U.S. Department of Labor
Occupational Safety and Health Administration

Inspection Report

Fri Jun 27, 2003 7:21am

Rpt ID	Assignment Nr.	CSHO ID	Supervisor ID	Inspection Nr.	Opt. Insp. Nr.
0626300	0	Ex 7(c)		305465916	149

Establishment Name	Eastman Chemical Company, Texas Operations				
Site Address	Kodak Blvd Longview, TX 75607	Site Phone	(903) 237-5418	Site FAX	
Mailing Address	P.O. Box 7444 Longview, TX 75607-7444	Mail Phone	(903) 237-6309	Mail FAX	(903) 237-5882
Controlling Corp	Eastman Chemical Company	Employer ID	Ex 4		
Ownership	A. Private Sector	City	4080	County	203
Legal Entity		Previous Activity (State Only)			

Related Activity					
Type	Number	Satisfied	Type	Number	Satisfied
A. Accident	100782697				

Employed in Establishment		Advance Notice?	Yes	Category	H. Health
Covered By Inspection	Ex 4	Union?	No	Interviewed?	Yes
Controlled By Employer		Walkaround?	No		
Primary SIC	2869	Secondary SIC		Inspected	
Primary NAICS	325110	Secondary NAICS		NAICS Inspected	

Inspection Type	A. Fatality/Catastrophe	Reason No Inspection	
Scope of Inspection	B. Partial Inspection		
Classification			
Strategic Initiatives			
National Emphasis	PETRO Petro Chemical		
Local Emphasis			

Anticipatory Warrant Served?	No	Denial Date	Date ReEntered	Date ReDenied	ReEntered
Anticipatory Subpoena Served?	No				

Entry	05/12/03	13:15	First Closing Conference		
Opening Conference	05/12/03	13:30	Second Closing Conference		
Walkaround	05/12/03	15:00	Exit	05/13/03	16:00
Days On Site	2		Case Closed		
			No Citations Issued		

Type	ID	Optional Information
N	10	IMMLANG-N

CSHO Signature	Date	6-27-03

Ex 7(c)

U.S. Department of Labor
Occupational Safety and Health Administration

Inspection Report

Wed May 14, 2003 11:24am

Rpt ID	Assignment Nr.	CSHO ID	Supervisor ID	Inspection Nr.	Opt. Insp. Nr.
0626300	0	EX7(c)		305465916	

Establishment Name	Eastman Chemical Company, Texas Operations				
Site Address	Kodak Blvd Longview, TX 75607	Site Phone	(903) 237-5418	Site FAX	
Mailing Address	P.O. Box 7444 Longview, TX 75607-7444	Mail Phone	(903) 237-6309	Mail FAX	(903) 237-5882
Controlling Corp	Eastman Chemical Company	Employer ID	EX4		
Ownership	A. Private Sector	City	4080	County	203
Legal Entity		Previous Activity (State Only)			

Related Activity					
Type	Number	Satisfied	Type	Number	Satisfied
A. Accident	100782697				

Employed in Establishment	EX4	Advance Notice?	Yes	Category	S. Safety
Covered By Inspection		Union?	No	Interviewed?	Yes
Controlled By Employer		Walkaround?	No		
Primary SIC	2869	Secondary SIC		Inspected	
Primary NAICS	325110	Secondary NAICS		NAICS Inspected	

Inspection Type	A. Fatality/Catastrophe	Reason No Inspection	
Scope of Inspection	B. Partial Inspection		
Classification	Safety Planning Guide/Manufacturing		
Strategic Initiatives			
National Emphasis	PETRO Petro Chemical		
Local Emphasis			

Anticipatory Warrant Served?	No	Denial Date	Date ReEntered	Date ReDenied	ReEntered
Anticipatory Subpoena Served?	No				

Entry	05/12/03	13:15	First Closing Conference	05/13/03	15:45
Opening Conference	05/12/03	13:30	Second Closing Conference		
Walkaround	05/12/03	15:00	Exit	05/13/03	16:00
Days On Site	2		Case Closed		
			No Citations Issued		

Type	ID	Optional Information
N	10	IMMLANG-N

CSF

14, 2003

EX 7(c)

U. S. Department of Labor
Occupational Safety and Health Administration

Investigation Summary

Wed Oct 22, 2003 1:55pm

Reporting ID	Investigation Summary Number	OSHA-36 Number	OSHA-36 Establishment Name
0626300	**200782738**	**100782697**	**Eastman Chemical Company, Texas Operations**
Event Date	**05/11/03**	Event Time	**11:00 am**
Type of Event	**explosion and fire**		

Inspection Number/ Establishment Name	**305465916** **Eastman Chemical Company, Texas Operations**
Injured/Deceased Name	**G. Mark Mitchell**
Sex:	**M. Male**
Age:	**42**
Injury:	**A. Fatality**
Nature:	**05 Burn or scald (heat)**
Part of Body:	**04 Body system**
Source of Injury:	**16 Fire or smoke**
Event Type:	**14 Other**
Environmental Factor:	**10 Flammable liquid or solid exposure**
Human Factor:	**14 Other**
Task:	**A Regularly Assigned**
Substance Code:	
Occupational Code	**766 - FURNACE, KILN AND OVEN OPERATORS**

