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Economic Analysis for the Final Rule to Exclude Closed and Controlled Processes from the PCB (Polychlorinated Biphenyls) Ban Rule

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ECONOMIC ANALYSIS FOR THE FINAL RULE TO EXCLUDE CLOSED AND CONTROLLED PROCESSES FROM THE PCB BAN

by

Amy Moll
Economics and Technology Division

OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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This report updates and revises the Cost Analysis for the proposed rule to exclude closed and controlled processes from the PCB ban.

16. Abstract (Limit: 200 words)

In May, 1979 EPA promulgated the original PCB ban rule, which permitted the manufacture, processing, distribution, and use of PCBs in concentrations less than 50 ppm. The Court remanded the rule to EPA because EPA did not present sufficient evidence to justify the 50 ppm cut-off decision. The Court ordered that a rule dealing with the incidental generation of PCBs in closed and controlled manufacturing processes be promulgated by October 13, 1982. EPA is promulgating a final rule which excludes closed and controlled processes from the PCB ban. This report estimates the costs and benefits of the final rule as well as the other regulatory alternatives considered by EPA.

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EXECUTIVE SUMMARY

EPA is promulgating a final rule to exclude certain closed systems and controlled waste processes from the PCB ban rule where only minute quantities of PCBs are released into products, air, or water streams. The purpose of this paper is to estimate and discuss the incremental costs and benefits associated with this exclusion rule as well as the other alternatives considered by EPA.

In May, 1979 EPA promulgated the original PCB ban rule which permitted the manufacture, processing, distribution, and use of PCBs in concentrations less than 50 ppm. The Court remanded the rule to EPA because EPA did not present sufficient evidence to justify the 50 ppm cut-off decision. Since the effect of this remand would have been to ban all PCBs, including those generated in very minute concentrations, serious disruptions could have resulted. Therefore, the Court granted a stay of the mandate until October, 1982, and has since extended the stay until December, 1982. Until that date the May, 1979 rule remains in effect. The Court ordered that the PCB rule dealing with the incidental generation of PCBs in closed and controlled manufacturing processes be promulgated by October 13, 1982.

This paper discusses four options for regulating PCBs incidentally generated in closed or controlled processes. The first option is the use of the exemption petition process. This option is used as the baseline against which to measure the costs and benefits of the other three options, i.e. zero costs and benefits are implicitly associated with this alternative. The second alternative considered is one in which EPA would only require that theoretical assessments be made of the level of PCB release from a process. The third alternative considered is the one chosen by EPA for this final exclusion rule. Under this rule EPA has given companies the option of doing either a theoretical assessment or testing for self-certification. EPA will hold companies to a standard of proof achievable through the recommended testing. Under the fourth alternative only testing would be acceptable for self-certification.

The estimates of the incremental costs and benefits of this exclusion rule are presented in Summary Table 1. It should be noted that these estimates are subject to a great deal of uncertainty for the following reasons:

1. Uncertainty over the appropriate baseline from which to measure costs and benefits - Since EPA has not established a policy for dealing with exemption petitions, there is uncertainty over the appropriate baseline from which to measure incremental costs and

benefits of any exclusion policy. For purposes of this analysis EPA has assumed that exemption requests for PCBs generated in closed/controlled processes would be granted.

2. <u>Uncertainty over the number of processes affected</u> - Since only rough estimates have been made of the numbers of processes which might be affected by this rulemaking the total cost estimates are very uncertain.

Table 1: Summary Table: Aggregate Incremental Benefits and Costs for Final EPA Exclusion Rule for Closed/Controlled Processes

	Number of processes affected: 51 processes	175 processes
<u>Benefits</u>		
INDUSTRY:		
Exemption petition cost savings	\$5.8m-\$45.9m	\$20.0m-\$157.5m
Costs saved by not having to alter or cease production*	---	---
Added certainty*	---	---
EPA:		
Petition processing savings	\$2.6m	\$8.9m
Total	\$8.4m-\$48.5m	\$28.9m-\$166.4m
<u>COSTS</u>		
INDUSTRY: Self-certification costs		
-Sampling Testing/Theoretical Calculation	\$6.1m-\$8.6m	\$20.8m-\$29.7m
-Recordkeeping	\$.04m-\$.14m	\$.14m-\$.47m
-Reporting	\$.03m-\$.09m	\$.09m-\$.32m
EPA		
-Report Review	\$.01m-\$.02m	\$.03m-\$.70m
-Enforcement*	---	---
Total	\$6.2m-\$8.9m	\$21.0m-\$31.2

*For purposes of this analysis these costs have not been quantified.

3. <u>Uncertainty over component costs</u> - Estimation of the unit costs which will make up the total cost of any policy is difficult since this testing is not commonplace; since there was never a need to do such testing and monitoring before now, there is little or no historical basis for estimating testing costs.

Based on the estimates presented in Table 1, a conclusion can be drawn that the benefits of the exclusion policy -- which include avoidance of the costs of filing exemption petitions and/or of altering or ceasing production processes -- will exceed the costs imposed by requiring companies to self-certify to qualify for the exclusion.

I. INTRODUCTION

EPA is promulgating a final rule to exclude certain closed systems and controlled waste processes from the PCB ban rule where only minute quantities of PCBs are released. The purpose of this paper is to estimate and discuss the incremental costs and benefits associated with this rule and the other alternatives considered by EPA for PCBs generated in closed processes and processes in which all wastes go to an EPA-approved landfill or are incinerated in an EPA-approved incinerator.

A. Background

Section 6(e) of the Toxic Substances Control Act (TSCA) prohibits all manufacture, processing, distribution in commerce, and use of PCBs after July 1, 1979. EPA promulgated regulations under 40 CFR Part 761, published in the FEDERAL REGISTER, of May 31, 1979 (44 FR 31514), to implement section 6(e) of TSCA. The regulations excluded PCBs in concentrations less than 50 ppm from the 6(e) ban, thus permitting their continued manufacture, processing, distribution in commerce, and use.

The Environmental Defense Fund (EDF) petitioned the U.S. Court of Appeals for the District of Columbia Circuit to review three aspects of the PCB regulations, including the 50 ppm regulatory cut-off as it applies to the manufacturing, processing, distribution, and use of PCBs (EDF v. EPA, No. 79-1580). In an October 30, 1980 decision, the Court found that there was not substantial evidence in the record to support this 50 ppm regulatory cut-off. The Court remanded this portion of the regulations to EPA for further action.

The effect of the court's decision would be to make the manufacture, processing, distribution in commerce, and use of PCBs in concentrations below 50 ppm a violation of section 6(e) of TSCA unless an exemption petition for these activities is filed and approved by EPA. An exemption petition must demonstrate that 1) the company generating PCBs has made a good faith effort to develop substitutes for PCBs, and 2) that no unreasonable risk is attributable to the PCBs generated in process or released from the process. Requests for exemption can be granted for a maximum of one year, i.e. petitions must be refiled annually.

On February 20, 1981, EPA, EDF, and certain industry intervenors in EDF v. EPA filed a joint motion with the Court requesting an eighteen-month stay of the Court's mandate for the 50 ppm regulatory cut-off. During the period of the stay, EPA agreed to promulgate regulations relating to the manufacture, processing, distribution in commerce, and use of low levels of PCBs, beginning with the publication of two Advance Notices of Proposed Rulemaking (ANPRs).

