

**VISTA CHEMICAL COMPANY
ABERDEEN CHEMICAL PLANT
ABERDEEN, MISSISSIPPI**

**HAZARD AND OPERABILITY STUDY
FOR
INCINERATOR REPLACEMENT
PROJECT**

DECEMBER 1990

Table of Contents

HAZOP REPORT VOLUME

Legal Notice	i
1.0 Scope.	.1-1
2.0 Methodology.	.2-1
2.1 Team Members	.3-4
2.2 Documents made available	.3-6
2.3 Criticality evaluation	.3-8
3.0 Mitigation	.4-1
3.1 Mitigation Summary	
4.0 P&IDs.	.5-1

APPENDIX

A. Study Data Report by Criticality Rank.	.A-1
---	------

1

VISTA
COMPANY CONFIDENTIAL
Aberdeen Chemical Plant

Section 1.0 Scope

Vista Chemical Company operates a nominal capacity 455 million pound per year PVC plant located in Aberdeen, Mississippi. The plant manufactures PVC resins by polymerizing VCM in batch reactors. As a part of the process, some non-condensable material containing small amounts of VCM is produced. The material must be incinerated to convert the VCM to HCl and other environmentally innocuous byproducts. The current incinerators are being replaced because they are becoming mechanically unsound. The Incinerator Replacement Project is the subject of this HAZOP study.

Section 2.1 Team Members

The HAZOP study team assembled to identify potential hazard or operability problems should be composed of a multiple disciplined team with the sufficient technical expertise to answer most guide word deviation questions without resorting to further expertise.

The HAZOP study team meetings were held at the VISTA Aberdeen Chemical plant site in Aberdeen, Mississippi. All team members conducting the HAZOP study are employees of VISTA from the Aberdeen plant. They are as follows:

Attendee	Expertise/Responsibility
Rendell Newton*	Process Engineering Representative
Jim White*	Project Engineer
Steve Kilgore*	Maintenance Advisor
Joe Shackelford*	I & E Advisor
Don Johnson*	Operations Advisor
Mike Kane*	Trainer/Facilitator

* = full time

= part time

Section 2.2 Documents made available

Prior to the start of the HAZOP, the necessary reference documentation needs to be assembled and made available for use and reference during the HAZOP team study. A meaningful HAZOP study cannot be conducted without the required documentation to review. Assembly of the documentation optimizes the chance for a successful HAZOP.

- INCINERATOR P&ID - February, 1981

Section 2.3 Criticality evaluation

During the initial stage of the HAZOPs, the team should develop a criticality rating and a probability rating for preparation of a hazard ranking matrix. This is to allow screening of identified hazards by prioritization and sorting to focus subsequent corrective action on the significant identified hazards; eliminating the insignificant or trivial hazards from any further consideration.

To this end, a hazard rating index and a risk ranking matrix was developed in the HAZOP team review as follows:

HAZARD RATING INDEX

Criticality Rating

I	Major	An incident which may result in a possible lost time injury, or a reportable VCM release, or major damage or production loss greater than \$1,000,000
II	Severe	An incident which may result in a restricted work case, or a VCM release, or severe damage or production loss between \$50,000 and \$1,000,000
III	Moderate	An incident which may result in a recordable injury, or moderate damage or production loss between \$10,000 and \$50,000
IV	Slight	Loss of containment of small amounts of flammable material which may result in slight damage or production loss less than \$10,000

Frequency Rating

A	Frequent	Expected to occur frequently in the life of a single plant, i.e., may occur more frequently than once per year
B	Probable	Expected to occur in the life of a single plant, i.e., may occur between 1 and 100 years
C	Occasional	Could occur in the life of a single plant but expected to occur once in the life of multiple plants, i.e., may occur between 100 and 10,000 years
D	Remote	Unlikely to occur in the life of multiple plants, i.e., may occur less frequently than once per 10,000 years

2-2
RISK RANKING MATRIX

		Frequency			
		A	B	C	D
C R I T I C A L I T Y	I	1	1	2	
	II	1	2	3	4
	III	2	3	4	4
	IV	4	4	4	4

The risk ranking codes assigned to each grid of the risk ranking matrix are as follows:

Risk Ranking

- | | | |
|---|--------------------------|--|
| 1 | Unacceptable | Mitigation planning should be completed within six months using engineering and/or administrative controls to reduce the risk ranking to a 3 or less. |
| 2 | Undesirable | Mitigation planning should be completed within twelve months using engineering and/or administrative controls to reduce the risk ranking to a 3 or less. |
| 3 | Acceptable with controls | Should be verified that procedures or controls are in place |
| 4 | Acceptable as is | No mitigation action required |

2-3

SECTION 3.0 MITIGATION

SECTION 3.1 MITIGATION SUMMARY

ITEMS WITH A CRITICAL RANK OF 1

Risk Code I-A

No references cited.

Risk Code I-B

One reference cited.

Risk Code II-A

No reference cited.

ITEMS WITH A CRITICAL RANK OF 2

Risk Code I-C

No references cited.

Risk Code II-B

Three references cited.

Risk Code III-A

Two references cited.

