaning.

There was discussion about whether any facilities are using VOC control devices in printing operations. None of the ATMI survey respondents reported controlling for VOCs in printing operations. However, participants noted that operational limits on printing to control VOCs have been written into some textile air permits. Roger Settlemeyer stated that Fieldcrest's air permit stipulates VOC limits, but it does not require controls because the firm refuses to purchase printing products containing photochemically reactive chemicals.

Finishing (Pages 12 & 13 of 18)

Steve York noted that diethylene glycol and polyethylene glycol should not be included and glycol ethers should be added to the list of HAP compounds with emissions of greater than 1 TPY reported in the ATMI survey for finishing operations. Paul Almodóvar conveyed that ethylene glycol and glycol ethers have delisting petitions in place, and may be removed from the list of HAPs .

Steve York reported that at least 7 facilities use thermal oxidizers on wet finishing operations with reported efficiencies ranging from less than 50 percent to 99 percent or greater. The question was raised about the thermal oxidizers that were reported on the ATMI survey for finishing. Participants agreed that these are being used to control opacity.

Steve York asked what sorts of operating temperatures were typically found on the thermal oxidizers. Jimmy Summers responded that one needed 450 °F for adequate visible emissions control and that oil flashes at around 480 °F. The operating range is probably from 450 to 1,200 or even 1,600 °F. He further noted that it is rare to see thermal oxidizers on finishing processes. It would primarily be afterburners that are used, and these are rarely run at incinerator temperatures. Afterburners would operate more in the 450 to 525 °F range. Paul Almodóvar said that the MACT team will have to look into whether these temperatures are effective for HAP destruction and may need to do some stack testing on afterburners. If these afterburners and other opacity controls do co-control HAPs, then these devices could be part of the MACT floor determination. But the MACT team would have to look at why the controls were installed to evaluate whether they would limit a facility's potential to emit. The industry participants expressed major concerns with the use of thermal oxidizers to control HAP emissions from process equipment like a tenter frame because of the multiple uses of tenter frames and the on and off operating modes for the process equipment.

David Dunn asked whether the MACT team could speculate at a range of temperatures that might be required. Steve York replied that thermal oxidizers have to be run at 1,200 or 1,400 °F to achieve a 95 percent destruction efficiency, but there is still the issue of whether the opacity control devices are currently destroying HAPs. If they are not being run hot enough to destroy HAPs, then the MACT team will not consider them in the MACT floor determination.

Steve York reported that according to a regulatory subgroup member, emissions testing was performed last month on a tenter frame at a plant in western North Carolina. The test program included Method 25A testing at the inlet and outlet of the control device. The control device is a fume oxidizer that operates at 450 to 550 °F. The fume oxidizer manufacturer is probably funding the test to determine the VOC removal efficiency. The test results should be available by the latter part of September and with the approval of the plant and the fume oxidizer manufacturer should be provided to EPA. The MACT team plans to evaluate those results.

Ron Beegle commented that finishing probably has the most variation in chemistry of any of the processes with potential HAP emissions. The type and quantity of HAP emitted will depend on the finish that's applied. Steve York submitted that the resin finishes seem to be the biggest source of HAP emissions in finishing. He would like to understand better the HAPs that other finishes are contributing. Mr. York stated that according to the Basic Textiles short course at N.C. State University, resins without formaldehyde cost about 3 times more than resins with formaldehyde and provide lower quality finishes. Participants responded that resins without formaldehyde are at least 5 to 7 times more expensive than those with formaldehyde, and agreed that the finishes sometimes do not work adequately.

Ron Beegle said that he could not think of any sources of formaldehyde in preparation. He would expect that it would show up in "heat-setting" only if respondents are using the term heat-setting incorrectly. He suggests that for purposes of MACT development, the term "heat-setting" be reserved for greige goods only. The situation where heat is applied to a fabric that has previously had a chemical applied to it should be called "finishing & cross linking". Formaldehyde is a cross linking agent. Gary Moore further noted that heat-setting is only used for thermoplastic fibers like polyester.

Carpet and Rug (Pages 13 thru 15 of 18)

Steve York remarked that a regulatory subgroup participant from Georgia provided a report of emissions tests performed by DuPont Fibers to measure VOC emissions from heat-setting on Suessen and autoclaves. The tests showed potentially major source levels of HAP emissions from the vent on 6 Suessens. Carroll Turner responded that the entire industry does not agree with the accuracy of the report and noted that Table 1 of the emission test report was revised after the report was released. Mr. Turner also noted that the testing of the autoclaves showed only trace quantities of HAP emissions. The MACT team will further evaluate this issue.

It was noted by a meeting participant that Superba heat-setting equipment does not typically have stacks.