First, EPA agreed to publish an ANPR requesting comments on the possible exclusion of PCBs from the section 6(e) ban when generation occurs in a closed or controlled manner which presents little or no risk to human health or the environment. These processes are the subject of this economic analysis. In the ANPR, closed manufacturing processes were defined as processes in which PCBs are generated, but from which no PCBs are released. Such processes generate PCBs within closed reaction equipment, and the chemical reactions within the processes destroy those PCBs continuously as they are produced. Controlled waste processes were defined in the ANPR as processes in which PCBs are generated, and from which PCBs are released only as constituents of wastes which are either incinerated in EPA approved incinerators, disposed of in EPA-approved PCB landfills, or stored for such disposal or landfilling.

Second, EPA agreed to publish an ANPR requesting information on the manufacture, processing, distribution in commerce, and use of PCBs in low concentrations which might present risk; i.e. activities that are not considered closed or controlled. This rulemaking is only discussed here as it affects the closed/controlled manufacture rulemaking.

On April 13, 1981, the Court granted the requests of the joint motion and entered an order. The text of the Court's order is set forth in the FEDERAL REGISTER of May 20, 1981, along with EPA's two ANPRs on the 50 ppm regulatory cutoff (46 FR 27615; 46

FR 27617; 46 FR 27619 respectively). The Court's April 13, 1981 order stays the mandate of the court, and leaves the 50 ppm regulatory cutoff in place until October 13, 1982. The Court recently extended the stay to December 1, 1982. The effect of this order is that the regulations promulgated on May 31, 1979, regarding the 50 ppm regulatory cutoff, remain in effect for the duration of the stay. Therefore, persons manufacturing, processing, distributing in commerce, and using PCBs in concentrations less than 50 ppm may continue these activities until December 1, 1982. EPA intends to request additional stays of the mandate beyond that date. The Court's order requires EPA to promulgate a final rule for closed manufacturing processes and controlled waste manufacturing processes by October 13, 1982.

B. The Magnitude of the Incidental Generation[1] Problem

The magnitude of this incidental generation of PCBs has been documented by the Chemical Manufacturers Association (CMA) (A Report of a Survey on the Incidental Manufacture, Processing, Distribution, and Use of Polychlorinated Biphenyls at Concentrations Below 50 PPM), and by Versar, Inc.. Both CMA and Versar have estimated the number of processes in which PCBs are incidentally generated in concentrations less than 50 ppm. Versar has also made rough estimates of the extent to which PCBs are incidentally generated in concentrations greater than 50 ppm

[1]The term "incidental generation" refers to inadvertent production of PCBs (e.g., as by-product or impurities) in manufacturing processes for other end-products.

using information gathered from exemption petitions. (Versar Materials Balance Information on Inadvertently Generated PCBs) A list of end-products of manufacturing processes in which PCBs are incidentally generated is given in Appendix A.

The survey conducted by the Chemical Manufacturers Association (CMA) provided data which indicate that 26 chemical firms (of 85 respondents to the survey) generate approximately 13,800 pounds of PCBs in 135 manufacturing processes where the in-process concentration of PCBs is less than 50 ppm. An estimated .69 pounds of PCBs are reportedly generated in 4 closed manufacturing processes, and approximately 6,900 pounds of PCBs are generated in 40 controlled waste manufacturing processes. CMA does not give its criteria for closed and controlled waste manufacturing processes with these estimates. 97.5% of the PCBs generated in controlled waste processes are reportedly incinerated, and 2.5% are disposed of in EPA-approved chemical waste landfills (CMA 1981). The 85 chemical firms responding to the CMA survey represent 37.6% of industrial chemical sales. However, since these 85 firms represent a large percentage of basic industrial chemical sales, and since incidental generation of PCBs is most apt to occur in that industry segment, CMA assumed that most of the incidentally generated PCBs are accounted for by these 85 surveyed firms. The CMA went on to estimate that "up to thousands" of processes may generate PCBs in concentrations under 50 ppm. However, the justification for that estimate was not given.

Versar estimates that there are between 130 and 500 processes where the in-process concentration of PCBs is less than 50 ppm. (Versar 1982a) Of these, from 4 to 15 processes are considered closed, and generate a total of between .7 and 1.8 pounds of PCBs. Between 40 and 153 processes are considered "controlled waste processes", i.e. all wastes from these processes are disposed of in EPA-approved PCB landfills or incinerated in EPA-approved incinerators (i.e., PCB approved incinerators, certain RCRA approved incinerators, and EPA-approved high efficiency boilers). These "controlled waste processes" generate between 6,926 and 18,006 pounds of PCBs. The 87-332 "other than closed or controlled processes" generate from 6,856 to 17,830 pounds of PCBs (Versar 1982). (See Appendix B)

Data provided in the 26 manufacturing petitions for exemption from the May 31, 1979 rule were used by Versar to estimate 1) the number of processes in which PCBs are generated in concentrations greater than 50 ppm and 2) the total pounds of PCBs generated in those processes. Appendix B gives the breakdown of these exemption petitions in terms of numbers of processes that are closed, controlled, or uncontrolled, and in terms of the pounds of PCBs contained in such processes. Depending upon the ppm in-process limit, and on the "no-PCB" level used to define closed and controlled processes, more or fewer manufacturers and processes may be affected by the policies being considered. Assuming that 1) a "closed process" is defined as one in which "no PCBs" are released to air, water, and waste streams, and ≤50 ppm are released to products, and 2) a "controlled process" is defined as one in which "no PCBs" are released to air and water streams, ≤50 ppm are released to products, and all wastes go to EPA-approved incinerators or EPA-approved PCB landfills, then Versar estimates that among the submitters of exemption petitions there is one closed process generating an unknown amount of PCBs and six controlled processes generating at least 9,125 pounds of PCBs where in process concentrations of PCBs are greater than 50 ppm (Versar 1982). See Table 2 below.

Aggregating the estimates of the number of processes and associated poundage from the ≤50 ppm and ≥50 ppm categories, the total number of closed and controlled processes which may be eligible for the exclusion being considered is estimated to be between 51 and 175. The total number of pounds of PCBs generated annually in these processes is estimated to be between 16,051 and 27,131 pounds.

Table 2: No. of Closed, Controlled, and Other Processes by PPM Category

PPM Category	Closed	Controlled	Uncontrolled
<50 ppm	4-15	40-153	87-332
>50 ppm	1	6	19
Total	5-16	46-159	106-351

Source: Versar Inc., "Materials Balance Information on Inadvertently Generated PCBs", 1982.

C. Methodology

The incremental costs and benefits associated with this rulemaking are calculated against a baseline case of an immediate ban on all manufacture, processing, distribution and use of PCBs. The incremental costs associated with the exclusion options are considered 1) the additional health risks resulting from any exposure to PCBs from processes which would have been subject to the ban had they not been excluded, and 2) the additional costs incurred by manufacturers and EPA due to self-certification requirements imposed by EPA. The exposure risks will not be discussed here since a separate exposure analysis is being prepared by EPA. However, if the assumption is made that all manufacturers and processors subject to the ban would file exemption petitions if there is no exclusion rule, and that all such petitions would be granted without any conditions, then there would be no incremental costs in terms of PCB exposure in the short run. In the long run there might be additional costs in terms of PCB exposure since companies would be relieved of the annual exemption petition requirement that they make a "good faith" effort to develop PCB substitutes.

Incremental benefits are considered the savings which would accrue to: 1) companies which would be relieved of the burden of filing exemption petitions, altering processes, and/or ceasing certain production processes, 2) companies which would be relieved of the uncertainty resulting from the annual exemption process, and 3) government which would only have to review brief exclusion reporting forms rather than lengthier exemption petitions from companies whose processes had been excluded.

D. Organization of Report

Section II discusses the alternatives available to EPA for dealing with the incidental manufacture of PCBs, given the mandate of the Toxic Substances Control Act (TSCA). Section III discusses the generic costs of testing, recordkeeping, and reporting which might be incurred by industry under any exemption or exclusion policy. It also discusses the costs which would be incurred by EPA under such a policy. Section IV presents EPA estimates of the total costs and benefits of various exclusion policies.