SECTION 3.2 MITIGATION SHEETS
SUMMARY OF
CRITICAL IDENTIFIED HAZARDS

Page 1 : I-B

PROCESS WATER TREATMENT SYSTEM
CRITICAL RANK: 1, UNACCEPTABLE - MUST BE IMPROVED = MAJOR CONSEQUENCE = PROBABLE OCCURRENCE
DEVIATION: HIGH COMBUSTIBLES
EQUIPMENT NUMBER: LINE SEGMENT 6
EQUIPMENT DESCRIPTION: AIR TO INCINERATOR
CAUSE: VCM GAS RELEASE
CONSEQUENCE: FLASHBACK INTO BLOWER DISCHARGE
SUGGESTED MITIGATION: SRO DESIGN OF BLOWER SYSTEM
RESOLUTION:
COMMENTS:

**SUMMARY OF
CRITICAL IDENTIFIED HAZARDS**

Page 2 : II-B

PROCESS WATER TREATMENT SYSTEM
CRITICAL RANK: 1, UNACCEPTABLE - MUST BE IMPROVED = SEVERE CONSEQUENCE = PROBABLE OCCURRENCE
DEVIATION: INCREASED TEMPERATURE
EQUIPMENT NUMBER: COMBUSTION CHAMBER
EQUIPMENT DESCRIPTION:
CAUSE: OVERFIRING
CONSEQUENCE: DAMAGE TO REFRACTORY
SUGGESTED MITIGATION: SRO REFRACTORY TEMPERATURE RATING
RESOLUTION:
COMMENTS:

SUMMARY OF
CRITICAL IDENTIFIED HAZARDS

Page 3 : II-B

PROCESS WATER TREATMENT SYSTEM	
CRITICAL RANK: 1, UNACCEPTABLE - MUST BE IMPROVED = SEVERE CONSEQUENCE = PROBABLE OCCURRENCE	
DEVIATION:	NO FLOW
EQUIPMENT NUMBER:	LINE SEGMENT 8
EQUIPMENT DESCRIPTION:	WATER TO SCRUBBER
CAUSE:	LINE PLUGGED, VLV CLOSED, SPRAY NOZZLE PLUGGED, BREAK IN LINE
CONSEQUENCE:	HCL RELEASE, SOME VCM RELEASE, OVERHEAT SCRUBBER INTERNALS
SUGGESTED MITIGATION:	SRO INTERLOCK LOGIC (WHAT DOES FSL TRIP LOCK OUT)
RESOLUTION:	
COMMENTS:	

SUMMARY OF
CRITICAL IDENTIFIED HAZARDS

PROCESS WATER TREATMENT SYSTEM
CRITICAL RANK: 2, UNDESIRABLE - SHOULD BE IMPROVED = SEVERE CONSEQUENCE = PROBABLE OCCURRENCE
DEVIATION: HIGH LEVEL
EQUIPMENT NUMBER: QUENCH CHAMBER
EQUIPMENT DESCRIPTION:
CAUSE: SEWER LINE PARTIALLY PLUGGED OR UNDERSIZED
CONSEQUENCE: WATER BACKUP TO COMBUSTION CHAMBER
SUGGESTED MITIGATION: SRO ADDITION OF HIGH LEVEL S/D TO INTERLOCK LOGIC
RESOLUTION:
COMMENTS:

SUMMARY OF
CRITICAL IDENTIFIED HAZARDS

Page 5 : III-A

PROCESS WATER TREATMENT SYSTEM	
CRITICAL RANK: 2, UNDESIRABLE - SHOULD BE IMPROVED = MODERATE CONSEQUENCE = FREQUENT OCCURRENCE	
DEVIATION:	REDUCED FLOW
EQUIPMENT NUMBER:	LINE SEGMENT 8
EQUIPMENT DESCRIPTION:	WATER TO SCRUBBER
CAUSE:	PARTIAL PLUG OF LINE, NOZZLE, OR ORIFICE, VALVE PINCHED
CONSEQUENCE:	POSSIBLE OVERHEAT AND DAMAGE, HCL EMISSIONS
SUGGESTED MITIGATION:	SRO OTP AND INTERLOCKS
RESOLUTION:	
COMMENTS:	

**SUMMARY OF
CRITICAL IDENTIFIED HAZARDS**

Page 6 : III-A

PROCESS WATER TREATMENT SYSTEM
CRITICAL RANK: 2, UNDESIRABLE - SHOULD BE IMPROVED = MODERATE CONSEQUENCE = FREQUENT OCCURRENCE
DEVIATION: REDUCED PRESSURE
EQUIPMENT NUMBER: LINE SEGMENT 8
EQUIPMENT DESCRIPTION: WATER TO SCRUBBER
CAUSE: PARTIAL PLUG OF LINE, NOZZLE, OR ORIFICE, VALVE PINCHED
CONSEQUENCE: POSSIBLE OVERHEAT AND DAMAGE, HCL EMISSIONS
SUGGESTED MITIGATION: SRO OTP AND INTERLOCKS
RESOLUTION:
COMMENTS:

HAZOP Study Data Report

(Grouped by Risk Codes)

