



Project Summary

Criteria Pollutant Emission Factors for the 1985 NAPAP Emissions Inventory

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As part of the National Acid Precipitation Assessment Program (NAPAP), the U.S. Environmental Protection Agency (EPA) identified the need to generate emission factors for volatile organic compound (VOC) emissions for about 1,800 source classification categories (SCCs). Additionally, emission factor development was needed for nitrogen oxides (NO_x), sulfur oxides (SO_x), and VOCs for SCCs that states have used to report emissions. Each SCC represents a specific process or function that is logically associated with a point source of air pollution. The objective of this effort was to estimate VOC emission factors for all SCCs where VOC factors were previously absent, and to develop NO_x and SO_x emission factors for SCCs that states had reported as emission sources. This report includes emission factor estimates for VOCs, NO_x, and SO_x which were developed from a variety of readily available information. Emission factors for particulate matter (PM) and carbon monoxide (CO) from AP-42 Fourth Edition and Supplement A are also presented. Data gathered during numerous standards-setting activities as well as data provided from state emissions inventory data bases were used to calculate the new emission factor estimates. Technology transfer of emission factors for similar processes in different industries provided emission factor estimates for source categories where no data were available. A list of all valid SCCs used in the 1985 NAPAP Emissions Inventory, as well as about 90 SCCs which have been added to the inventory since

October 1985, is included along with all emission factor estimates developed through April 1987.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

As part of the National Acid Precipitation Assessment Program (NAPAP), the Air and Energy Engineering Research Laboratory (AEERL) of the U.S. Environmental Protection Agency (EPA) updated the October 1985 *NEDS Source Classification Codes and Emission Factor Listing* that was prepared by EPA's Office of Air Quality Planning and Standards (OAQPS). In Phase I of the update, volatile organic compounds (VOC) emission factor estimates were generated for source classification categories (SCCs) where substantial amounts of VOC emissions were expected. The major emphasis of that effort was on organic chemical manufacturing processes and storage of petroleum products and organic chemicals. This report describes Phase II of the update which consisted of developing VOC emission factor estimates for all remaining SCCs. Additionally, state air offices have reported to the National Emissions Data System (NEDS) on emissions from point sources within their states. The SCCs appearing in these reports which previously lacked emission factors were targeted as high priority SCCs for the development of

VOC, nitrogen oxide (NO_x), and sulfur oxide (SO_x) emission factors.

The SCCs and emission factors that are reported in OAQPS' 1985 NEDS report resulted from updating all emission factor changes through AP-42, Fourth Edition. During this effort, the SCC listing was revised to incorporate all changes through Appendix A to AP-42 (December 1986). This report also contains a number of new SCCs and changes to existing SCCs that have been previously listed. A list of all SCCs and emission factors published in the 1985 NEDS document, as well as the emission factor estimates developed during Phases I and II of the update, are included in this report.

In the current work by AEERL, the primary objective was to provide VOC emission factor estimates for all SCCs that had no current listing of VOC emission factors. Also included in this work was the development of NO_x and SO_x emission factor estimates for SCCs which were included in reports submitted by states that previously lacked these factors. The new emission factor estimates resulting from this current work are not of the same known quality as emission factors tabulated in AP-42. They represent best estimates which have not been subjected to rigorous quality assurance. These factors were generated from estimates taken from the literature, from averaging of data submitted by 13 state air quality offices, and through the transfer of emission factors for SCCs from similar industries. Extensive notes and references are supplied in an appendix explaining how the new emission factor estimates were generated. In some cases, these notes indicate data quality by reporting the number of emission tests used to develop a factor.

State Contacts

Thirteen states were contacted to obtain emission data from emission inventories, test reports, and permit files. States which have large industrial sectors and potentially large emission sources were specifically targeted during this effort. Emissions data were supplied by 12 of the states, 7 through computerized emissions inventories and 5 through review of permit files. Emission factors were estimated by averaging the emissions data submitted for each SCC. In some cases, states or industries were recontacted to provide more complete process descriptions and production rates. States provided a substantial amount of emissions data on metal

operations (both primary and secondary) and on mineral products operations.

Literature Review

A number of source specific documents, including Background Information Documents (BIDs), Industrial Process Profiles, Source Assessments, and chemical specific emission source survey documents were reviewed to gather information on emissions and processes. These documents provided useful information on process descriptions, operating parameters, raw materials, and end products for many source categories. This information was used to compare similar processes in different industries in order to transfer emission factors across industries where appropriate. The Industrial Process Profiles, although somewhat outdated (published in 1977 and 1980), proved especially useful for this exercise.

State Reports Requiring Emission Factor Calculations

In 1985, EPA asked states to submit emissions data for large sources of criteria pollutants, emphasizing SO_x, NO_x, and VOC emissions from sources emitting over 100 tons/year. Source test emissions data have been submitted, as well as emission estimates based on AP-42 emission factors or engineering judgment. Where no emission factors were available, states have requested that emissions be calculated for them by the NEDS, using emission factors already in the system for an SCC. Where no emission factors have ever been reported, the SCCs were flagged for emission factor development as a high priority for this work assignment.