Michelle Shlapak asked how the MACT team classifies heat-setting. She noted that it is part of the yarn spinning SIC code, and wondered if this affects how the MACT team classifies the processes. Paul Almodóvar replied that MACT does not regulate based on SIC codes. Any facility in any SIC code that conducts fabric printing, coating, and dying and other processes identified as affected sources will be regulated. Steve York emphasized that developing robust process definitions will assist industry and EPA in identifying what facilities are covered by the MACT.

Steve York remarked that the carpet and rug respondents to the ATMI survey have not been analyzed separately because the MACT team does not have access to the SIC code associated with each survey response. Therefore, survey responses are not reported in the briefing document.

An industry participant commented that regarding the one plant in Georgia that was major for HAP emissions and reported biphenyl emissions from dying, the biphenyl was used as a dye carrier for polyester fibers but is no longer used. Ken Fontaine remarked that glycol ethers are soluble in water and whether they are emitted to the air is an issue in carpet dying as it is in the basic textile manufacturing subcategory.

Carroll Turner reported that results of the Consortium for Competitiveness in the Apparel, Carpet, and Textile Industries (CCACTI) study on characterizing air emissions from the carpet and rug industry are due in December, 1997. The current phase of the study is measuring emissions from 2 coating operations and 2 dye lines. Gene Roberts noted that the glycol ether results from this study may help to quantify glycol ether emissions from other textile dyeing processes.

Michelle Shlapak asserted that most of the carpet and rug industry does not run back coating containing methanol at all. Steve York replied that MACT floor likely will be based on latex with .5% methanol or no methanol.

David Dunn asked if carpet and rug will be a MACT subcategory. Paul Almodóvar replied that there are probably enough differences to look at it separately.

Polymeric Coating of Substrates (Pages 15 thru 17 of 18)

Steve York stated that he is unsure about whether coating is clearly distinct from finishing. Jim Pruitt replied that for coating, one applies more of the material/compound than for finishing, and the technologies are quite different. Calendaring, however, may not fit under a coating operation definition. Calendaring is actually a laminating process. Steve York noted that flame laminating is covered by a separate MACT. The MACT team has some information on flame laminating, but not a lot of information on other types of laminating. Jim Pruitt remarked that there is some adhesive lamination, and some lamination where the bond is from the laminate melting, and then there is calendaring which is a true mechanical bond.

David Dunn noted that finishing could be seen as impregnation, where coating is really a surface coating, and suggested that the MACT team look to the NSPS for guidance. Gary Moore agreed that a typical wet finishing operation might involve formaldehyde going into the fabric and cross linking inside the fabric, as opposed to coating, where there is a distinct layer of coating. It was suggested that the MACT team also distinguish that coating refers to a permanent, coating, as opposed to slashing, where the coating is removed before the product is completed.

David Dunn asked whether the Regulatory Subgroup defined coating? Steve York responded that at the time of the Regulatory Subgroup meeting, the question of clearly defining the processes that are HAP emission sources was not raised. Seeing the textile manufacturing processes on site visits and reviewing the ATMI survey data brought home the fact that, particularly in the preparation and wet finishing areas, separate processes such as finishing and coating are not necessarily distinct and well defined.

Regarding the example in the briefing document of dimethylol dihydroxy ethylene urea (DMDHEU) being a flame resistant coating, there was some discussion of flame resistant versus flame retardant and whether DMDHEU is a finish rather than a coating. Ron Beegle noted that there are both flame retardant finishes and flame retardant coatings. Paul Almodóvar asked ATMI members to come up with definitions of what they would define as a flame resistant coating vs. a flame resistant finish.

Steve York noted a correction to the briefing document at page 16; the list of HAP emissions from solvent-based coatings should include methanol. Mr. York also added that the control efficiencies reported for thermal oxidizers in the ATMI survey ranged from less than 50% to 99% or greater. John Eapen asked that the term thermal oxidizer be used rather than thermal incinerator in the emission control equipment that may be used by coaters on page 17. In addition, Mr. Eapen noted that thread needs to be added to the list of end products covered by the NSPS (40 CFR part 60, subpart VVV). Mr. York commented that site visit information is being treated as CBI until trip reports have been reviewed and commented on by the plants, so none of

that has been incorporated into the briefing package.

The observation was made by an industry participant that the NSPS is a good example of co-control of HAPs by a VOC control. There was discussion of whether controls installed by facilities required to do this by NSPS will go into MACT floor determination for all facilities? Paul Almodóvar replied that these will go into the MACT determination for facilities in the polymeric coating preliminary subcategory.

Paul Almodóvar clarified that the function of the PMACT determination is to give guidance to States for new sources which are required to install best control. He noted that new sources will be required to install NSPS anyway, so NSPS may well be "best control" for MACT purposes.