Abstract:

On Sunday morning, May 11, 2003 at approximately 11:00 am, Waste Facility Operator was transferring a waste liquid from a 5 ft portable tank into an active incinerator. The waste liquid was a mixture of mineral oil and triethyl aluminum (TEAL). TEAL is pyrophoric and reacts spontaneously with air and/or moisture resulting in ignition. The liquid waste was moved by nitrogen pressure on the tank, through a flexible steel hose, into a rigid piping system for delivery into the incinerator. The delivery hose and piping had been pre-purged with nitrogen. The explosion and fire destroyed the flexible steel hose, splitting it both lengthwise and into approximately six inch crosswise segments. The waste facility operator was in close proximity to the ruptured hose and was engulfed in flames. His body was not retrievable until after the fire was extinguished.

The portable tank was charred on the side where the steel hose was located, not undamaged on its opposite side. The rigid piping had char marks on the outer surfaces, but was not bent or deformed. The incinerator was unaffected by the explosion and fire which had occurred only 20-30 feet away.

A co-worker reported having had some operational difficulties while he was working on the waste transfer with the waste facility operator that morning. The rigid piping system had clogged and was cleared by nitrogen pressure. The piping system had also developed hot spots, a situation which hadn't ever happened before.

U. S. Department of Labor
Occupational Safety and Health Administration

Fatality/Catastrophe Report

Mon May 12, 2003 9:34am

Reporting ID	0626300	Previous Activity (Type & Number)	0			Event Number	100782697	
Establishment Information	Establishment Name	Eastman Chemical Company				Employer ID		
	Site Address	Kodak Blvd Longview TX 75607				City Code	4080	County Code 203
		Site Phone	(903) 237-5418	Site FAX				
	Mailing Address	P.O. Box 744 Longview, TX 75607-7444						
	Event Address (if different)	Kodak Blvd Longview, TX 75607						
Industry & Ownership	Type of Business		Primary SIC	2869	Primary NAICS		No. of Employees	Ex 4
	Ownership	A. Private Sector						
Receipt Information	Reported By			Date	05/11/03	Time		
	Job Title			Telephone				
Employee Representation	Group Name(s):							
Classification	A. Fatality							
Event Description	Event Date	Event Time	Number of Fatalities	Number of Hospitalized Injuries	Number of NonHospitalized Injuries	Number Unaccounted for		
	05/11/03	11:00 am	1	0	0	0		
	Type of Event	fire						
Preliminary Description	Employee G(eorge) Mark Mitchell was transferring watse liquid from a portable tank to an active incinerator. The flexible line connecting the tank to the incinerator failed, possibly from a pressure failure, and the liquid sprayed and immediatley caught fire.							
Action	Inspection Planned?	Supervisor(s) Assigned		CSHO(s) Assigned				
	Yes	Ex 7(c)			Ex 7(c)			
Strategic Initiatives								
National Emphasis								
Local Emphasis								
Optional Information	Type	ID	Optional Information Value					
Comments								

U. S. Department of Labor
Occupational Safety and Health Administration

Worksheet

Fri Nov 7, 2003 9:04am

Inspection Number	305465916
Opt. Insp. Number	149

Establishment Name	Eastman Chemical Company, Texas Operations				
Type of Violation	S Serious	Citation Number	01	Item/Group	001
Number Exposed	Ex 4	No. Instances	1	REC	A Accident
Std. Alleged Vio.	1910.0132(a)				

Abatement Period	MultiStep Abatements			Final Abatement	Action Type/Dates
	PPE Period	Plan	Report		
15					

Abatement Documentation Required	Y	Date Verified		

Substance Codes	

AVD/Variable Information:

29 CFR 1910.132(a): Protective equipment was not used when necessary whenever hazards capable of causing injury and impairment were encountered:

On or about, May 11, 2003, at the incineration unit; appropriate personal protective equipment clothing and faceshields were not used to protect employees from the hazards and potential hazards of transferring triethylaluminum mixtures to the incinerator kiln.

Penalty Calculations				Adjustment Factors			Proposed Adjusted Penalty
Severity	Probability	Gravity	GBP	Size	Good Faith	History	
H High	G Greater	10	5000.00	0	0	10	4500.00
Repeat Factor		0					

Employee Exposure:

Occupation		Employer	Eastman Chemical Company		
Nr of Employees		Duration	6-8 hours	Frequency	every 60 days
Employee Name					
Address		Phone	Ex 7(c)		
Occupation	Ex 7(c), 4, 6	Employer	Eastman Chemical Company		
Nr of Employees		Duration	6-8 hours	Frequency	every 60 days
Employee Name					
Address		Phone	( ) -		

Instance Description: A. Hazard B. Equipment C. Location D. Injury/Illness E. Measurements

4. Date/Time
05-11-03 11am

20. Instance Description - Describe the following:

a) Hazards-Operation/Condition-Accident:

The Hazard
The task at hand was the pressured gas (nitrogen) transfer of a Triethyl Aluminum (TEAL) in mineral oil solution from a waste tank to an incineration kiln.
TEAL is PYROPHORIC (ignites in air). Ignition occurs immediately upon contact with air and the flame is self-sustaining in that the product burns its own ethyl molecules as fuel and only elemental aluminum remains. TEAL also reacts with water in a similar fashion. The hazards in employee exposure would inlcude exothermic reactions with the water in eyes and mucous membranes and a thermal burn hazard.