II. ALTERNATIVES

The final exclusion rule will alleviate the burden of the PCB ban where little or no risk is posed by the generation of PCBs as a byproduct or impurity. EPA proposes to exclude from the PCB ban certain processes from which "no PCBs" are released into the air, water, or end-products, and from which all wastes are disposed of in EPA-approved landfills or EPA-approved incinerators. The rationale for the exclusion is that such processes pose a "de minimis", or trivial risk.

Since it is often impossible to totally prevent PCBs from escaping from a process, and since PCBs that may escape are often difficult to detect, EPA is proposing to issue guidelines on appropriate analytical techniques to use to detect and monitor PCB releases to air, water, and end-products of controlled waste processes at the practical limit of quantification. Since the actual minimum quantitatable level for a particular sample depends on the sensitivity of the detector, the amount of original sample extracted and condensed for analysis, and the extract and injection volumes, the practical limit of quantitation of PCBs is a function of the economic characteristics of each of the inputs to the analysis.

The major policy variables considered by EPA in developing the rule included the appropriate ppm cutoffs for PCB release to various media, the content of the test guidelines, and the associated recordkeeping and reporting requirements EPA would impose on industries. For example, EPA considered requiring that a company, in order to be eligible for exclusion from the ban, perform tests, and record and report test results, on a monthly, quarterly, semi-annual, or annual basis, or whenever significant process changes were made. In addition, EPA considered giving companies the option of making a theoretical calculation on the concentration of PCBs in their processes.

The rule being promulgated by EPA will exclude closed and controlled processes from the PCB ban as long as PCB releases to air, water, and end-products are at or below the practical limits of quantification. EPA has set these limits of quantification at 10 micrograms per cubic meter per resolvable gas chromatographic peak in air emissions, 100 micrograms per liter per resolvable gas chromatographic peak in water effluents, and 2 micrograms per gram per resolvable peak in an organic waste stream. In order to be eligible for the exclusion companies will have to certify that PCB releases from their suspect processes are at or below the limits of quantification. The certification can be made by testing and recording the results, or by making a one-time theoretical calculation showing that PCB releases will not exceed limits of quantification. The testing and/or theoretical calculation will have to be redone each time a firm's process changes significantly.

This report presents costs and benefits of four regulatory options. The cost and benefits of other options can be easily calculated using the tables given. The first alternative is the use of the exemption petition process to deal with all incidentally generated PCBs, including those in closed and controlled processes. Zero costs and benefits are implicitly associated with this alternative since it is used as the baseline against which to measure incremental costs and benefits of the other three alternatives.

The second alternative considered is one in which EPA would only require that a firm perform a theoretical calculation to certify that a suspect process qualified for the closed/controlled exclusion. EPA would not hold the firms to any stricter standards of proof than the theoretical assessment results to show that their process qualified.

The third alternative is the regulatory alternative chosen by EPA. That alternative requires that a firm with a suspect process perform a theoretical calculation and/or analytical testing to certify that their process qualifies for the closed/controlled exclusion. Under this regulatory strategy EPA will hold firms to a stricter standard of proof than under the second alternative to assure that PCB releases are below designated levels; EPA has set up a testing protocol which it will use for enforcement purposes--i.e. firms will be held to this standard of proof.

The fourth alternative is one in which EPA would require the testing described in the third alternative for <u>all</u> processes which attempt to qualify for the exclusion. In other words, under this regulatory strategy a theoretical calculation could not be used to certify a process for exclusion.

The incremental costs and benefits of each of the last three alternatives are calculated with and without a reporting requirement. Under each of these regulatory alternatives recertification would be required each time there was a "significant process change".

The greatest amount of uncertainty in calculating incremental costs and benefits is associated with the third alternative, i.e. the one chosen by EPA. Since firms have the choice whether to test or to perform a theoretical calculation the total impact will depend largely on how many choose each option.

Section III presents and discusses the component costs of each of these policy options as well as others considered by EPA. Section IV aggregates those costs and benefits over the applicable number of processes and over time to get a rough estimate of the total cost of each policy considered.

III. GENERIC COSTS OF SELF-CERTIFICATION, REPORTING, AND PROCESSING EXEMPTION PETITIONS

This section discusses and estimates the costs which would be incurred by industry and by EPA under various policy options. The costs of sampling, testing, recordkeeping, and reporting are considered. Most estimates are very rough; the problems encountered in making these estimates are discussed individually.

A. Sampling Costs

The costs of sampling each medium of release should be added to the costs of testing to calculate total costs of testing. The costs of gathering water and product samples are so small that they are assumed to be zero for purposes of this analysis. However, the cost of taking air samples from stacks is significant, so these have been included in the analysis.

The cost of gathering air samples for the testing recommended by EPA are estimated to be $32,770. This estimate includes the costs of sampling equipment preparation, site preparation, labor and overhead costs for a four man sampling crew working for 5 days, travel costs, and report writing costs. (See Appendix C)

B. Testing Costs

Estimating the costs of detecting and testing for incidentally generated PCBs is very difficult for a number of reasons. First, analytical techniques for such testing are still being developed. Second, the test protocol, and therefore the individual test costs, may be different for every process and product. Third, total testing costs may be different for each process because the sequential testing scheme recommended by EPA calls for 2-7 tests[1] to make each determination of the level of PCB release, and because the frequency of "significant changes" in processes (which require recertification) will vary from one process to another. The technical problems in detecting and measuring small quantities of PCBs in various media are discussed at length in a CMA study: The Analysis of Chlorinated Biphenyls (August 1981). Following is a list and brief discussion of the technical problems discussed in that CMA study:

1. Lack of chlorobiphenyl standards - The chlorobiphenyls which occur in chemical process streams are generated by chemical reactions which do not produce fixed patterns of isomers which can be used to identify the presence of chlorobiphenyls. Since the chlorobiphenyls are comprised of 209 individual chemical isomers, the analysis of chlorobiphenyls in process streams involves the difficult problem of having to detect, identify, and measure each

[1] The 2-7 tests should be done on samples which are each from a separate cycle in the manufacturing process.

isomer individually. The quantitative analysis of specific chlorobiphenyl isomers is hampered because standards necessary to calibrate analytical equipment are not commercially available for all of the isomers.

2. Matrix interference - Process stream analyses for incidentally generated chlorobiphenyls are severely inhibited by the matrix of other substances in which they are dispersed. The matrix interferes with the analysis by hiding the presence of chlorobiphenyls, by decreasing the sensitivity of the instruments to the presence of chlorobiphenyls, or by incorporating the chlorobiphenyls so that they cannot be extracted for analysis. These matrix effects make it difficult to develop appropriate analytical methods to detect and measure chlorobiphenyls in process streams.

3. Limits of quantification - The limit of an instrument's ability to reliably measure the quantity of chlorobiphenyls present in a process stream may be 3 to 3½ times greater than the limit of detection.

4. Analytical equipment limitations - Gas Chromatography (GC) with the electron capture detector (EC) and gas chromatography combined with mass spectrometry (MS) are the most suitable methods for the detection, identification, and measurement of chlorobiphenyls.

However, these instruments are limited in their ability to measure low levels of chlorobiphenyls, and both methods show variations in response to isomers within the same homolog, i.e. isomers with the same number of chlorine atoms. Also, the GC/EC increases in responsiveness, while the GC/MS decreases in responsiveness, as the number of chlorine atoms increases.