Other Operations Determined to be Potential HAP Sources from Information in ATMI Survey (Page 17 of 18)

Steve York noted that there were at least two facilities in the ATMI survey who were close to being major sources based on their spot cleaning emissions. Therefore, spot cleaning will be evaluated by the MACT team as a possible affected source that should be subject to requirements under the MACT standard. Paul Almodóvar remarked that you cannot install a control device for spot cleaning; any requirements would have to be in the form of compliant compounds for use as spot cleaners or work practices.

A participant asked about the accuracy of the reference on page 17 of the briefing document to trichloroethane. [A check of the ATMI survey data after the meeting revealed that the compound should be 1,1,1 trichloroethane (methyl chloroform).] Paul D'Andries related that some freons are being used for spot cleaning. Paul Almodóvar stated that the freons are not listed as HAPs.

Regarding the statement in the briefing document that the ATMI survey had no respondents for flame laminating or other laminating, David Dunn clarified that there were flame lamination facilities in the raw survey data, but these were factored out of the ATMI summary because flame lamination is covered by a different MACT standard.

Paul Almodóvar noted that lamination is a cross cutting issue for the coating MACTs. EPA is looking into whether they should address lamination of different substrates on a piecemeal basis or as one big effort.

Technical Issues (Page 18 of 18)

Steve York asked for definitions from ATMI. David Dunn noted that before the survey was sent out, ATMI had many discussions about definitions. Steve York clarified that the MACT team needs definitions in terms of: (1) function of process, and (2) a clear definition of where the process begins and ends. The MACT team will try to work with the Subpart VVV definitions for polymeric coating of supporting substrates.

David Dunn asked for a list of terms for which the MACT team needs definitions. The MACT team will provide a list to ATMI. Chip Moore inquired whether all the industrial fabrics trade associations have been contacted. Steve York replied that he had spoken to the Industrial Fabrics Association International in June and had notified them of the meeting; one representative of an industrial fabrics firm, Jim Pruitt was present at this meeting. In addition, 3 representatives of tire companies attended or participated by phone.

Jim Pruitt observed that calendaring represents a significant market segment that is not represented at the PMACT meeting. He offered that these firms generally apply polymeric coatings like vinyl, polyethylene, and urethane. He will try to get a list of trade associations that EPA should contact. Paul Almodóvar said that EPA will need a separate meeting for coaters. Mr. Pruitt will have the trade association contact Steve York .

With regard to emissions estimation techniques, Steve York submitted that there are no published emission factors available for most textile processes and that the factors that are available, such as for printing, are outdated. Information obtained from site visits and the review of the ATMI survey results show that firms are using very different techniques to estimate their emissions. Paul Almodóvar stated that EPA needs to develop/document consistent and reasonable approaches to estimating HAP emissions, including emissions from wastewater.

Chip Moore asked if it would be possible to prioritize the processes that need more work on emission estimation techniques. David Dunn noted that there are major sources of emissions where we can just go with an easy approximation method (e.g., assuming 100% methanol emitted from slashing). Mr. Dunn further observed that preparation, dyeing, and finishing are the three areas where there have been the biggest range of estimation techniques. Steve York expressed concern with eliminating insignificant sources of emissions from the development of emissions estimation techniques, since all sources must be accounted for in making major source determinations.

Paul Almodóvar stated that there probably will be an EPA budget for emission testing to corroborate mass balance efforts. David Dunn objected that often the results of stack testing do not correlate well with engineering calculations. In textile processing, stack tests can be extremely variable from day to day, and from facility to facility. Chip Moore suggested that glycol ethers might be a good area to do these tests, and to build on the CCACTI study. Mr. Moore questioned whether testing is needed for formaldehyde. David Dunn suggested that if a compliant coating approach is used for formaldehyde, stack testing would be unnecessary. The industry participants agreed to keep emission testing open as an option for developing and refining emission estimation techniques.

Chip Moore asked if EPA had worked on MACT standards for any industry that would allow the use of a compliant coating that would result in major source emissions. Paul Almodóvar responded that, yes, use of a compliant coating could still result in major source emissions. Mr. Almodóvar noted that the wood furniture MACT rule provides a gallons per month limit on HAP

input to the process. Thus, even if a source's potential to emit makes it a major source, the rule would allow a source to be minor for HAPs if this gallons/time limit is written into its permit. Paul Almodóvar also clarified that if a source is major for Title V on basis of criteria pollutants emitted from the boiler, such as VOC or NOx, it is not automatically also major for HAP.

Ron Beegle submitted that HAP emissions from finishing operations will depend on the type and number of 10 to 12 different finishes applied and the HAP content of each finish. Mr. Beegle asked how HAP emissions would be limited? Paul Almodóvar answered that a limit could be established based on reformulation of finishes. This could be done in terms of pounds of HAP per gallon of solids, or in terms of HAPs per product output. Gary Moore noted that, regardless of compliant finish requirements, the firm whose customer requires a softener, a flame retardant, and a waterproof finish will be emitting far more HAPs than the firm whose customer just requires the softener. Mr. Beegle also asserted that putting a limit of "percentage HAPs in a mix" will be difficult to comply with. He suggests subcategorization to deal with this variability. David Dunn replied that this could also be handled as different options within a single subcategory.

