

Supplementary material

Excess lifetime cancer risk assessment of volatile organic compounds emitted from a petrochemical industrial complex

Ming-Jen Chen^a, Ching-Ho Lin^b, Chin-Hsing Lai^b, Li-Hsin Cheng^c, Ya-Hui Yang^a,
Li-Jen Huang^a, Shu-Hsing Yeh^c, Hui-Tsung Hsu^{d*}

^a *Department of Occupational Safety and Hygiene, Fooying University, Kaohsiung City 831, Taiwan.*

^b *Department of Environmental Engineering and Science, Fooying University, Kaohsiung City 831, Taiwan.*

^c *Department of Leisure and Recreation Industry Management, Fooying University, Kaohsiung City 831, Taiwan.*

^d *Department of Health Risk Management, China Medical University, Taichung City 404, Taiwan.*

*Corresponding author: Hui-Tsung Hsu, Ph.D. Email: hthsu@mail.cmu.edu.tw

Table S1 Summary of industrial manufacturing processes for 21 factories and selected source profile for estimation of speciation of VOCs.

ID	Manufacturing processes	Selected profile No.	Name of selected profile from SPECIATE 4.2
A	Surfactant	2474	Industrial Point Source, Texas Petrochem, Principle Business: Organic Chemical Synthesis - 1993
	HTM heating processes	0001	External Combustion Boiler - Residual Oil
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil
	Wastewater treatment plant	2541	Wastewater Treatment Plants - New Jersey
B	Terephthalic acid	1025	Terephthalic Acid/Dimethyl Terephthalate Product Transfer Vent
	Terephthalic acid/dimethyl	1025	Terephthalic Acid/Dimethyl Terephthalate Product Transfer Vent
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil
	Solid waste incineration process	0122	Bar Screen Waste Incinerator
	Wastewater treatment plant	2541	Wastewater Treatment Plants - New Jersey
C	Terephthalic acid/dimethyl	1025	Terephthalic Acid/Dimethyl Terephthalate Product Transfer Vent
D	Carbon black	1002	Chemical Manufacturing – Carbon Black Production
	Boiler, power generation	0004	External Combustion Boiler - Refinery Gas
	Boiler, steam generation	0004	External Combustion Boiler - Refinery Gas
E	Acrylonitrile-styrene copolymer (AS)	1009	Plastics Production - ABS Resin

ID	Manufacturing processes	Selected profile No.	Name of selected profile from SPECIATE 4.2
	Acrylonitrile-butadiene-styrene copolymer	(ABS) 1009	Plastics Production - ABS Resin
	Industrial waste incineration process	0122	Bar Screen Waste Incinerator
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
F	Boiler, power generation	0001	External Combustion Boiler - Residual Oil
	Naphtha cracking process	2459	Refinery - Chevron South - August 6-17, 1996
	Catalyst Restructuring Program	2459	Refinery - Chevron South - August 6-17, 1996
	Aromatics	2459	Refinery - Chevron South - August 6-17, 1996
	Hydrodesulfurization process	2459	Refinery - Chevron South - August 6-17, 1996
	Sulfur recovery process	2459	Refinery - Chevron South - August 6-17, 1996
	Solid waste incineration process	0122	Bar Screen Waste Incinerator
	Other chemical	2459	Refinery - Chevron South - August 6-17, 1996
	Other petroleum products	2459	Refinery - Chevron South - August 6-17, 1996
	Butadiene	2459	Refinery - Chevron South - August 6-17, 1996
	VOCs Tanks	2460	Refinery - Chevron Tank Farm (Evaporative) - August 6-17, 1996

ID	Manufacturing processes	Selected profile No.	Name of selected profile from SPECIATE 4.2
	Industrial waste incineration process	0122	Bar Screen Waste Incinerator
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
G	MTBE	1158	Methyl T-Butyl Ether
	Butanol	2474	Industrial Point Source, Texas Petrochem, Principle Business: Organic Chemical Synthesis - 1993
	Other ketones chemical	2474	Industrial Point Source, Texas Petrochem, Principle Business: Organic Chemical Synthesis - 1993
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil
	Other Inorganic Chemical	2474	Industrial Point Source, Texas Petrochem, Principle Business: Organic Chemical Synthesis - 1993
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
H	Other alcohols chemical	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals – 1993
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
I	Ethylbenzene	1066	Styrene – General
	Diethylbenzene	1066	Styrene – General
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil
	Styrene	1066	Styrene - General
J	Vinyl chloride	1091	Plastics Production - Polyvinyl Chlorides and Copolymers