Although the CMA study points out several limitations in detecting incidentally generated PCBs, it now appears that, with sufficient resources for engineering research and development, it is technologically feasible to detect very low concentrations of PCBs in processes and products.

A number of variables are involved in estimating test costs. These are discussed above in the CMA study excerpts. They include:

1. the complexity of the matrix in which the PCBs are dispersed,
2. the type of testing equipment used,
3. the size of the sample tested (which also affects the limit of detection), and
4. the extent of sample extraction and "clean-up" required.

Depending on the combination of variables, the cost of an individual gas chromatography/mass spectrometry test for incidentally generated PCBs ranges from $120 - $770 per sample when sent to an outside lab (SRI 1982). These costs reflect both the direct costs of operating testing equipment, and the indirect costs to recover overhead expenses such as depreciation of capital equipment, maintenance costs, etc. The costs of testing for PCB releases in air ranges from $120 to $595 per sample. (This does not include the costs of collecting air samples.) The cost of testing for PCB releases in water ranges from $180 to $595. Testing for releases to products ranges from $122 to $770. See Appendix E for a description of sample products and associated extraction and clean-up requirements for testing.

Table 3 presents the one-time costs of testing for self-certification for each suspect process. Since the estimated test costs per sample span a fairly wide range, and since anywhere from two to seven tests will have to be performed on each medium of release, the range of total costs is very wide; total costs range from $840 to $13,720.

C. Costs Associated with Recordkeeping and Reporting for Self-Certification

The costs of recordkeeping and reporting associated with any exclusion policy will be dwarfed by the costs of testing and/or performing a theoretical calculation for certification. The costs of recordkeeping and reporting for self-certification are assumed to be the same for each of the exclusion options; i.e. the recordkeeping and reporting requirements are assumed to be the same as those specified by EPA in the final rule. The final

Table 3: One Time Costs of Testing for Self-Certification

No. of Tests Required on Each Medium of Release[1]	Air[2] $120-$595/Test	Water $180-$595/Test	Product $122-$770	Total
Two	$240-$1,190	$360-$1,190	$244-$1,540	$844-$3,920
Four	$480-$2,380	$720-$2,380	$488-$3,080	$1,688-$7,840
Seven	$840-$4,165	$1,260-$4,165	$854-$5,390	$2,954-$13,720

[1]The sequential sampling scheme specified in the EPA testing guidelines requires that 2-7 tests be done on each medium of release

[2]The costs of air sampling are not included here

Source: SRI 1982

rule requires that all firms which have a process which qualifies for the exclusion report their determination, and the basis of the determination, to EPA. Also, records of the theoretical calculation and/or the testing must be kept for seven years or for at least three years after the particular process being used at the facility ceases operations. A new certification must be filed and renotification of EPA must occur each time a significant process change occurs. A significant process change is defined as one which is likely to change the concentration of PCBs in releases from the processes (except in controlled wastes).

Records of the theoretical assessment must include (1) a description of the reaction or reactions believed to be producing the PCBs, (2) the levels of PCBs generated and released, (3) documentation of the basis for estimates of PCB concentrations in releases, and (4) the name and qualifications of the person or persons performing the analyses.

Records of actual monitoring of PCB levels must include (1) a description of the method of analysis, (2) documentation of the results of the analysis, including data from the quality assurance plan, (3) the name of the analyst or analysts, and (4) the date and time of the analysis.

The costs of recordkeeping and reporting are estimated here in terms of managerial hours, technical hours, and clerical hours required to carry out those tasks. The estimated burden on industry and EPA is given in Table 4 below.

Table 4: Costs of Recordkeeping and Reporting for Self-Certification

	Managerial hours	Managerial costs	Technical hours	Technical costs	Clerical hours	Clerical costs	Total cost
Industry							
Recordkeeping -per test round*	2	$134	4	$172	4	$68	$374.00
-for each theoretical calculation	2	$134	4	$172	4	$68	$374.00
Reporting (per report)	2	$134	2	$86	2	$34	$254.00
EPA							
Report review (per report)	.5	$20.0	1	$26	1	$10	$56.00

(Average hourly wage rates used for industry: managerial - $67, technical - $43, clerical - $17). Average hourly wage rates used for EPA: managerial: $40, technical: $26, clerical: $10. See Appendix F for calculation of wage rates).

*A "test round" includes one set of tests on each medium of concern: air, water, and end-product

Source: EPA estimates

D. <u>Cost of Making a Theoretical Calculation of the Level of Incidental PCB Production and Release</u>

As mentioned earlier, EPA plans to allow companies the option of making a one time theoretical calculation of the level of incidental PCB production and release in place of testing. However, companies would be held to staying below the concentration limits specified by EPA. The threat of enforcement action might cause companies, particularly those with PCB levels near the quantification limit, to forego the option of making a theoretical calculation.

The cost of making a theoretical calculation has been estimated by EPA to be approximately $1,014. (EPA 1982) (See Table 5) This cost includes the direct labor and overhead costs of technical and clerical staff to perform and document a theoretical calculation. It is estimated that it would take an experienced chemical engineer approximately 22 hours to 1) gather data on raw materials, 2) analyze the reaction and reaction conditions to determine whether PCBs were incidentally generated, 3) survey the reactor and other equipment to identify where, and to what extent, PCBs could be released to air, water, and end-products, and 4) to document the calculation. Four hours of clerical time is also estimated to be necessary for the documentation of this theoretical calculation.

Table 5: Cost of Making a Theoretical Calculation of the Level of Incidental PCB Production and Release (Per Process)

	Technical[1]		Clerical[2]		Total	
	Hours	Costs	Hours	Costs	Hours	Costs
1. Gather data on raw materials, e.g. information on composition and impurities	8	$344			8	$344
2. Analyze reaction, reaction conditions to determine whether PCBs may be incidentally generated; do mass balance calculation;	8	$344			8	$344
3. Survey reactor, reaction conditions to identify where PCBs may be released to air, water[3]	2	$86			2	$86
4. Documentation	4	$172	4	$68	8	$240
Total	22	$946	4	$68	26	$1,014

[1]Assumes that an experienced chemical engineer performs the analysis at a cost of $43 per hour.

[2]Assumes clerical wage rate @ $17/hour.

[3]Assumes that it will take one half hour per reaction step for an experienced chemical engineer to survey the equipment for potential releases. Each reaction step is assumed to include separation and/or purification steps.

SOURCE: EPA Estimates

Table 6: Estimated Costs to Industry of Filing an Exemption Petition (including research and testing costs)

	Managerial hours	Managerial costs	Technical hours	Technical costs	Clerical hours	Clerical costs	Total Cost (per petition)
Company 1*	1768	---	5200	---	208	---	$126,000
Company 2*	---	$4,500	---	$11,500	---	---	$16,000
Company 3*	280	$18,760	120	$5,160	60	$1,020	$24,940

Source: Industry estimates

[Note: The companies contacted to estimate costs of filing exemption petitions did not give detailed breakdowns of cost estimates. Specifically, the wage rates used by Company 1, and hours estimated by Company 2 were not given. Company 3 provided hour estimates of the cost; the wage rates used here to calculate total costs were: $67/managerial hour, $43/technical hour, $17/clerical hour.]

*See Appendix D for a more detailed breakdown of exemption petition costs.

E. Costs of Exemption Petitions

For purposes of this analysis EPA surveyed three petitioners to gather rough estimates of the cost of filing an exemption petition. Rough estimates of the costs to EPA of processing exemption petitions are also presented here.

Table 6 summarizes the reported costs to individual companies of developing the data necessary, and documenting the results, in order to file an exemption petition. More detailed breakdowns are given in Appendix D. It is evident from the estimates received that the effort expended by companies in making a "good faith" attempt to develop PCB-substitutes and documenting their cases for "no unreasonable risk" may vary significantly.