Ron Beegle submitted that emissions resulting from dye chemicals vary according to where the chemicals are introduced in the dyeing process. Gary Moore further noted that a single dye bath can be used to dye a variety of shades of the same color (e.g., from navy blue to pastel blue). Therefore, the emissions from dye baths using identical chemistry will vary depending on whether deep or pastel shades are being produced. Mr. Moore articulated a deep fear that the MACT floor will be set based on 12% of manufacturers who are only dyeing pastels. Mr. Moore also stated that in Massachusetts, the state set limits on dyebaths by taking an average concentration of dyestuffs, but there's no such thing as an "average" dyebath. The textile industry runs what the market orders, making it difficult to average out HAP content. He also suggested that setting the MACT floor at the average of the "best" 12% may be basing the floor on the least sophisticated facilities that are not running sophisticated dyes and finishes.

Bob Zerbonia recommended that the industry carefully consider what type of standard format they could live with, and what regulatory formats would be very difficult to comply with. Gene Roberts asked the related question that if, for example, 5 HAPs are emitted from a process but one is totally dominant, would the regulation limit HAP or be specific to the major HAP of concern. Paul Almodóvar replied that the regulation will limit total HAP; it will not likely be specific to certain HAPS.

David Dunn asked for clarification about why a source cannot average across subcategories. Paul Almodóvar explained that because the subcategories have different MACT floors, averaging across them could allow sources to avoid meeting the MACT floor for their subcategory.

The issue of averaging period was raised; the industry considers the length of the averaging period as a key to developing reasonable compliance options. Participants noted that HAP emissions can vary a huge amount from season to season. One industry participant noted that his company buys in bulk and keeps an inventory for the plant, but does not track what goes to specific processes,

monthly averages, etc. Emissions for the plant can be estimated on an annual basis from the plant inventory records. Tommy Thompson noted that his company uses 7,000 different dye formulations, which created a tremendous burden in calculating an emission inventory.

Ron Beegle suggested that ATMI's subgroup come up with a list of options that they could live with. David Dunn submitted that defining emissions estimating techniques is going to be a key first step. He noted that the processes in the briefing package seem to be the only processes where significant HAP emissions have been identified by the MACT team, and therefore that other processes will not be considered by this MACT rulemaking, at least as far as ATMI members are concerned for the purpose of documenting emissions estimating techniques.

V. Action Items

- The MACT team will provide a list of terms to ATMI for which definitions are needed.
- The ATMI will provide the MACT team definitions in terms of: (1) function of the process, and (2) clear definition of where the process begins and ends.
- The ATMI will provide emissions estimating techniques for each of the basic textile manufacturing processes identified in the briefing document as known HAP emission sources for EPA review.
- The MACT team will look for more information about the non-woven/chemical manufacturing process and thread manufacturing.
- The MACT team will contact trade associations recommended by the Industrial Fabric Association International to identify more polymeric coating stakeholders.
- The MACT team will evaluate emissions tests results of the JHK fume oxidizer used to control opacity from a tenter frame at a plant in western North Carolina.
- The MACT team will further evaluate available emissions test results from heat-setting on Suessens.
- The MACT team will make additional efforts to bring other relevant groups (stakeholders) into the MACT process as soon as possible.

ATTACHMENT 1

ATTENDEE LIST
SECOND PMACT MEETING FOR FABRIC PRINTING, COATING, AND DYEING

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Attachment 2

A G E N D A

Second PMACT Meeting for
Fabric Printing, Coating, and Dyeing
September 4, 1997

Topic	Lead	Time
Introduction and PMACT Status	**P. Almodovar**	**Noon - 12:10 p.m.**
Preliminary Subcategories	**S. York**	**12:10 - 12:30 p.m.**
Known HAP Emission Sources and Controls	**S. York**	**12:30 - 2:00 p.m.**
• **Process description, equipment, and chemicals**		
• **HAP emission sources**		
• **HAP emission controls**		
• **Pollution prevention opportunities**		
Break		**2:00 - 2:15 p.m.**
Technical Issues	**P. Almodovar/S.York**	**2:15 – 3:30 p.m.**
• **Definitions** **Processes with potential HAP emissions** **Equipment and chemicals**		
• **Emission estimation techniques** **Potential to emit** **Actual emissions** **Emissions from wastewater** **Emission testing**		
• **Monitoring requirements** **Purchase records** **MSDS** **Averaging periods**		
Questions and Comments		**3:30 - 4:00 p.m.**

ATTACHMENT 3

Second Round Table Meeting

PRESUMPTIVE MACT FOR FABRIC PRINTING, COATING, AND DYEING

EMISSION STANDARDS DIVISION
OFFICE OF AIR QUALITY PLANNING AND STANDARDS
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, N.C.