Results

At the completion of the Phase II effort, 99% (2725) of the SCCs have VOC emission factors or emission factor estimates associated with them or do not need emission factors due to their general description. Of these, 37% (1006) were developed during this effort. Emission factors for NO_x and SO_x are included for 75% of the SCCs in the list. Table 1 summarizes the emission factor development for the SCCs currently in NEDS and breaks down progress by major source category. During this effort, over 100 VOC emission factors were developed in the following major source categories: chemical manufacturing,

primary metals operations, and secondary metals operations.

Forty-six states reported on emissions for SCCs in which emission factor development was necessary for NO_x, SO_x, and VOC. Emission factors for 293 SCCs were included in these reports. Of the 293 SCCs for which factors were needed, 130 NO_x emission factors (98% of the NO_x requests) were developed, 128 SO_x emission factors (99% of the SO_x requests) were developed, and 169 VOC emission factors (100% of the VOC requests) were developed. These emission factors are based on data supplied in published literature and the transfer of existing factors from similar processes. Many of the state submittals were received late in the project, and emission factor development is on-going. Two states had not yet submitted emissions data to NEDS as of April 30, 1987. In its final form, this document will address all SCCs for which state reports on emissions require emission factor development.

Recommendations

Recommended activities for future study include the development of additional NO_x and SO_x emission factor estimates. The approach would be similar to that used for VOCs. Further review of data which have been collected from states and the literature may help estimate additional NO_x and SO_x emission factors. Source categories targeted are chemical manufacturing industries and primary and secondary metals industries.

The emission factors developed during this effort are considered of "E" quality by AP-42 standards primarily because they are of unknown or uncertain quality. In some cases, the factors may be of much higher quality; however, the data should be reviewed and verified before higher ratings are applied. Emissions testing is recommended for improving some of these "E" rated factors, with emphasis on testing of sources with large VOC emission factors. Identification of the SCCs for which testing is desirable should be included in future work.

Emission factor development needs for particulate matter (PM) and carbon monoxide (CO) should be identified to determine the amount of additional work necessary if filling of emission factor gaps for SCCs for these two pollutants is desired.

Table 1. Summary of Emission Factor Development

<i>Major Source Category</i>	<i>Total SCCs in Category</i>	<i>SCCs for Which Emission Factors are Inappropriate^a</i>	<i>SO_x Emission Factors (% Completed)^b</i>	<i>NO_x Emission Factors (% Completed)^b</i>	<i>VOC Emission Factors (% Completed)^b</i>
<i>Combustion Sources</i>	190	8	179 (98%)	177 (97%)	182 (100%)
<i>Chemical Manufacturing</i>	723	70	179 (34%)	192 (36%)	612 (94%) ^c
<i>Inorganic Chemical Storage</i>	28	6	15 (75%)	18 (86%)	26 (100%)
<i>Food and Agricultural</i>	151	22	102 (82%)	102 (82%)	129 (100%)
<i>Primary Metals</i>	223	13	142 (70%)	120 (60%)	210 (100%)
<i>Secondary Metals</i>	215	20	126 (68%)	131 (70%)	195 (100%)
<i>Mineral Products</i>	387	31	321 (91%)	328 (93%)	354 (100%)
<i>Petroleum Operations</i>	56	8	39 (84%)	39 (84%)	48 (100%)
<i>Pulp and Paper</i>	87	26	51 (89%)	52 (90%)	65 (100%)
<i>Rubber and Plastics</i>	38	7	6 (34%)	6 (34%)	31 (100%)
<i>Fabricated Metals</i>	52	19	24 (83%)	26 (86%)	35 (100%)
<i>Oil and Gas Production</i>	29	8	12 (69%)	11 (66%)	21 (100%)
<i>Textiles</i>	21	12	0 (0%)	0 (0%)	9 (100%)
<i>Organic Solvent Evaporation</i>	270	41	229 (100%)	229 (100%)	229 (100%)
<i>Petroleum Storage</i>	139	17	122 (100%)	122 (100%)	122 (100%)
<i>Chemical Storage</i>	289	52	237 (100%)	237 (100%)	237 (100%)
<i>Solid Waste Disposal</i>	62	4	45 (79%)	44 (77%)	58 (100%)
<i>Other^d</i>	197	35	145 (91%)	142 (90%)	162 (100%)
Total	3157	399	1974 (75%)	1976 (75%)	2725 (99%)

^aThese include the "General Processes" (-01) codes, the "Other/Not Classified" (-98, -99) codes, and "Specify in Comments" (-888) codes.

^bThese percentages include SCCs for which emission factors have been developed and SCCs for which emission factor development is not required (see note a).

^cEmission factors for fugitives cannot be developed until nationwide equipment counts become available for each chemical manufacturing industry

^d"Other" category includes numerous small categories such as building construction, electrical equipment, printing and publishing, and photographic equipment.

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J. David Mobley is the EPA Project Officer (see below).

The complete report entitled "Criteria Pollutant Emission Factors for the 1985 NAPAP Emissions Inventory," (Order No. PB 87-198 735/AS; Cost: \$24.95, subject to change)

will be available only from:

National Technical Information Service
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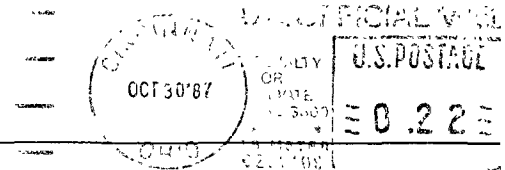
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