For the three companies surveyed here the exemption petition development cost ranged from $16,000 to $126,000. It should be noted that these costs could change if EPA decides to revise the information requirement or the standard of proof to demonstrate a "good faith effort" to develop substitutes and of "no unreasonable risk" to file exemption petitions in the future.

The costs to EPA of processing exemption petitions on an annual basis will depend on the number submitted and on the scrutiny given to each petition. Since there are likely to be "economies of scale" in processing petitions, unit costs will probably fall as the number of petitions submitted rises. Rough estimates of the number of managerial, technical, and clerical hours required to process an exemption petition are presented here. These are broken down by function and presented in Table 7 below. The functional cost categories include the costs of EPA review, preparation for public hearings, federal register notice preparation, and correspondence costs. The total estimated cost of processing each exemption petition is estimated to be $7,126.

Table 7: Estimated Cost to EPA of Processing Exemption Petitions (on a Per-Petition Basis)

	Managerial hours	costs[1]	Technical hours	costs[2]	Clerical hours	costs[3]	Total hours	costs
EPA review	10	$400	100	$2600	10	$100	120	$3100
Public Hearing Preparation	1	$ 40	10	$ 260	1	$ 10	12	$ 310
Federal Register Notice Preparation	1	$ 40	100	$2600	50	$500	151	$3140
Correspondence	2	$ 80	16	$ 416	8	$ 80	26	$ 576
Total	14	$560	226	$5876	69	$ 690	309	$ 7,126

[1]assuming managerial wage rate @ $40/hour
[2]assuming technical wage rate @ $26/hour
[3]assuming clerical wage rate @ $10/hour
(See Appendix F for calculation of wage rates for EPA personnel)

Source: EPA estimates

IV. BENEFITS AND COSTS OF ALTERNATIVE EXCLUSION OPTIONS

As mentioned in the introduction, the incremental costs and benefits estimated here will be calculated using as a baseline the scenario in which all PCBs would be banned unless an exemption request were approved by EPA. The implicit assumption made here is that all processes which would qualify for the exclusion would also be granted their exemption requests, and would be subject to the same disposal requirements and process control requirements under both policies.

The incremental costs associated with exclusion options are 1) the additional health risks resulting from any exposure to PCBs in processes which would have been subject to the ban had they not been excluded, 2) the costs incurred by companies to self-certify and report that the level of PCBs in various media are below designated levels, and 3) the costs incurred by EPA to spot check records of companies which certify themselves.

A. Costs of Self-Certification (Per Process)

The incremental costs of self-certification will vary significantly depending on how a company certifies itself. Companies that make a theoretical calculation will incur the lowest costs to self-certify. Companies that test to determine PCB concentrations could incur very high costs depending on the number and complexity of processes affected, and on the necessary frequency and sophistication of tests performed. The sequential sampling scheme recommended in the EPA test guidelines which accompany the final rule calls for 2-7 tests to be performed on each sample from each medium of concern (i.e., air releases, water effluents, and products). Also, under the final rule testing and/or the theoretical assessments will have to be repeated each time there is a significant process change such that the concentration of PCBs in release might change. It is estimated that a significant process change could be expected to occur once every 1-5 years. (EPA 1982a) Since so many variables are involved in these cost calculations, the estimated range of costs for self-certification which are presented here are very large.

The costs of testing a process range from $844 per year, assuming the lowest estimates of testing costs and assuming that only 2 tests need to be performed on each medium of release, to $13,720, assuming the highest estimate of testing costs to be applicable, and that 7 tests need to be done on each medium of release. (See Table 3) If a significant process change occurs once a year, so that annual recertification is necessary, then the present value of costs over 10 years ranges from $6,030 to $98,023. If a significant process change occurs only once every four years then the present value of testing costs for recertification would range from $1,814 to $23,091. (See Table 8) The costs of air sampling must be added to the costs of testing to calculate total certification costs.

Table 8: Present Value of Testing Costs Over 10 Years (Per Process)*
(using a 10% discount rate)

No. of Tests Required on Each Medium of Release	No. of Significant Process Changes[3]		
	1 per year	1 per 2 years	1 per 4 years
Two	$6,030-$28,007	$3,313-$15,390	$1,814-$8,426
Four	$12,060-$56,013	$6,627-$30,780	$3,628-$16,852
Seven	$21,105-$98,023	$11,597-$53,864	$6,350-$23,091

[1]The sequential sampling scheme specified in the EPA testing guidelines requires that 2-7 tests be done on each medium of release

[2]The costs of air sampling are not included here.

[3]It is estimated that "significant" process changes will occur every 1 to 5 years. (EPA 1982a)

The costs of self-certification would be significantly less if a company makes a theoretical assessment(s) to show that PCB releases are below a certain level. The cost of making that calculation has been estimated to be $1,014 per process. (See Table 5) The present value of the costs of conducting theoretical assessments over 10 years range from $7,244, assuming that significant process changes occur every year, to $2,180, assuming that a significant process changes only happen once every 4 years. Given the choice between doing a theoretical calculation and testing for certification, not all companies that have processes in which PCBs are generated would be willing to self-certify using a theoretical calculation, especially if they feel that the level of PCBs in their processes may be variable and/or near the maximum allowable concentration of PCBs. But manufacturers and processors that are reasonably certain that PCBs that are generated in their processes remain below the limits of quantification may not feel that testing is necessary.

Table 9 shows the recordkeeping costs to industry associated with testing and/or theoretical assessments for self-certification. Discounting the stream of recordkeeping costs which could be incurred annually over a 10 year period, total recordkeeping costs per process range from $804 assuming that significant process changes occur once every four years, to $2,672, assuming that significant process changes occur once every year.

PREAMBLE

The following guidelines describe methods for performing testing of chemical substances under the Toxic Substances Control Act (TSCA). These methods include the state-of-the-art for evaluating certain properties, processes and effects of chemical substances. They are intended to provide guidance to test sponsors in developing test protocols for compliance with test rules issued under Section 4 of the TSCA. They may also provide guidance for testing which is unrelated to regulatory requirements. Support documentation is included for some of these guidelines. It is expected that additional guidelines and support documentation will be incorporated later as the state-of-the-art evolves or the need for them warrants.

Since these guidelines are divided into three sections which cover the diverse areas of health effects, environmental effects and chemical fate testing, there are some differences in the ways they are presented. These differences are explained in an introduction prepared for each section.

Table 9: Recordkeeping Costs to Industry For Self-Certification (Per-Process)**

Frequency of Significant Process Changes	Present Value* 10 Years
One per Year **	$2,672
One per two years **	$1,468
One per four years **	$804

*Using a 10% discount rate
**Assuming testing will be required on air releases, water releases, and end-products.

Table 10 presents the costs of reporting assuming that significant process changes occur every one to four years. The present value of the combined reporting costs to industry and EPA range from $665 per process if one report must be filed every four years, to $2214 if one report must be submitted each year.