The MSDS to Triethylaluminum from the AKZO NOBEL CORPORATION, specifies that skin contact must be prevented through the use of fire-retardant clothing. The MSDS continues to read: During sampling, disconnecting lines or opening connections, additional protective outerwear including full-face shield, impervious gloves, aluminized suit, and hard hat, steel toed safety shoes that cover the ankles and chemical safety goggles should also be worn.AKZO and other manufacturers all recommend aluminized jackets/suits as the appropriate form of fire-retardent clothing.

The Actual Exposure
Huntsman Chemical Company, which shares a production campus with Eastman Chemical in Longview, contracted with Eastman to incinerate hazardous waste consisting of a mixture of Triethyl Aluminum (TEAL) and Mineral Oil. Huntsman Chemical Company would empty two 55 gallon drums of Mineral Oil into a portable tank and fill the tank with the waste product (from TEAL lines flushed with mineral oil) over a 60-day accumulation period. The Environmental Protection Agency allows for a 90 day retention on a hazardous waste for a small quantity generator, so the Huntsman Company transfers the waste at 60 days giving them a 30 day window. Management for the Huntsman Company said that the exact ratio of TEAL to Mineral Oil was unknown but they thought it was between 20 and 40% TEAL.The tank used on this day had a capacity of 422 gallons.

Mark Mitchell was the outside operator at the incinerator on May 10 and 11. His co-worker (inside operator) said that they set up the piping system on Saturday before they left the worksite so that they could start with the incineration of the TEAl on Sunday morning. On the morning of the 11th they ran a nitrogen purge and then tried to start the flow of TEAL to the incinerator. No flow could be established. Mitchell reported the line was plugged and said that a section of hard piping, 8 feet above a bend, was hot to the touch. The co-worker stated that they worked to remove the plug with little success until Mitchell went to another area and obtained a cyliner of nitrogen at higher pressure (regulated to about 900 psi, unregulated to about 2100 psi) and blew the pipe out. The incnerator log showed that they worked for about three hours to unplug the floow of the line. Less than 5 minutes after the flow was established, there was an explosion and fire. Mark Mitchell's body was recovered from the burn area.

The Justice of the Peace [illegible] who pronounced Mr. Mitchell at the accident site, said in response to a question via phone, that she did not see any fire-retardant material on the body or any type of mask on the face of the victim. She did indicate that the body was so badly burned that it would have been difficult to see anything on the face, and the clothing was badly burned as were the shoes.

In response to document request 3, items 7 and 8 dated June 19, 2003, the company's hazard assessment specifies the wearing of chemical goggles or safety glasses, gloves, and hardhat(TXO 00246). It does not specify the use of fire-retardant clothing. Another out-side operator was interviewed and it was learned that he was not issued a fire-retardant suite to wear for this same operation nor for the transfer of two other flammable materials (EPB and CPCA). The Eastman hazard assessment for PPE to item Five on TXO 00343, reads: Operates/monitors/maintains incinerators and incinerator related equipment (pumps, fans, etc.) General Hazards, Thermal Burns, Corrective measures = Follow General Corrective Measures. Provide long sleeve coveralls and gloves. Provide training on all Standard Operating Procedures pertaining to the operation of incinerators and incinerator related

equipment. Again the company's hazard assessment fails to identify fire-retardant suits as a necessary PPE for this operation, stating more to the point that the employee(s) are not provided adequate protection as according to the MSDS and the general characteristic of the chemicals.

Information Held by the Company Demonstrating the Potential for Exposure to the Hazard

Eastman performed PHAs on incinerator processes, including the TEAL incineration process. On page marked TXO 00286, from Eastman's Process Hazard Analysis,

Question Number 63 reads as follows:

> "What are the potential consequences if connections from portable teal tank to SA-1 burner line are not made properly?
> Priority Ranking-3 Consequence-Serious Frequency-Possible
> Explanation of Worst Case Credible Consequences/Causes
> Improper connection may lead to a release of teal solution which is pyrophoric and could result in a fire.
> RECOMMENDATIONS:
> Verify that Safe practices for handling teal are addressed in the SOP.
> This should include PPE.
> Consider need for sprinkler protection."

> Question Number 66 reads as follows:
> "What are the potential consequences if the TEAL line to the kiln plugs?"
> Priority...3
> Consequences...Serious
> Frequency...Possible
> Explanation of worst case credible consequences.causes
> ...Plugging of TEAL Line
> ...Attempts to unplug line could expose personnel and surroundings to TEAL which is pyrophoric.
> Engineering Controls:
> 1. Trained operators and SOPs which includes maximum pressure to be used during unplugged operations.
> 2. Two fire water monitors nearby.
> 3. PPE equipment available
> 4. Sprinkler protection and CGA's

Eastman's own writing shows employer knowledge of the potential leakage and subsequent employee exposure to a pyrophoric substance; furthermore, they acknowledge that personal protective equipment must be addressed and made available to the employee. Although they fall short of specifying just what that PPE should be, it is evident from their attention to it in this context that it must address the pyrophoric nature of the exposure. Eastman was unable to locate any documentation of actions taken following this PHA to address the concerns.