September 4, 1997

PURPOSE

- Review the PMACT status
- Discuss scope of source category
- Define preliminary subcategories and affected sources
- Discuss process descriptions, equipment, and HAP emission sources
- Identify preliminary control options
- Discuss technical issues

GOALS BY OCTOBER 1997

- Understand industry processes that are HAP emission sources
- Identify HAP emissions points
- Identify/involve representatives for each industry segment
- Determine scope
- Locate major HAP emission sources
- Identify existing controls
- Identify issues/develop plan for resolving

PRELIMINARY SUBCATEGORIES

- Basic textile manufacturing
  - SIC Major Group 22- Textile Mill Products with the exception of:
    - * SIC Industry Group No. 227- Carpets and Rugs; and
    - * SIC Industry No. 2295- Coated Fabrics, Not Rubberized).

- Carpets and rugs
  - SIC Industry Group No. 227

- Polymeric coating of supporting substrates
  - SIC Industry Nos. 2295 Coated Fabrics, Not Rubberized
  - SIC Industry Nos. 3069 Fabricated Rubber Products, NEC

- Other industry groups?
  - Hosiery (largest hosiery plant in the US has potential process air toxic emissions of 1.5 TPY, most of which are acetic acid and ammonia. Regulatory subgroup consensus is that hosiery manufacturing should not be covered by the MACT standard.)

- Narrow fabrics (same processes as broadwoven fabrics)

- Tire cord and fabrics (biggest HAP emission source believed to be polymeric coating of supporting substrate - polyester and nylon fabric)

-Non-woven (adhesive, chemical):
In the ATMI survey, 5 facilities reported that they were manufacturing non-woven fabric using an adhesive/chemical process. No controls are being used at any of these facilities. At least one facility reported greater than 3 TPY of methanol emissions (actual) and smaller quantities of other HAPs.

KNOWN HAP EMISSION SOURCES AND CONTROLS

! Basic Textile Manufacture

Slashing: Description: Slashing or sizing is the application of a chemical sizing solution to warp yarns prior to weaving to protect against snagging or abrasion that could occur during weaving.

Equipment and chemicals:

- Sizing is done on a large range called a slasher using pad/dry techniques.

- Yarns are dried over hot cans or in an oven.

- The three main types of size currently used:
  * natural products (starch)
  * fully synthetic products (e.g., PVA)
  * semi-synthetic blends (e.g., modified starches and carboxymethyl cellulose or CMC).

HAP Emission Sources:

- Methanol from PVA size, typically applied to synthetics
  * from the size cooking operation;
  * and/or from the slashing or sizing process itself

- Natural fibers
  * no HAP emissions

Controls:

- No air emission control technologies are being used for slashing operations.

- Reducing methanol content in PVA [methanol contents less than 1% or possibly less than 0.5%; ATMI notes that it is likely that ATMI survey results probably reflect use of much higher methanol content PVA (1-2%)]

P2: QC measures include preparing correct quantities of size, proper selection of size mix, scheduling runs, eliminating unnecessary additives, avoiding leaks and spills, etc. During desizing operations, PVA can sometimes be recovered for reuse, although this is feasible only in integrated mills (where both sizing and desizing operations take place) and is not feasible when size blends are used. Recovered PVA contains no methanol.

Preparation:

Description: Several steps that may be taken to clean or prepare the fabric prior to dyeing including

* desizing (woven only)
* scouring
* heatsetting (synthetics and blends)
* bleaching
* mercerization (optional)

Equipment and chemicals:

- Heatsetting - semi-contact oven or tenter frame, no chemicals applied

- Desizing, scouring, bleaching - various types of washers and steamers, chemicals vary from a simple warm water wash or use of surfactants, chelates, alkali, and oxidizing agents to solvent scouring (very uncommon).

- Mercerizing - mercerizer, chemicals used are NaOH and surfactants.

- Drying - ovens, tenter frames.

HAP Emission Sources:

- According to the ATMI survey results, bleaching and heat-setting (and 'other' preparation operations like desizing and merceizing) are the preparation steps that have the potential for major HAP emissions.

- Dryer stacks (from tenter frames) and curing ovens used for drying and heat-setting operations. The pollutants will vary widely according to the type of substrate, the end product, and desired properties of the end product.

- Possible HAP in both solvent and non-solvent scours include:

* 1,4 dioxane
* formaldehyde

- Companies doing heat-setting report emissions of greater than 1 TPY of:
    * methanol
    * formaldehyde
    * glycol ethers

- Companies using 'other' preparation steps report emissions of greater than 5 TPY of glycol ethers used for desizing and mercerizing.

- According to the ATMI survey, small amounts of various chemicals such as formaldehyde, vinyl acetate, etc. are emitted in the bleaching step. Higher emissions (over or around 10 TPY) are reported for glycol ethers and methanol.