B. Benefits Derived From an Exclusion Policy (Per Process)

The benefits associated with the various exclusion policies include 1) the cost savings to industry from not having to shut down or alter processes, or file exemption petitions, 2) the added certainty for industry in not having to file annually for exemption from the PCB ban rule, and 3) the savings to EPA by not having to process exemption petitions each year. We have not attempted to quantify the potential savings to industry from added certainty or from not having to shut down or alter processes. However, these benefits should not be ignored in considering alternative options. Only the costs of filing an exemption petition are quantified here. Table 6 shows that the annual cost of filing an exemption petition may range from $16,000 to $132,440 (see Section III). Assuming that these same costs would have to be incurred by a company each year over the next 10 years for each process which does not fall within the criteria for exclusion, then the total cost of filing exemption petitions over that period range from $114,313 to $946,226 per process. (See Table 11)

Table 10: Costs of Reporting for Self-Certification

No. of Reports Required	Present Value* Over 10 Years **Industry Cost per process	**EPA Review Costs Per Process	Total
1 Report/Year	$1,814	$400	$ 2,214
1 Report/2 Years	$997	$220	$ 1,217
1 Report/4 Years	$545	$120	$ 665

*assuming a 10% discount rate
**see Table 2 for detailed calculation of these costs

Table 11: Costs to Industry of Filing Exemption Petitions (per process)

	annual cost per petition**	10 Years *present value
Company 2	$16,000	$114,313
Company 3	$24,940	$178,185
Company 1	$132,440	$946,226

*using a 10% discount rate
**see Table 6 for detailed calculation of these costs

C. <u>Total Incremental Costs and Benefits of Exclusion Policy Options (Per Process)</u>

The incremental costs and benefits of three exclusion policy options are quantified here using as a baseline the costs and benefits associated with an exemption petition process. Obviously, many more policy options could be constructed with various combinations of self-certification requirements. The cost of options not given here can be easily calculated using the tables given.

The first alternative which is implicitly considered here is the use of the exemption petition process to deal with all incidentally generated PCBs including those in closed and controlled processes. This alternative is used as the baseline against which to measure costs and benefits of the other three alternatives, i.e. zero costs and benefits are implicitly associated with this option. The second alternative considered is one in which EPA would only require that a firm perform a theoretical calculation to certify that a suspect process qualified for the closed/controlled exclusion. Under this alternative EPA would not hold the firms to any stricter standards of proof than the theoretical assessment results to show that a process qualified for exclusion. The third alternative -- the regulatory option chosen by EPA -- requires that a firm with a suspect process perform a theoretical calculation and/or analytical tests to show that their process qualifies for the closed/controlled exclusion. Under this regulatory strategy EPA will hold firms to a stricter standard of proof than under the second alternative to assure that PCB releases are below designated levels; EPA has set up a testing protocol which it will use for enforcement purposes under this regulatory strategy. The fourth alternative is one in which EPA would require that testing be done for all processes attempting to qualify for exclusion. Theoretical calculations would not be acceptable to qualify for the exclusion under this regulatory approach.

The incremental costs and benefits of each of the last three alternatives are calculated including a recordkeeping and reporting requirement. Under each of these regulatory alternatives recertification would be required each time there was a "significant process change".

The greatest amount of uncertainty in calculating incremental costs and benefits is associated with the third alternative, i.e. the one chosen by EPA. Since firms have the choice whether to test or to perform a theoretical calculation the total impact will depend largely on how many choose each option. Since there was no data from which to estimate the percentages of firms which will choose each option EPA has assumed that roughly 40-60% of the processes which file for exclusion will perform theoretical assessments of the concentrations of PCB releases rather than doing testing.

Table 12 presents the estimated incremental benefits and costs per process for each of the three alternatives considered. The present value of the incremental benefits per process is the same for each alternative. Discounted over 10 years at a 10% rate, incremental benefits range from $165,225 to $951,127. The present value of the incremental costs per process range from $3,649 to $337,036. The low end of the range represents the costs of performing a theoretical calculation initially, and once every four years thereafter when the process changes. The high end of the range represents the costs of testing annually to recertify. A major cost component in that total is the costs of doing air sampling to determine PCB releases to air.

The net benefits for the three alternatives considered here range from $0 to $947,478 per process. It is assumed that net benefits would never be negative since firms would choose the least costly alternative available to them to comply with the rule, i.e. if it were going to cost them more to certify for exclusion than to file an exemption petition each year then the firm would choose to utilize the exemption petition alternative. Because of the discretion allowed firms under EPA's exclusion rule (Alternative 3) the range of net benefits for that alternative is very large, i.e. net benefits range from $0 to $145.4 million. The wide range is bounded at the high end by estimates of net benefits for firms that only have to do infrequent theoretical calculations, and at the low end by

Table 12: Average Incremental Benefits and Costs Per Process for Exclusion Options (Present Value[1] Over 10 Years)

	Alternative 2	Alternative 3	Alternative 4[2]
Benefits			
INDUSTRY			
Exemption Petition Costs Saved[3]	$114,313-$900,215	$114,313-$900,215	$114,313-$900,215
Costs Saved by not having to alter or cease production	---	---	---
Added certainty	---	---	---
EPA Petition Processing Savings (per petition)	$50,912	$50,912	$50,912
Total	$165,225-$951,127	$165,225-$951,127	$165,225-$951,127
Costs			
Self Certification Costs to:			
INDUSTRY			
Sampling & Testing/ Theoretical Calculation	$2,180-$ 7,244	$2,180-$332,150	$235,941-$332,150
Recordkeeping	$804-$ 2,672	$804- $2,672	$804- $2,672
Reporting	$545-$ 1,814	$545- $1,814	$545- $1,814
EPA			
-Report Review	$120-$ 400	$120- $400	$120- $400
-Enforcement	---	---	---
Total	$3,649-$12,130	$3,649-$337,036	$237,410-$337,036

[1] Using a 10% discount rate

[2] Alternative 2: Only theoretical assessments required for exclusion
Alternative 3: Theoretical assessment and/or testing acceptable for exclusion.
Alternative 4: Only testing acceptable for exclusion
(Alternative 1--the alternative in which only the exemption petition process was used to deal with closed and controlled processes -- is used as the baseline against which to measure costs and benefits of the other alternatives; i.e. zero costs and benefits are implicitly associated with this alternative)

[3] The range of costs is very large since under this alternative firms are given the choice whether to test or perform a theoretical calculation to qualify for the exclusion

Table 13: Aggregate Incremental Benefits and Costs for Exclusion Options[2] (Present value[1] over 10 years) (in millions of dollars)

	Alternative 2 51 processes	Alternative 2 175 processes	Alternative 3 51 processes	Alternative 3 175 processes	Alternative 4 51 processes	Alternative 4 175 processes
<u>Benefits</u>						
INDUSTRY						
Exemption Petition Costs Saved	5.8-45.9	20.0-157.5	5.8-45.9	20.0-157.5	5.8-45.9	20.0-157.5
Costs Saved by not having to alter or cease process	---	---	---	---	---	---
Added certainty	---	---	---	---	---	---
EPA Petition Processing Savings	2.6	8.9	2.6	8.9	2.6	8.9
Total	8.4-48.5	28.9-166.4	8.4-48.5	28.9-166.4	8.4-48.5	28.9-166.4
<u>Costs</u>						
Self Certification Costs to: INDUSTRY						
-Sampling & Testing/ Theoretical Calculation	.1-.4	.4-1.3	6.1-8.6	20.8-29.7[3,4]	12.0-16.9	41.3-58.1
-Recordkeeping	.04-.14	.14-.47	.04-.14	.14-.47	.04-.14	.14-.47
- Reporting	.03-.09	.09-.32	.03-.09	.09-.32	.03-.09	.09-.32
EPA						
-Report Review	.01-.02	.02-.7	.01-.02	.03-.7	.01-.02	.02-.7
-Enforcement	---		---		---	
Total	.18-.69	.65-1.8	6.2-8.8	21.0-31.2	12.1-15.0	41.6-59.6

[1]Using a 10% discount rate

[2]Alternative 2: Only theoretical assessments required for exclusion
Alternative 3: Theoretical assessment and/or testing acceptable for exclusion.
Alternative 4: Only testing acceptalbe for exclusion
(Alternative 1--the alternative in which only the exemption petition process was [illegible] deal with closed and controlled processes -- is used as the baseline against which to measure costs and benefits of the other alternatives; i.e. zero costs and benefits are implicitly associated with this alternative.

