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Mr. T. W. Dalton

WGK Plant

DEPARTMENTS 246, A-246
SAFETY AUDIT (TSD 729:2331)
FLAMMABLE LIQUIDS

A survey was made in the subject departments of all crude and finished materials to determine the relative fire and explosive hazard by comparing with the W. G. K. Plant Guide for Hazardous Flammable Liquids.

A tabulation of the products and pertinent physical properties is included.

Diphenyl, with a flash point of 235°F (112.5°C) may be heated above this temperature (melts at 70°C), therefore must be continued to be handled as a flammable liquid.

Toluene, Xylene, and Butyl Acetate-Sec. along with each of their Aroclor mixes, all have flash points under the specified (W. G. K. Plant Guide) 110°F making it necessary to handle all of them as flammable liquids. It was noted the flash points of Toluene and Butyl Acetate-Sec. as listed in the Formal Operating Instructions are not in agreement with those I have listed, along with the source of my information.

In reviewing the Toluene, Xylene, Butyl Acetate, Aroclor Mixing Operating Instructions (intermittent operations) and inspection of the equipment, certain inherent hazards must necessarily be recognized.

1. Flame arrestor missing on the Mixing Tank Vent. Recommend physically disconnecting the blanked off line from vent extending into the lean-to and connected to the vent header.

2. Toluene, Xylene, and Butyl Acetate-Sec. are pumped into the mix tank containing the Aroclor. Instructions require the Aroclor to cool overnight in the mix tank before pumping in the flammable ingredients. Suggest specifying maximum temperature at which pumping is to start.

3. Clearing the Toluene, Xylene, and Butyl Acetate-Sec. pump-in line with air pressure and opening the mix tank for sampling and measuring are all conducive to a hazardous situation, particularly with gas burners and smoking privileges in this area, in spite of the fact that department regulations (included in written Operating Instructions) control these sources of ignition.

4. Monthly Safety Inspection Report, as reported to Safety Office, indicates only "all grounded equipment" inspected on certain date and condition. Believe a report showing specific points tested with Ohm readings would be more meaningful. Condition of flame arrestor should also be included.

The conditions as stated above have been discussed with the department supervisor, Mr. J. Kellogg, and foreman, Mr. Earl Smith.

Further discussion and/or other comments will be appreciated.

T. H. Becker

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MONS 049315

MONS 049316

Product	Flash Point Closed Cup °F	Flash Point Open Cup °F	Source	Auto Ignition °F	Explosive Limits % Vol. in Air Lower	Explosive Limits % Vol. in Air Upper	X. Pt. or Mt.Pt.	Boiling Point @ 760 mm	Vapor Density Air=1	Remarks From Dangerous Properties of Industrial Products by N. I. Sax (Safety Office Library)
Diphenyl	235	255	(1)	498	-	-	70°C	255°C	5.31	Will burn when exposed to heat or flame, can react with oxidizing materials.
Chlorine Gas	-	-	-	-	-	-	-101°C	-34.5°C	2.49	Is not combustible in air but can react to cause fires or explosions upon contact with turpentine, ether, ammonia gas, illuminating gas, hydrocarbons, hydrogen, powdered metals and/or reducing agents. Sunlight can accelerate these reactions. (See footnote A)
Toluene (Toluol)	40	45	(1)	1026	1.27	7.0	-95°C	110°C	-	Dangerous fire hazard when exposed to heat or flame. Moderate explosion hazard when exposed to heat or flame. Can react vigorously with oxidizing materials.
Xylene 20% Ortho 36% Meta 15% Para 28% Ethyl-benzene	85 78	-	(5) (4)	-	1.1	7.0	-	137°C	Heavier than air	Dangerous fire hazard when exposed to heat or flame, can react with oxidizing materials. Moderate in the form of vapor when exposed to heat or flame.
Butyl Acetate-Sec.	59	-	(2)	-	1.7(3)	-	-	112°C	4.00	Dangerous fire hazard when exposed to heat or flame, can react with oxidizing materials. Moderate explosion hazard when exposed to flame.
Attapulgus Earth	-	-	-	-	-	-	-	-	-	Inert - Dried at 400°C in dept.