- Though a few facilities reported large HAP quantities as part of bleaching, it is likely that those emissions better fit in the solvent scouring category. According to ATMI, this error could have occurred as it is often difficult to segregate the different preparation steps since they are typically done sequentially.

Controls:

- According to the ATMI survey, most facilities do not use any air emission controls during preparation steps.

- Most of the controls that are employed are used to control particulate emissions (mists/opacity) from tenter frames, since most States have opacity standards. (No HAP control)
    * fabric filters
    * demisters
    * scrubbers
    * cyclones
    * wet ESPs

- A small number may use incinerators/afterburners in the heat-set or 'other' operations categories.

P2: QC measures include chemical dosing systems and automated mix kitchens to optimize chemical use.

Dyeing: Description: Textiles are dyed using continuous and batch processes. May take place at any of several stages in the manufacturing process (i.e., fiber, yarn, or fabric).

Equipment and chemicals:

- Most of the batch dyeing is being done using pressurized machines such as package or jet dye machines.

- Almost all the continuous dyeing was reported as being done at atmospheric pressures, such as by skein or continuous dyeing.

- Drying - ovens, tenter frames.

- In the ATMI survey, most companies reported dyeing temperatures ranging from 100 - 400 degrees F.

HAP Emission Sources:

- HAP emissions will generally be from dryer stacks (from tenter frames) and curing ovens used for drying operations.

- Pollutants will vary widely according to the type of substrate, the end product, and desired properties of end product.

- All HAP emissions reported for continuous fiber dyeing, batch fiber dyeing, and batch yarn dyeing were less than 1 TPY.

- Higher emissions were reported for continuous yarn and fabric dyeing, and batch fabric dyeing.

- Types of emissions reported in quantities greater than 1 TPY include:
    * ethylene glycol
    * formaldehyde
    * glycol ethers
    * 1,2,4 trichlorobenzene
    *biphenyl

        + ATMI stressed that the issue of glycol ethers needs to be addressed since these chemicals are highly soluble, biodegradable, and have low vapor pressure. These properties, according to ATMI, make it likely that the majority of glycol ethers remain in the wastewater (depending on the temperature of the dye liquor) and biodegrade within 3 days, thus making most of the current estimates of glycol ethers air emissions highly inflated.

Controls:

-According to the ATMI survey, most companies are not using any controls on dyeing processes, especially for dyeing fiber, where only a demister may be used.

- For processes other than dyeing fibers, controls include demisters, cyclones, scrubbers, fabric filters, etc. to control particulate emissions (mists/opacity). Most States have opacity standards.

- No incinerators/afterburners were reported to be in use.

- According to the regulatory subgroup, many facilities are converting from atmospheric dye ranges to pressure dye becks, thereby greatly reducing emissions.

P2: Limited information available on dyes that use toxic carriers and whether substitutions are possible. QC measures include chemical dosing systems and automated mix kitchens to optimize dye use, low bath-ratio dyeing systems, and dyebath reuse. These measures have been designed to deal with water pollution problems, but can reduce air emissions through reduced chemical use/substitutions too.

Printing: Description: Color and patterns, usually in the form of a paste, are applied to fabrics using a variety of techniques of which rotary screen printing is the most commonly used, with pigments being the most common dye class used. Fabric is treated with steam, heat, or chemicals to fix the color. (Dyeing is preferred for solid patterns or simple patterns).

Equipment and chemicals:

- Printing range (variations in equipment and techniques).

- Chemicals used are:
  * pigments (most common)
  * dyestuffs
  * auxiliaries (such as softeners, thickeners, cross-linking agents)

HAP Emission Sources:

- HAP emissions depend on printing technique and chemicals used.

  * solvent-based print pastes - however these have almost completely been replaced by polymeric thickeners (a small organic

solvent percentage - 2% - may be needed to produce the correct rheology)

* use of oil-water emulsion systems as thickeners and some specialty print shops still use solvent-based printing inks. Urea-formaldehyde crosslinking agents can also be used.

- HAP emissions come from application, drying, and curing operations.
  * glycol ethers
  *ethyl benzene
  * ethylene glycol
  * formaldehyde
  * vinyl acetate
  * xylene

-HAP emissions from all printing operations reported in the ATMI survey are less than 5 TPY for all HAPs.

-Cleaning operations (machine cleaning and screen cleaning) are another potential source of HAP including:
  *xylene
  *ethylbenzene.

Controls:

- Some States have VOC content limits based on the CTG for vinyl coating, which refers to any printing or decorative topcoat applied over vinyl coated fabric or vinyl sheets. The CTG recommended limitation is 0.45 kg VOC/ liter of coating (minus water).

- No regulatory subgroup participants knew of the use of any emission control equipment.

- The ATMI survey results reveal that there are no HAP emission controls used.