Eastman provided the PHA for incineration of CPCA, performed in the fall of 2002. This also addressed the concern of accidental releases occurring. In response to these concerns, Eastman wrote into the CPCA incineration SOP that the outside operator was to wear a full butyl rubber suit and a respirator and that even the inside operator should wear a respirator. The equipment and techiques used to transfer CPCA were exactly the same as those used for TEAL. This PHA also called for an unplugging method to be included in the SOP, and indeed this was written into the SOP, unlike the one for TEAL.
Note that both the PHA and SOPs for TEAL had been re-written since the issue was first raised, then apparently dropped. See file.

At the 1999 review of the incinerator PHA, near misses were reviewed and two of these involved accidental releases of chemical at the incineration unit. While neither involved TEAL, they did demonstrate the potential for material to be released. See file.

Approximately 50 Eastman employees are used to operate the Huntsman Chemical processes at the site. Both Huntsman and Eastman described a shared responsibility in the safety of those employees. Eastman employees breaking lines and transfering TEAl mixtures at the Huntsman operation have worn aluminized jackets and faceshields since the early 1990s.

Industry Practice: Information was obtained from Akzo Nobel and Abermarle (TEAL suppliers), Huntsman Chemical and Texas Instruments (TEAL users) and Clean Harbor (incineration site recommended by AKZO to their users). All used at least aluminzed jackets, gloves and specialty faceshields when performing line breaks and/or transfers of TEAL. Additional piping, purge and transfer measures not used by Eastman were referenced by these companies. See file.

b) Equipment: Corrugated flexible steel braided hose made by PENFLEX, 20 feet in length.
. According to information received from Eastman, dated June 9, 2003, TXO 00250, the steel braided hose that failed in the accident was a Penflex (brand) one inch I.D, 1.58 O.D., with a working pressure capacity of 714 PSI @70^{0}F, with a bursting pressure at 2,856 PSI @70^{0}F. According to interview statements the system was attached to a compressed bottle of N_2, at 2100 PSI, used to blow-out a clog in the line. According to my field evaluation, there was a regulator that permitted only 90 PSI from the N_2 cylinder to enter the line. The line normally operated at about 30 PSI.

The flexible coupling was a metal corrugated hose with a stainless steel braided outer covering. This particular one has been identified by the Eastman to be Series 700. The failure of the hose appears to be in the section between the two ends, as each of the two ends are still welded to the hose. The ends are steel flanges with bolt holes that are used to attach the hose to the incinerator system. The exact failure of the hose appears to be limited to either fatigue leading to a hole in the corrugated hose, or rupture from too much pressure. Since the regulator was set to limit the pressure to 90 PSI, over pressurization is not likely. It may be possible that a small leak through a pin hole could evolve into a larger hole, given the violent nature of the chemical.

c) Location: Rotary Kiln Area where hazardous waste is transferred to the kiln.

d) Injury/Illness: Fatal burns: note from photographs the compact nature of the fire that burned for several minutes on 5/11/03, as well as the minimal damage to the piping and tank itself. Aluminized outer wear could have permitted the victim to leave the immediate fire zone and allowed him to limit his exposure to medical treatment rather than death.
e) Measurements: TEAL under approximately 30 PSI nitrogen, mixed with Mineral Oil.

21. Photo Number	Location on Video
Yes	

23. Employer Knowledge : See comments above about site characterization of TEAL, information about Fire-retardant, PPE on the MSDS. The Eastman Process Hazard Analysis repeatedly recognized TEAL and the incineration process as a potential fire hazard of "Pyrophoric" in nature, which would require "PPE", the exact PPE assigned to operators for this work has not included Fire-Retardant material.
Note that the general ppe assessment for the site does reference special flame retardant clothing in some areas (not specifed as to where)

Feasible means of abatement that could have mitigated the outcome of death was available and common as industry practice in that the following companies hold this practice:

Albemarle Corporation 451 Florida Street, Baton Rouge, LA 70801. They specify full aluminized proximity type suit when transferring material (large scale) and whenever contact may occur. Albemarle Corporation

is a supplier of TEAL to Eastman Chemical Company, Which is used in other processes at the Longview, Texas facility.

Akzo Nobel Polymer Chemicals
P. O. Box 600, Deer Park, Texas 77536 (and at many world wide locations) Has provided much literature dedicated to the importance and application of flame retardant clothing and aluminized suits depending on the level of work involved with TEAL. Akzo Nobel is a supplier of TEAL to the Huntsman Chemical Corporation, where approximately 50 Eastman employees work. See catalogs in the case file from Akzo Nobel which show several types of aluminized suits and their application.

Personal protection such as the aluminized suit was not only common to industry practice but feasible to use, as is evident by company literature and industry practice.