[3]The range of costs is very large since under this alternative firms are given the choice [illegible] to test or perform a theoretical calculation to qualify for the exclusion

[4]The range of costs presented here assumes that 50% of firms will perform theoretical assessments and 50% w[illegible] conduct testing for self-certification.

estimates of net benefits for firms that must do frequent testing (including air sampling) to qualify for exclusion. It is important to note that these net benefit figures do not include the benefits in cost savings from added certainty and from not having to alter or cease production, nor the costs of enforcement for EPA. It is likely that inclusion of these unquantified benefits and costs would result in larger net benefits since the enforcement costs to EPA are not likely to outweigh the benefits of added certainty and avoidance of production changes.

The net benefits of Alternative 2 -- the regulatory strategy in which EPA would only require that theoretical calculations be done for certification -- are obviously a lot higher than for either of the other two alternatives. The present value of net benefits for that alternative ranges from $153,095 to $947,478 per process, whereas net benefits range from -$0 to $947,478 under the alternative chosen by EPA, and from -$0-$713,717 under the alternative where only testing would be permitted to qualify for exclusion.

D. Aggregate Incremental Costs and Benefits of Exclusion Policy Options

Table 13 aggregates the incremental costs and benefits of the three exclusion alternatives over the total number of processes which may be affected by the exclusion. The cost ranges within each category represent the 10 year discounted (10% real rate) present value of benefits and costs for 51 processes to 175 processes. Aggregate incremental benefits, range from $8.4 million for 51 processes, to $166.4 million for 175 processes. Incremental benefits will be the same under all of the alternatives considered.

The incremental costs range from .$18 million under the second alternative (where only theoretical calculations need be done for self-certification), to $59.6 million under Alternative 4, where only testing would be acceptable for certification for exclusion. The range of incremental costs for the alternative chosen by EPA is given assuming that 50% of the firms which certify will do a theoretical calculation, and the other 50% will conduct testing for certification. Under that assumption the incremental costs associated with the EPA policy (Alternative 3) range from $6.18 million to $31.2 million.

Assuming 175 processes take advantage of this rulemaking, net benefits range from -$0 under Alternatives 3 and 4, to $166 million under Alternative 2 (where theoretical calculations would be sufficient for self-certification). For the alternative chosen by EPA net benefits range from $0 to $145.4 million if 175 processes take advantage of the exclusion (assuming one-half of the firms affected do theoretical assessments and the other half conduct tests to qualify for exclusion). If 51 processes take advantage of the exclusion net benefits range from $0 to $44.6 million. (See Table 1)

Table 14: Summary Table: Aggregate Net Benefits[1]
(in millions of dollars)

	Number of processes affected: 51 processes	Number of processes affected: 175 processes
Alternative 2 (theoretical assessments only)	7.71-48.32	27.1-165.75
Alternative 3 (testing and/or theoretical assessments)	0-42.3[2]	0-145.4[3]
Alternative 4 (only testing permitted)	0-36.4[4]	0-124.8[5]

[1] As measured here, NET BENEFITS = [(Exemption Petition Cost Savings to Industry) + (EPA petition processing savings)] - (Self-Certification Costs to Industry)

[2,3,4,5] It is assumed that Net Benefits will never be negative since firms will choose the least cost alternative in order to continue manufacturing, i.e. if certification costs associated with the exclusion rule are greater than the costs of filing exemption petitions annually then firms will choose to file exemption petitions rather than certify for exclusion.

As has been mentioned before, the range of net benefits estimated here does not include the benefits derived from the added certainty associated with an exclusion policy nor the benefits from not having to cease or alter certain types of processes. Also, enforcement costs to EPA (outside of report review costs) have not been quantified. It is probably safe to say that if these benefits and costs could be quantified the net benefits of all of the alternatives would be increased significantly.

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Versar. 1982b. Versar List of Plants and Chemical Manufacturing Processes Known or Suspected to Generate PCBs as Impurities. September 8, 1982 Memo to Liz Bryan, et. al. Office of Toxic Substances, U.S. Environmental Protection Agency.

Appendix A

End-Products of Manufacturing Processes in Which PCBs are Incidentally Generated
(Versar, 1982a,b)

Dyes

diarylide yellow

dyes/pigments made with halogenated solvents

halogenated dyes/pigments

halogenated solvents, unspecified

phthalocyanine

Organic Chemicals

alkyl benzene

alkyl chlorophosphine derivatives

benzene chlorination (process)

benzene phosphorous dichloride

biphenyl derivatives

carbon tetrachloride

chlorinated aryl phosphines

chlorinated naphthalene derivatives

chlorinated phosphate ester

chlorobutane derivatives

chlorosilane derivatives

chloroxylene derivatives

diphenyl oxide and derivatives

ethyl benzene

halogenated solvents, unspecified

monochlorinated butylated diphenyl

monochlorinated terphenyls

organo phosphorus trichloride derivative

pentachloranitrobenzene

phenyl chlorosilanes

phenyl siloxanes

polychlorinated terphenyls

tetrachloraethylene

aluminum chloride

Appendix B

Summary of Inadvertent Production of PCBs by Concentration in Process and Process Category

PCBs Concentration in Process (ppm)	Type of Process	Number of Processes Scenario 1**	Number of Processes Scenario 2††	Average Quantity of Quantity of PCBs (lbs) Scenario 1	Average Quantity of Quantity of PCBs (lbs) Scenario 2	PCBs per Process (lbs) Scenario 1	PCBs per Process (lbs) Scenario 2
0-25***	Closed	4 - 15		0.7 - 1.8		0.2	
	Controlled	40 - 153		6926 - 18,006		173	
	Other than	87 - 332		6856 - 17,830		78	
25-50***	Closed	4 - 15		0.7 - 1 9		0.2	
	Controlled	40 - 153		6926 - 18,006		173	
	Other than	87 - 332		6949 - 17,830		78	
Subtotal	<50 ppm	131 - 500		13,783 - 35,837			
50-200	Closed	1	1	UNK	UNK	UNK	UNK
	Controlled	0 - 1	0 - 5	0 - 125	0 - 4131	0 - 125	0 - 826
	Other than	8 - 16	7 - 12	10,008 - 14770	10,008 - 10,764	1259 - 928	1440 - 903
200-500	Closed	0	0	0	0	0	0
	Controlled	0 - 1	0 - 5	0 - 125	0 - 4131	0 - 125	0 - 826
	Other than	6 - 14	6 - 10	1149 - 5911	1149 - 1905	192 - 422	192 - 191
500-1200	Closed	0	0	0	0	0	0
	Controlled	0 - 1	0 - 4	0 - 125	0 - 4,125	0 - 125	0 - 1031
	Other than	0 - 3	0	0 - 4,000	0	0 - 1333	0
1200-10,000	Closed	0	0	0	0	0	0
	Controlled	1 - 2	1 - 5	5000 - 5125	5000 - 9125	5000 - 2563	5000 - 1825
	Other than	0 - 3	0	0 - 4000	0	0 - 1333	0
10,000-100,000	Closed	0	0	0	0	0	0
	Controlled	0	1 - 4	0	25000 - 29000	0	25000 - 7250
	Other than	1 - 4	0	25000 - 29000	0	25000 - 7250	0
Subtotal	≥50	26		46,044			
Total		157 - 526		59,827 - 81,881			

*Included in more than one ppm category because there is insufficient information to determine the correct ppm category.