P2: Color shop practices and print paste handling techniques and possible substitutions for cleaning operations. Print paste HAP limits. Use of polymer print pastes (not varsol based, e.g., synthetic polymers similar to those used for warp sizes) and other nonvolatile alternatives. Various P2 options and emerging technologies for reducing water pollution and chemicals used, such as ink jet printing and transfer printing.

Finishing: Description: Finishing encompasses any of several mechanical (e.g., texturizing, napping) and chemical processes (e.g., optical finishes, softners, urea-formaldehyde resins for crease resistance) performed on fiber, yarn, or fabric to improve its appearance, texture, or performance. The ATMI survey had two categories - one for dry finishing and the other for wet finishing.

Equipment and chemicals:

- Wet finishing can be done on a continuous finishing range (pad and tenter frame). Various chemicals are used.
    * Fabric is passed through an oven after treatment to drive off water and activate/cure finishing chemicals.

- No chemicals are used in dry finishing

HAP Emission Sources:

- Specific chemical finishes may be released during application and during drying and curing operations.

- In the ATMI survey, facilities reported several different HAP emissions in the wet finishing category. HAP emissions in quantities greater than 1 TPY include:
    * 1,2,4 trichlorobenzene
    * biphenyl
    * diethylene glycol
    * ethyl acrylate
    * ethylene glycol
    * formaldehyde
    * methanol
    * polyethylene glycol
    * styrene
    * tetrachloroethylene
    * triethylamine
    * xylenes.

- In the ATMI survey, most HAP emissions from dry finishing were in quantities less than 1TPY, except for one facility reporting high releases of 1,2,4 trichlorobenzene.

- Other potential HAP sources include spot removers and machine cleaning solvents.

- All companies, other than two or three exceptions, report doing finishing operations at atmospheric pressures. Temperatures range anywhere from below 100 degrees F to over 400 degrees F, both for wet and dry finishing.

Controls:

- According to ATMI survey results, the majority of companies (performing both for dry and wet finishing operations) do not control emissions.

- Some companies doing wet finishing use wet and dry ESPs, demisters, fabric filters, and scrubbers and some facilities use thermal oxidizers (both with and without heat recovery).

- States do not have special requirements for finishing operations other than opacity limits.

P2: According to ATMI, the industry has made a lot of efforts to reduce amount of free formaldehyde in resins, however good substitutes that do not adversely affect the quality of the product are difficult to find. Formaldehyde contents can vary anywhere from 3/10 % for light weight fabrics to 4% by content for heavy fabrics (melamine-formaldehyde resins), and there is a lot of variability in types of resins. Formaldehyde itself does not affect the product, however it does affect the properties of the resin itself (manufacturing).

! Carpet and Rug

Heat-setting:

Description: Carpet manufacture involves various mechanical processes, as well as heat-setting and dyeing. Heat-setting is a process for stabilization of carpet yarns by exposure to heat. Not all yarn is heat set (just cut pile).

Equipment and chemicals:

- Three heat setting methods classified by type of equipment used
    * Superba
    * Autoclave
    * Suessen.

HAP Emission Sources:

- According to the Carpet and Rug Institute (CRI), there are HAP emissions only from the Suessen heat setting method.

    * Only substance thought to be emitted is caprolactam, which has

been removed from the HAP list.

* Evaluating test reports supplied by the Georgia DNR of 2 VOC emissions tests for heat-setting.

Dyeing: Description: The dyeing process imparts color to the carpet. Finishing is done after tufting, weaving, and dyeing and includes various mechanical (shearing, brushing) and chemical (application of soil retardant and antistatic chemicals) processes. Carpets can also be printed using processes similar to those for paper and fabric.

Equipment and chemicals:

- Dye beck
- Continuous range
- Jet dyeing equipment

HAP Emissions:

- Of 27 carpet mills in Georgia that submitted Title V permit applications, only 5 mills are major for HAP emissions.

- According to a Georgia DNR regulatory subgroup participant, one of the 5 plants reported biphenyl emissions from dyeing and another plant reported glycol ether emissions.

Backcoating:

Description: Backcoating is considered part of the finishing processes in carpet manufactuirng. The typical components of the carpet are the face yarn, below which are the primary backing and the secondary backing, separated by a layer of adhesive (CaCO3/Latex). Secondary backings are reinforcing fabrics laminated to the back of carpets, usually with a latex adhesive, to enhance dimensional stability, strength, stretch resistance, etc. The backcoating helps adhere carpet components to one another and is done subsequent to the tufting process. Secondary backings are typically woven jute and Polypropylene (PP). The primary backing (usually PP) is different from secondary backing, and is a component of tufted carpet consisting of woven and nonwoven fabric into which pile yarn tufts are inserted.

Equipment and chemicals:

- Performed on a continuous range.