24. Comments (Employer, Employee, Closing Conference) :
The legal counsel for Eastman said that the Aluminized Suit would present all kinds of other hazards for the employee such as being too warm.

25. Other Employer Information :

Employer defenses raised:
The employer said that they used a closed system for transfer therefore there was no potential for atmospheric exposure: TEAL is always intended to be used and transported in a closed system because it ignites spontaneously in air. Eastman engineers developed the tanks and piping system used in the TEAL incineration process and modified that system in the fall of 2002. A flexible, corrugated steel hose with exterior steel braiding was used to connect the hard piping to the portable tank. According to a sales receipt from Longview Rubber Products, the 075 SS Metal Assembly, was purchased on September 25, 2002, and according to the Eastman document TXO 00333, the hose was put in service in September or October of 2002, just about seven months prior to the accident. According to Eastman document, dated June 24, 2003, TXO 00335, no records of inspections of the braided hose have been located. The engineer stated that he had not looked into all the manufacturer's specs on the hose and was not aware that the manufacturer placed restrictions on angles and planes of bending of the hose. He said that he did not pass this on for inclusion in the SOP for set-up and transfer.

The employer said their safety programs were approved by VPP and that their assessments were reasonable: Note that in 1995 the PHA team used more information on TEAL and made recommendations to look at PPE and unplugging issues. These items were dropped and not addressed in current SOPs, training or equipment provisions. These same documents were not used when the 1999 review of the PHA was performed. Also, numerous other problems with the PHA were uncovered by this inspection. See file, narrative appendix A and the letter of significant finding to the company.

Using mixture at less than 20% TEAL is not pyrophoric in nature: The TEAL mixture with mineral oil is mixed at the Huntsman facility by first placing the contents of two 55 gallon durms of mineral oil into a larger vessel adding to that the collection of TEAL over a 60 day period. When this time has allapsed the contents is then transferred to a portable tank. The portable tank involved in this accident held 422 gallons. Eastman has not produced an analysis of the ratio and has not presented any evidence as to their claim of 20% TEAL to 80% Mineral Oil. Eastman management also claims that this ratio would produce a mixture that would not be pyrophoric, but manageable. They have not been able to produce any documentation to support this claim.

Huntsman Company management as well as other employers told us that any mixture of TEAL should be regarded as 100% TEAL. Management from the Huntsman also told OSHA that to there knowledge the Akzo Nobel Chemical Company claims that even a 1% mixture of TEAL and mineral oil can react pyrophoricly. They also said that to their knowledge a 30% to 40% mixture will form crystals in the transfer line, forming clogs. They also add that it is known that the TEAL/Mineral Oil mixture will separate and stratify in the tank after it sets for a period of time, which can produce a situation where 100% TEAL is transferred through the system from the portable tank. Huntsman's records indicate that the mixture actually contained 17.6% TEAL and the remainder was "Material Oil".

According to Eastman documents TXO 00321, and TXO 00323, which are Waste Characterizations of "Triethyl Aluminum' in Mineral oil, item (G) Special handling Instructions or Precautions: TEAL/Mineral

Oil Solution is Pyrophoric when TEAL Concentration greater than 25% Wear Protective Clothing to Prevent Contact. (Protective Clothing is not defined by Eastman.)

Greater Hazard The employer claimed that aluminized clothing would introduce an unbearable heat load for workers. Yet Eastman employees working Huntsman processes were wearing the ppe. And Eastman required the incinerator operators to wear butyl suits when using the same equipment and techiques to transfer CPCA.

26. Classification:				
Serious	Knowledge	S or O	Repeat?	Willful?
s	y	s	n	n

First Repeat	Second Repeat	Repeat Penalty
n	n	n

Event Date	Event Code	Action Code	Citation Type	Penalty	Abate Date	Final Order
	Z Add transaction	**A Add**	**S Serious**	**4500.00**		

NARRATIVE

Company: Eastman Chemical Company
Inspection OSHA-1, No .: 305465916
Fatality Report No. OSHA-36 No.: 100782697
Fatality Reporting Summary, OSHA-170, No.: 200782738

Event Date: 5-11-03, Time: 11:00 am
Opening Conference: 5-12-03

I. Investigation Documentation

a.) Name: George Mark Mitchell
b.) Address: [redacted] Ex. 6
c.) Telephon[redacted]
d.) DOB: June 20, 1961
e.) Sex: Male
f.) Job Title: Waste Facility Operator/Relief Supervisor
g.) Date of Employment: September 4, 1990
h.) Time in Position: From July 17, 2000, to day of accident.
i.) Supervisor: Ex. 7c
j.) Training for job being performed at time of accident: See training record provided by Eastman.
k.) Employee Date of Death: 5-11-03, Time 11:00 am
l.) Pronounced Dead at Site by: Justice of the Piece, Ex. 7c
m.) Nature or death: burned by ignition of pyrophoric mixture triethylaluminum and mineral oil.