**In this scenario the "controlled" category may include processes where the product contains up to 25 p[illegible] PCBs; processes where products contain >25 ppm fall into the "other than" category.

†Pounds associated with the process unknown

††In this scenario the "controlled" category may include processes where the product contains ≤50 ppm; processes where products contain >50 ppm are included in "other than" category.

***The data for these categories are from CMA survey.

Appendix C

AIR SAMPLING (from stacks)
Cost Breakdown

	Activity	Hours	Costs
1.	Sampling Equipment Preparation	100	$4,300
2.	Site Preparation/Equipment Installation		$10,000
3.	Four-Man Sampling Crew for 5 Days (includes travel time)	160	$6,880
4.	Travel Costs		
	a. Round-trip airfare @ $200 each		$800
	b. 5 nights hotel @ $75/night		$1,500
	c. 5 days of meals @ $34.50/day		$690
			$2,990
5.	Data Reduction/Report Writing	200	$8,600
	TOTAL		$32,770

SOURCE: EPA 1982b

Appendix D

Estimating Costs to Industry of Filing an Exemption Petition - Company 1

ACTIVITY AREA	EFFORT (Person Years)			APP CO
	Technical	Secretarial	Managerial	
1. Development of an Analytical Method to Quantitate PCBs in Organic Pigments				
2. Analytical Testing Program on Raw Materials & Finished Products	0.50			
3. Process Reformulation for Product Compliance				
4. Record Keeping with Manufactured Products & Purchased Raw Materials		0.1		
5. Customer Assurance Data Provided on Products	0.20		0.1	
6. Administrative Time			0.1	
7. Legal Drafting and Filing		0.1	0.1	
8. Plant Survey for Exposure Levels			0.1	
9. Company & Trade Association Meetings			0.1	
TOTAL ACTIVITY IN FILING EXEMPTION APPLICATION	2.50	0.1	0.85	

Note: Specific hourly and financial burden estimates are not given here to maintain confidentiality

Appendix D (cont.)

Estimated Costs to Industry of Filing an Exemption Petition

Company 2

	Hours	Cost
Managerial	--	$4,500
Technical		
Analytical Testing	--	$9,500
Travel	--	$2,000
Total		$16,000

Company 3	Hours	Cost*
Managerial	280	$18,760
Technical	120	$5,160
Clerical	60	$1,020
Total		$24,940

*Wage rates used to arrive at cost estimates: $67/managerial hour, $43/technical hour, $17/clerical hour

Appendix E

Description of Samples to be Tested for PCB Concentration

SAMPLE PRODUCT-1

Description: Clear Liquid
Extraction: None
Cleanup: None
Analysis: Direct injection/CGC/EIMS
Anticipated Levels of PCB's: 1-100 ug/g. All homologs present
Anticipated Levels of Interferents: Negligible

SAMPLE PRODUCT-2

Description: Opaque, viscous oily liquid
Extraction: Dilute 1/100, filter off solid (F2)
Cleanup: Liquid (F1) - Florisil column cleanup
Solid (F2) - Digest with acid, refilter and extract PCBs into hexane
Analysis: CGC/EIMS
Anticipated Levels of PCBs: 100-1,000 ug/g, $C_{12}H_5Cl$ - $C_{12}H_5Cl_5$ presents
Anticipated Levels of Interferents: Twenty-five chlorinated species from chloroform through C_6Cl_6 are known to be present. C_4Cl_6 is present at about 40%; all chlorobenzenes are present, including C_6Cl_6 at 10%. Sample assays at 50% chlorine

SAMPLE PRODUCT-3

Description: Colored Powder
Extraction: Dissolve in heated H_2SO_4, extract three times with hexane, dry on Na_2SO_4 column, concentrate the appropriate volume
Analysis: CGC/EIMS
Anticipated Levels of PCBs: 100 ug/g total; mixture of $C_{12}H_5Cl_5$ isomers
Anticipated Levels of Interferences: Minimal Chlorinated; may semivolatile hydrocarbons, aromatics, and nitrogen bases

SAMPLE WATER-1

Description: Industrial wastewater
Extraction: Method 608
Cleanup: Method 608
Analysis: CGC/EIMS
Anticipated Levels of PCBs: 50 ug/Liter total, 50 isomers over all homologs
Anticipated Levels of Interferences: 100-1,000 ug/Liter each of 10 PNAs, 6 chlorinated pesticides, and 4 chlorophenols

SAMPLE AIR-1

Description: Florisil, aqueous condensate, and hexane rinse (3 containers) from modified Method 5 train (assume sample is in-house)

Extraction: Florisil -- soxhlet, 4 hours with hexane
Aqueous sample - liquid-liquid partition with hexane-
Hexane Rinse - back extract with water
Combine all extracts

Cleanup: Shake hexane extract with concentrated sulfuric acid

Analysis: CGC/EIMS

Anticipated Levels of PCBs: 10 ug/m^3 ($10 m^3$ of air sampled) total; 10 isomers $C_{12}H_9Cl$ through $C_{12}H_7Cl_3$; mostly a mixture of the three $C_{12}H_9Cl$ isomers

Anticipated Levels of Interferences: Similar levels of PCNs and chlorobenzenes; some chloraliphatics

Appendix F

Calculation of Wage Rates for EPA Personnel

I. Managerial hourly wage rates:

- Assumed GS-15 (step 5) annual salary based on "Proposed Pay Schedule for Federal White Collar Employees" (August, 1982): $55,025

- Allow 50% overhead costs:
  $55,025 x 1.5 = $82,537

- 2,080 manhours/year
  $82,537 ÷ 2,080 hrs. = $40/hour

II. Technical hourly wage rates:

- Assumed GS 12/13 (step 5) annual salary based on "Proposed Pay Schedule for Federal White Collar Employees" (August, 1982): $33,290 + 39,586)
  2 = $36,438

- Allow 50% overhead costs:
  $36,438 x 1.5 = $54,657

- 2,080 manhours/year

- $54,657 ÷ 2,080 $26/hour

III. Clerical hourly wage rates

- Assumed GS 4/5 (step 5) annual salarly based on "Proposed Pay Schedule for Federal White Collar Employees" (August, 1982): ($13,541 + 15,153)
  2 = $14,347

- Allow 50% overhead costs:
  $14,347 x 1.5 = $21,520

- 2,080 manhours/year

- 21,520 ÷ 2,080 = $10/hour

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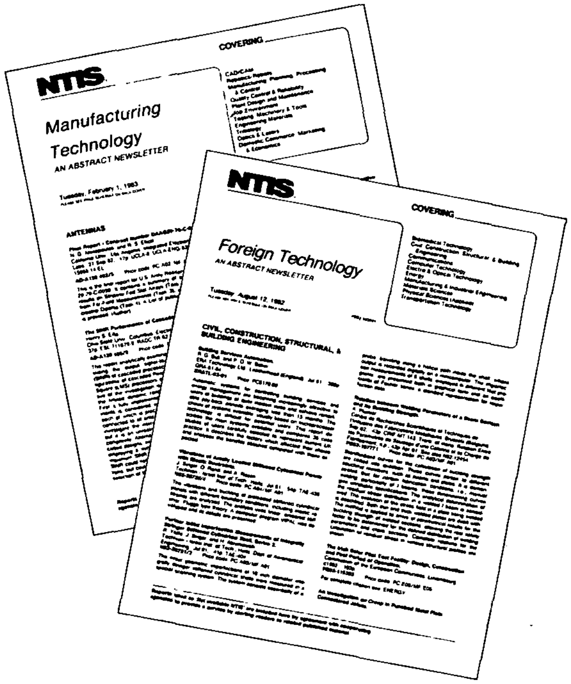

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