(1) Factory Insurance Association (2) WGK Physical Constants Manual (3) N. I. Sax book (4) WGK Lab
(5) Purchased from and reported by Shell, Xylene 5 Degree, Shell Code 81395, information from Shell through Mr. Durnstorff

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Product	Flash Point Closed Cup °F	Flash Point Open Cup °F	Source	Auto Ignition °F	Explosive Limits % Vol. in Air Lower	Explosive Limits % Vol. in Air Upper	X. Pt. or Mt.Pt.	Boiling Point @ 760 mm	Vapor Density Air=1	Remarks From Dangerous Properties of Industrial Products by N. I. Sax (Safety Office Library)
Lime Hydrated (slaked) $Ca(OH)_2$	-	-	-	-	-	-	-	Decomposes	-	In the form of dust it is considered to be an industrial hazard.
Aroclors:										
1142-1242	350	-	(2)	-	-	-	-	325°C	-	Slight fire hazard when exposed
1148-1248	382	-	(2)	-	-	-	-	345°C	-	to heat or flame. Can become
1154-1254	None	-	(2)	-	-	-	-	365°C	-	dangerous when heated to decom-
1160-1260	None	-	(2)	-	-	-	-	385°C	-	position, emit highly toxic fumes.
1162-1262	None	-	(2)	-	-	-	-	390°C	-	
Aroclor 1254 + 10% Butyl Acetate-Sec.	90	-	(2)	-	-	-	-	-	-	Fire and explosion hazard when exposed to heat or flame.
Aroclor 1260 + 10% Toluene	94	-	(4)	-	-	-	-	-	-	Fire and explosion hazard when exposed to heat or flame.
Aroclor 1262 + 10% Toluene	105	-	(2)	-	-	-	-	-	-	Fire and explosion hazard when exposed to heat or flame.
Aroclor 1254 + 10% Xylene	120	-	(4)	-	-	-	-	-	-	Fire and explosion hazard when exposed to heat or flame.
Hydrochloric Gas (By-Product)	-	-	-	-	-	-	-(2)	-85°C	-	Dangerous when heated to decomposition, it emits highly toxic fumes of chlorides. Explosive hazard when wet HCl reacts with metal to form hydrogen.

(A) General Chlorine information (does not now apply in this dept.) In some chlorination processes the excess or unreacted chlorine is absorbed in caustic soda. If the caustic soda becomes neutralized and more chlorine

(over)

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(A) (continued)

added, chlorine dioxide may be formed. The chlorine dioxide gas explodes spontaneously when it reaches about 10% concentration. (From Discussions of Fires and Explosions, Vol. 6, Page 24, 1951 National Safety Council)

Product	Flash Point Closed Cup °F	Flash Point Open Cup °F	Source	Auto Ignition °F	Explosive Limits % Vol. in Air Lower	Explosive Limits % Vol. in Air Upper	X. Pt. or Mt. Pt.	Boiling Point @ 760 mm	Vapor Density Air=1	Remarks From Dangerous Properties of Industrial Products by N. I. Sax (Safety Office Library)
Trichloro-benzene (1, 2, 3 + 1, 2, 4 TCB)	230	-	(3)	-	-	-	10°C	213°C	6.26	Slight fire hazard when exposed to heat or flame. When heated to decomposition (300°C+) it emits highly toxic fumes of chlorides. Can react with oxidizing materials.
Tri-Tetra-chlorobenzene	-	-	-	-	-	-	-15°C	210°C	-	Slight fire hazard when exposed to heat or flame. When heated to decomposition it emits highly toxic fumes of chlorides.
Tin Tetra-phenyl	450	-	(2)	-	-	-	228°C	424°C	-	Slight fire hazard when exposed to heat or flame. Dangerous when heated, it emits toxic fumes. Can react with oxidizing materials.
Glycidyl Phenyl Ether (Phenoxypropane Oxide) 1, 2 Epoxy-3-Phenoxypropane)	-	175	(2)	-	-	-	3.5°C	245°C	- (6)	Slight fire hazard when exposed to heat or flame. The vapors of glycidyl phenyl ether normally will not present a hazard at ordinary room temperatures. Inhalation of vapors above 60°C should be avoided.

(2) WGK Physical Constants Manual
(3) N. I. Sax Book, Dangerous Properties of Industrial Products
(6) Technical Bulletin SC:54-5, Shell Chemical Corporation