II. Accident Data

The Huntsman Chemical Company, operating a polypropylene unit on the premises of Eastman Chemical in Longview, had contracted with Eastman to incinerate the hazardous waste product Triethyl Aluminum (TEAL). TEAL is extremely pyrophoric in air or water. Huntsman, a VPP site, utilized approximately 50 Eastman employees to operate their production facility. Both companies described a shared knowledge and duty for the safety of the Eastman/Huntsman employees and both companies acknowledged that Eastman employees performed work with TEAL. Huntsman stated that their policy is for any employee working with the product to wear an aluminized coat and face shield during connection and disconnection of lines. It is important to remember that TEAL is always maintained in a closed system and that PPE is worn as a safety measure in case of accidental release.

Huntsman added mineral oil to the TEAL in a nominal ratio of 80/20 in an effort to control the likelihood of oxygen reaching the chemical. The Huntsman procedure was to

first add two 55 gallon drums of Mineral Oil to the collection vessel then collect TEAL in mineral oil lines washes for sixty day intervals. Managers of Huntsman said that the exact composition was unknown but estimated that the amount of TEAL could be 20 to 40 percent. Although dilution was performed as a safety precaution, Huntsman policy was to regard the mixture as 100 percent TEAL for the purpose of determining appropriate safety precautions. They also maintained a blanket of nitrogen gas over the mixture to further reduce the potential for contact with air.

Approximately every 60 days this mixture would be transferred to a closed portable tank with a capacity of 350-450 gallons. The portable tank was moved to the Eastman incineration facility using a tractor-trailer rig with a flat bed trailer. Eastman reported that the TEAL mixture was not permitted to sit at the incinerator for any length of time. They also reported that it was incinerated on a lines dedicated to it and two other highly reactive compounds (EPB and CPCA).

Eastman employee, Mark Mitchell, an employee at the Eastman facility, was an "Outside Operator" for the waste incinerator operation. His job was to connect the waste product container to the incinerator and burn the waste product to destroy it. The procedure he was to follow was issued from the Utilities Department Environmental Services of Eastman Chemical Company, Texas Operation. That written procedure is in the case file marked with Bate stamp numbers TXO 00246-00248. It describes special precautions in handling the product and warns that TEAL may ignite violently in the presence of air or water so operators were to check all lines for liquids before connecting to the TEAL container.

The SOP listed the personal protective equipment the employee was to wear: chemical goggles or safety glasses, gloves, and hardhat. Note the absence of specifying any flame retardant suit. The section of procedures for "Normal Operations" outlined a sequence for closing certain valves and purging the open line with nitrogen gas. This was to avoid any contact of air or water to the mixture. Once the line that was to be used to transfer the mixture was under positive pressure of nitrogen then the transfer valve was opened and the contents were forced through the line by nitrogen pressure displacing the volume in the tank.

On the morning of the incident, Mitchell had reportedly purged the lines with nitrogen and was in the process of starting waste flow when he found the line was clogged. The inside operator reported Mitchell then connected a bottle of high grade nitrogen to the line to blow the clog through. There is some discrepancy as to the pressure of the bottle; one report stated it was 2100 psi. and another stated that the regulator on the bottle would restrict the pressure to no more than 90 psi on the line. After several attempts over about three hours, Mitchell was able to blow the plug though and he reconnected the piped in nitrogen line of lesser pressure, about 30 psi. He reportedly purged the system with nitrogen again and then opened the waste tank valve. Within about 4 minutes, an explosion and fire occurred.

The following is an excerpt taken from a statement by the other operator who was working at the inside control panel: Ex. 7c

> "We burn 75,000-100,000 gallons of waste each 24 hours. Solids come in fiber drums, liquids come from tanker trucks to one tank. We have several holding tanks at the incinerator. The liquid for the accident came in a small portable tank. We don't get small tanks on a daily. We get mineral oil/TEAL and other materials in slightly larger tanks. It is typical to purge the system with Nitrogen. It is typical to use Nitrogen to push the fluid into the system. The flexible steel hose connects to the ridged piping. The connected flow went directly into the fired incinerator. I have never done the TEAL connections but have connected other products. The accident area was far enough away to not feel heat of the incinerator. The day operator decides what to do next. Mark Mitchell said we were going to do this: Planned on Saturday to burn first thing Sunday. Not a specific time. Nitrogen purge started at 7:00am. The lines had been hooked up on Saturday. We purged for an hour. Then we put it on-line. Flow would be going by 8:00 am. Flow was not going at 8:00 am, had a plug in the line. Tried first with low pressure Nitrogen to blow the plug out and was unsuccessful. Plug was in hard piping, approximately 8 feet up at second elbow. This was diagnosed by temperature difference in pipe. Piping near TEAL was hot when piping near incinerator was cold, as determined by touch. Mr. Mitchell did the touching and diagnosing. Mr. Mitchell called to the control room to report this, and reported that the line was extremely hot. He sounded worried. Mr. Mitchell switched back to low pressure Nitrogen to pressure purge out the system. The fluid material was ambient temperature. We worked 5-10 minutes at the low pressure to see if it released, but it did not. Mr. Mitchell got a high purity high pressure (2100 psi) Nitrogen cylinder and tried to blow it out. This established flow. Then Mr. Mitchell went back to low Nitrogen pressure form the in-plant line. He then opened and closed low pressure Nitrogen to assure the fluid flow, purged again for 10-15 minutes. He radioed in to see if kiln was ready. Mr. Mitchell asked if flow of 4,4-5 gpm was established. The fall out flow was 2.7 gpm, he opened the control valve and then it exploded. Fluid was flowing about four minutes before the explosion. I was the only one in the control room...I yelled for Mark on the radio and didn't get a response. I ran out the back door, from back of kiln, flames were 20-30 ft high."