ID	Manufacturing processes	Selected profile No.	Name of selected profile from SPECIATE 4.2
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
K	Polypropylene (PP) manufacturing process	0068	Manufacturing - Plastics - Polypropylene
L	Polyvinyl Chlorides manufacturing process	1091	Plastics Production - PVC and Copolymers
	Acrylic resin	2476	Industrial Point Source, Phillips Chemical Company, Principle Business: K-Resin Production - 1993
	Vinyl chloride	1091	Plastics Production - PVC and Copolymers
	Acrylic acid and acrylic esters	1043	Acrylic Acid - Quench Absorber
	Waste gas incineration process	0122	Bar Screen Waste Incinerator
	Boiler, power generation	1178	Coal-Fired Boiler - Electric Generation
	High density polyethylene manufacturing	2547	Polyethylene Plant: Kawasaki City
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
M	Maleic anhydride	2474	Industrial Point Source, Texas Petrochem, Principle Business: Organic Chemical Synthesis - 1993
	N-butene	2474	Industrial Point Source, Texas Petrochem, Principle Business: Organic Chemical Synthesis - 1993
	Phenols	1050	Cyclohexanone/Cyclohexanol - Phenol Hydrogenation Process - Distillation Vent
	Other chemical	2474	Industrial Point Source, Texas Petrochem, Principle Business: Organic Chemical Synthesis - 1993

ID	Manufacturing processes	Selected profile No.	Name of selected profile from SPECIATE 4.2
	Isopropanol	1065	Propylene Oxide - Chlorohydration Process - General
N	Isopropanol	0227	Surface Coating Solvent - Isopropyl Alcohol
	Acetone	1028	Acetone - Light Ends Distillation Vent
	Methyl isobutyl ketone	1022	Printing/Publishing - Ink Thinning Solvents - Methyl Isobutyl Ketone
	Acetaldehyde	1033	Aldehydes Production - Acrolein - Reactor Blowoff Gas
	Ethyl acetate	0220	Paint Solvent - Ethyl Acetate
	HTM heating program	0002	External Combustion Boiler - Distillate Oil
	Other chemical	2456	Composite of five Emission Profiles from Miscellaneous Industrial Plants
	Industrial waste incineration process	0122	Bar Screen Waste Incinerator
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
O	Low density polyethylene manufacturing	2547	Polyethylene Plant: Kawasaki City
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil
	HTM heating program	0001	External Combustion Boiler - Residual Oil
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
P	Benzene	1066	Styrene - General

ID	Manufacturing processes	Selected profile No.	Name of selected profile from SPECIATE 4.2
	Other chemical	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals - 1993
	Phenols	1050	Cyclohexanone/Cyclohexanol - Phenol Hydrogenation Process - Distillation Vent
	Hydrogenated petroleum resin	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals - 1993
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
Q	Ethylene oxide	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals – 1993
	Ethylene glycol	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals – 1993
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil
	Ethanolamine	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals - 1993
	Other esters (ethylene carbonate)	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals - 1993
	Other rubber products	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals - 1993
	Ethanolamine	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals - 1993
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
R	Cumene	1048	Cumene Production - Cumene Distillation System Vent
	Other chemical	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals - 1993
	Maleic anhydride	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals - 1993

ID	Manufacturing processes	Selected profile No.	Name of selected profile from SPECIATE 4.2
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil
	Phenols	1050	Cyclohexanone/Cyclohexanol - Phenol Hydrogenation Process - Distillation Vent
	Cyclohexanone	1050	Cyclohexanone/Cyclohexanol - Phenol Hydrogenation Process - Distillation Vent
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
S	Adhesive chemical	2476	Industrial Point Source, Phillips Chemical Company, Principle Business: K-Resin Production – 1993
T	Synthetic latex	2476	Industrial Point Source, Phillips Chemical Company, Principle Business: K-Resin Production - 1993
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil
	Paperboard	1189	Pulp and Paper Industry - Plywood Veneer Dryer
	Other rubber products	2476	Industrial Point Source, Phillips Chemical Company, Principle Business: K-Resin Production - 1993
	Nitric acid	2476	Industrial Point Source, Phillips Chemical Company, Principle Business: K-Resin Production - 1993
	Wastewater treatment plant	2541	Wastewater Treatment Plants – New Jersey
U	Synthetic latex	2476	Industrial Point Source, Phillips Chemical Company, Principle Business: K-Resin Production - 1993
	Fumaric acid	2470	Industrial Point Source, Albemarle, Principle Business: Industrial Organic Chemicals - 1993
	Octyl phthalate	2476	Industrial Point Source, Phillips Chemical Company, Principle Business: K-Resin Production - 1993
	DEHP	2476	Industrial Point Source, Phillips Chemical Company, Principle Business: K-Resin Production - 1993

ID	Manufacturing processes	Selected profile No.	Name of selected profile from SPECIATE 4.2
	Cardiff esters	1046	Esters Production - Acrylates - Ethyl Acrylate
	Solid waste incineration process	0122	Bar Screen Waste Incinerator
	Boiler, steam generator	0001	External Combustion Boiler - Residual Oil