*Latex, a compound consisting of natural or synthetic rubber (typically, SBR), is applied to the secondary backing by pad, the secondary and primary backings are "married" by squeeze roller, and the carpet is dried in an oven. Carpet latex laminating

compounds and foams contain large amounts of fillers - a common one is powdered calcium carbonate.

HAP Emission Sources:

- Methanol emissions can result from its use as a latex thickener.
  *According to a Georgia DNR regulatory subgroup participant, at least 3 plants that are major for HAP emissions report methanol emissions from thickener.

Controls: No emission controls are known to be in use.

P2: Methanol content in thickener is being reduced or eliminated by suppliers. According to a regulatory subgroup participant, the industry is shifting to 2 different latex backings. One has no methanol, but contains from 5 to 6% ethanol, resulting in an increase in VOC emissions. The second has 0.5% methanol, resulting in decreased HAP and VOC emissions. ATMI survey results did not have a separate category for backcoating - results for backcoating operations would probably be included in the solvent/non-solvent coating operations categories.

! Polymeric Coating of Substrates

Coating operations:

Description: A specialized chemical finishing technique designed to produce fabric to meet high performance requirements - for end products such as tents, tire cord, roofing, soft baggage, marine fabric, etc. The distinction between coating and laminating is that coated fabrics are true composites (e.g., a plastic film on the textile), whereas laminating involves tacking together two or more pre-formed layers. A distinction between coating and slashing is that although slashing does involve putting a coating of size on the yarn, the coating is not permanent.

Equipment and chemicals:

- Coating range using one of several different types of applicators:
  *calanders
  * knife coating
  * roller coating

- Different types of chemicals are applied depending on end use:
  * vinyl
  * urethane
  * teflon

* flame resistants (e.g., DMDHEU)

- In conventional systems, latex or other synthetic polymers, in an organic solvent medium, are sprayed on the cloth, and the solvent evaporates, leaving behind the coating.

HAP Emission Sources:

-Solvent-based coating systems are expected to be the largest sources of HAP emissions.

* application
* drying/flashoff
* mix preparation.

- HAP emissions are reported in the ATMI survey at facilities doing both solvent-based and water-based coating.

* facilities doing solvent-based coating report:
    + MEK
    + methylene chloride
    + methyl isobutyl ketone
    + toluene
    + xylene
    + vinyl acetate
    + vinyl chloride
    + toluene

*facilities doing water-based coating report:
    + ethyl acrylate
    + ethylene glycol
    + formaldehyde
    + glycol ethers
    + methanol
    + phenol
    + styrene
    + vinyl acetate
    + xylene

- At least one facility doing water-based coating reported emissions of toluene (>100 TPY), which could be an error (actually for solvent-based coating?)

- All facilities, with one exception, report doing coating operations at atmospheric pressures and typically at drying/curing temperatures greater

than 300 degrees F

Controls:

- Many States have specified VOC content in coatings; typically based on the CTG [0.35 kg VOC/liter of coating (minus water)].

- Coaters also have the option to use emission control equipment such as thermal incinerators, condensers, and carbon adsorption systems to reduce emissions by 81% (90% capture and 90% efficient control device) , although the former method is probably more common.

- The best controlled facilities are believed to be those subject to NSPS (40 CFR part 60, subpart VVV). The NSPS requires reduction of VOC emissions by 90% or total enclosure vented to a 95% efficient control device.

- The ATMI survey shows that most facilities, both those doing water-based and solvent-based coating, are not using any controls.

- The types of controls reported in the ATMI survey that are used include wet ESPs, fabric filters, demisters, thermal oxidizers (with and without heat recovery), catalytic oxidizers, carbon adsorption units, and others.

P2: HAP content in coatings. Water-based systems in place of solvent-based systems, where possible. Powder coating technology (emerging technology).

! **Other Operations Determined to be Potential HAP Sources from Information in ATMI survey**

Spot cleaning:

Various facilities reported emissions from spot cleaning operations of greater than 1 TPY for HAPs such as dichloromethane, methyl chloroform, tetrachloroethylene, and trichloroethane. However, emission quantities varied widely. According to ATMI, better quality control can significantly reduce use of spot cleaners and associated emissions. At least three facilities reported that the operation was being phased out and one facility reported that they were investigating alternatives to the spot cleaners currently in use. Most facilities are not using any kind of controls with spot cleaning operations although at least three facilities reported using an unidentified air emissions control device.

Other: The ATMI survey had no respondents for flame laminating, other laminating.

TECHNICAL ISSUES

- Definitions
  Processes with potential HAP emissions
  Equipment and chemicals

- Emission estimation techniques
  Potential to emit
  Actual emissions
  Emissions from wastewater treatment
  Emission testing

- Monitoring requirements
  Purchase records
  MSDS
  Averaging periods

ATTACHMENT 4

Available on request from Paul Almodóvar (919) 541-0283 or Steve York (919) 990-8629.