The Eastman Fire Department and HazMat team responded and poured large quantities of water on the fire, reportedly to lower temperatures so that other materials would not catsh fire. Photographs show that the area of destruction was compact for a fire that raged for several minutes. Pipes had paint burned off but they were not deformed. The flexible steel hose used to make a connection between the tank and the hard piping of the incinerator system was totally destroyed, apparently coming apart in the explosion. White residue was on the interior surfaces of the blown-out hose.

Justice of the Peace Ex. 7c who pronounced Mitchell dead at the accident site, said in a phone interview that she did not see any fire-retardant material on the body or any type of mask on the face of the victim. She did indicate that the body was so badly

burned that it would have been difficult to see anything on the face, and the clothing was badly burned as were the shoes.

According to Eastman Waste Characterizations of Triethyl Aluminum in Mineral Oil (documents TXO 00321, and TXO00323) item (G) states "Special handling Instruction or Precautions: TEAL/MS Solution is **Pyrophoric** when TEAL Concentration greater than 25% Wear Protective Clothing to Prevent Contact." [Note that protective clothing was not defined as fire-retardant clothing.]

In response to a document request dated June 19, 2003, the company's hazard assessment specified the wearing of chemical goggles or safety glasses, gloves, and hardhat (TXO 00246). It did not specify the use of fire-retardant clothing. Another outside operator was interviewed and it was learned that he was not issued a fire-retardant suit to wear for this same operation nor for the transfer of two other flammable materials (EPB and CPCA). The Eastman hazard assessment for PPE (TXO 00343) reads: "Operates/monitors/maintains incinerator and incinerators related equipment (pumps, fans, etc.) General Hazards, Thermal Burns, Corrective measures = Follow General Corrective Measures. Provide long sleeve coveralls and gloves. Provide training on all Standard Operating Procedures pertaining to the operation of incinerators and incinerator related equipment."

It is well established industry practice for any employee working near this product to don an aluminized jacket and hood, or full suit with gloves. The following companies support this claim in their safety programs and sales literature (see literature in casefile):

Albemarle Corporation
451 Florida Street, Baton Rouge, LA 70801

Specifies full aluminized proximity type suite when transferring material (large scale) and whenever contact may occur. Albemarle Corporation was a supplier of TEAL to Eastman Chemical Company.

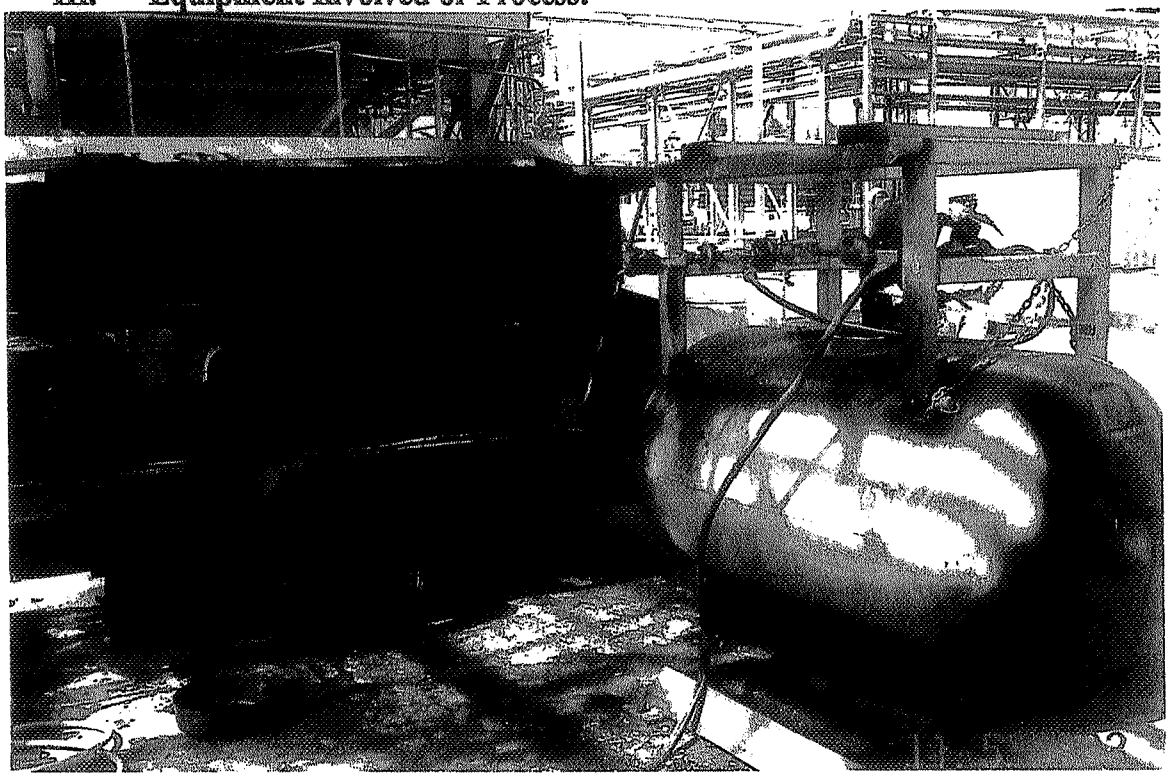
Akzo Nobel Polymer Chemicals
P. O. Box 600, Deer Park, Texas 77536

Provided much literature dedicated to the importance and application of flame-retardant clothing and aluminized suits depending on the level of work involved with TEAL. Akzo Nobel is a supplier of TEAL to the Huntsman Chemical Corporation.

Clean Harbor was the company Huntsman chose to incinerate TEAL after the May incident at Eastman, using information provided to them by Akzo Nobel. Huntsman arranged a field trip for their safety people as well as representatives of Eastman to evaluate their procedure for incineration of hazardous waste before signing a contract with them. Per Huntsman, Clean Harbor used dedicated TEAL lines for uploading product to the incinerator and also used aluminized jackets during all connections/disconnections.

Air Products and Chemicals, Inc.
Box 538 Allentown, PA
Specifies PPE to include fire resistant over garments.

III. Equipment Involved or Process:



The tank above to the right, is property of the Huntsman Chemical Company, the picture is from an accident site located at B-70 incinerator on the Eastman Chemical Company's property. The burned-out compressor adjacent to the tank was not related to the fire but serves to show the intensity of the flames. The tank was docked at a standard location for the transfer of the hazardous waste to the incinerator. The flexible steel hose seen in the photograph was used to apply nitrogen to the tank at 30 psig from an in-house source. The blown out line at the top of the plumbing from the tank shows the fragmented end of the pipe that transferred TEAL mixture from the tank to the incinerator.

Product chemistry of TEAL is that TEAL pulls the oxygen atom from other sources and discharges the aluminum atom, replacing it with the oxygen atom, causing a heat source from friction which ignites the methane group on the outer surface of the molecule. The heat also ignites any hydrogen produced by the reaction as well. This would happen with air, water or the compounds EPB and CPCA run through the same incinerator hard piping lines as TEAL. EPB, which was the material most frequently run through this line, has the property of accumulating in plaque-like patches as adherents to the pipe walls. See chemistry information from SLCAL in the file.

IV. Witnesses: There were no eye witnesses, but there was one inside operator, Gr·7U .hat was in radio contact with the decedent and who monitored the controls that responded to the work of the decedent.

V. Safety and Health Program: see Appendix A

VI. Employer knowledge:

This employer knew the pyrophoric nature of the TEAL mixture. They had MSDSs outlining PPE recommendations. They had been handling this product since at least 1990 and their 1995 PHA on the incinerator process raised a question about the adequacy of the ppe for the TEAL operation, yet no trace of additional evaluation could be found. The company knew that they had not provided flame retardant material or the aluminized suit for the worker as evidenced by their 1995 and 1999 Process Hazard Analysis. The question of addressing the leaks and the release of TEAL is documented along with the admission that the company should evaluate the personal protective equipment. The employee was never provided anything but cotton overalls, hard hat, gloves, and safety glasses.

Company representatives noted that aluminized gear would have created a heat load for the wearer. Yet this is addressed by other employers handling the same product, such as the Eastman employees working for Huntsman. Eastman also specified that a butyl rubber suit should be worn by operators using the same equipment to load CPCA to the incinerator.

In a document provided by Eastman titled ADEQUATE CONTROLS REPORTS for Hazardous Waste Incineration Facility, Revalidation '99. Dated 12/21/99, the following employer knowledge is written on page TXO 00630:

Question Number 63
What are the potential consequences if connection from portable TEAL tank to SA-1 Burner line are not made properly?
Priority ...3
Consequences.....Serious
Frequency .....Possible
Explanation of worst case credible consequences/causes
....Improper connection of teal tank to SA-1 Burner.
Consequences: **Could lead to release of TEAL solution which is pyrophoric and could result in fire.**
Engineering controls:

1. Trained operators and SOP
2. Two Fire water monitors are located nearby
3. **PPE equipment available**

4. Piping checked with nitrogen (bubble test) for leaks prior to startup
5. CGA's in the area
6. Sprinkler protection
7. Pocket monitors for hydrocarbons presence available

Question Number 66
What are the potential consequences if the TEAL line to the kiln plugs?
Priority....3
Consequences....Serious
Frequency.....Possible
Explanation of worst case credible consequences/causes
.....Plugging of TEAL line.
.....Attempts to unplug line could expose personnel and surroundings to TEAL which is pyrophoric.
Engineering Controls:

1. Trained operators and SOPs which includes maximum pressure to be used during unplugged operations.
2. Two fire water monitors nearby.
3. **PPE equipment available**
4. Sprinkler protection and CGA's