Risk Criticality Code & Frequency	Equip ID	PAID	Deviation Description	Caused By: Consequences:	Action Item Request Action Item Response
-----------------------------------	----------	------	-----------------------	--------------------------	---

** Risk Code is: 1					
1	I - R	PAID: SD-2446	HIGH COMBUSTIBLES	CAUSE: VCM/GAS RELEASE CONSEQ: FLASHBACK INTO BLOWER DIECH.	ACT: SRO DESIGN OF BLOWER SYSTEM RBN=>

HAZOP Study Data Report
(Grouped by Risk Codes)

Risk Criticality Equip ID		PAID	Deviation Description	Caused By: Consequences:	Action Item Request Action Item Response
Code & Frequency					
=====					
** Risk Code is: 2					
2	II - B	COMBUSTION CHAMBER SAME	PAID: SD-2446	INCREASED TEMPERATURE CAUSE: OVERFIRING CONSEQ: DAMAGE TO REFRACTORY	ACT: SRO REFRACTORY TEMP RATING RBN=>
2	II - B	LINE SEGMENT B WATER TO SCRUBBER	PAID: SD-2446	NO FLOW CAUSE: FLG, VLV CLOSED, SPRAY NOZZLE PLG, BREAK CONSEQ: HCL RELEASE, SOME VCM RELEASE, OVERHEAT SCRUBBER INTERNALS	ACT: SRO INTERLOCK LOGIC (FSL TRIP LOCKS OUT WHAT) RBN=>
2	III - A	LINE SEGMENT B WATER TO SCRUBBER	PAID: SD-2446	REDUCED FLOW CAUSE: PARTIAL PLG OF LINE, NOZZLE, OR ORIFICE, VLV FINCHED CONSEQ: POSSIBLE OVERHEAT & DAMAGE, HCL EMISSIONS	ACT: SRO OTP & INTERLOCKS RBN=>
2	III - A	LINE SEGMENT B WATER TO SCRUBBER	PAID: SD-2446	REDUCED PRESSURE CAUSE: SAME AS REDUCED FLOW CONSEQ:	ACT: RBN=>
2	II - B	QUENCH CHAMBER QUENCH CHAMBER	PAID: SD-2446	HIGH LEVEL CAUSE: SEWER LINE PARTIALLY PLUGGED OR UNDERSIZED CONSEQ: WATER BACK UP TO COMBUSTION CHAMBER	ACT: SRO ADDITION OF HIGH LEVEL S/D TO INTERLOCK LOGIC RBN=>

HAZOP Study Data Report

(Grouped by Risk Codes)

Risk Criticality Code & Frequency		Equip ID	PMID	Deviation Description	Caused By:	Action Item Request	
=====		=====	=====	=====	=====	=====	
Risk Code is: 3							
3	III - B	FLAME ARRESTOR	PAID: SD-2446	INCREASED PRESSURE	CAUSE: N2 PRESSURE FROM GLYCOL TANK, INERT VENT OVERPRESSURE	ACT: SRO R/D SP & STATUS, SRO ADDITION OF RV (MESHAPS COMPLIANCE)	
		SAME			CONSEQ: BLOWN R/D AND VCM RELEASE	RBN=>	
					CAUSE: NOT ENOUGH SPRAY H2O IN QUENCH CHAMBER	ACT: SRO WATERFLOW/BLOWER INTERLOCK	
3	III - B	LINE SEGMENT 10	PAID: SD-2446	INCREASED TEMPERATURE		RBN=>	
		GAS TO SCRUBBER			CONSEQ: MELT DOWN		
					CAUSE: FCV-1 FCV-1B MV'S SHUT, LINE PLG. RUPTURE, HI P, LO FIRE, BLANKS	ACT: SRO OTR, SRO HEAT TRACING ON FCV-1B & XMTR	
3	III - B	LINE SEGMENT 1	PAID: SD-2446	NO FLOW			
		INERT VENT LINE			CONSEQ: REC. P INCR. LEADS TO PROD. LOSS	JLM=>	

Risk Criticality Code & Frequency		Equip ID	Equipment Description	PAID	Deviation Description	Caused By: Consequences:	Action Item Request Action Item Response
=====							
** Risk Code is: 4							
4	IV - B	FLAME ARRESTOR	PAID: SD-2446	REDUCED TEMPERATURE	CAUSE: LOW AMBIENT TEMP	ACT: SRO OTP	
		SAME			CONSEQ: IF NO GLYCOL, H2O FREEZES	RBN=>	
4	IV - B	FLAME ARRESTOR	PAID: SD-2446	LOW LEVEL	CAUSE: EVAPORATIVE LOSSES	ACT: SRO ADEQUACY OF LEVEL PROTECTION	
		SAME			CONSEQ: LOSS OF SEAL FOR FLAME ARRESTING	RBN=>	
4	IV - A	LINE SEGMENT 11	PAID: SD-2446	NO FLOW	CAUSE: MV'S CLOSED, LINE PLG, RUPTURE	ACT: SRO OTP	
		ETHYLENE GLYCOL			CONSEQ: NO GLYCOL TO FLAME ARRESTOR	RBN=>	
4	IV - A	LINE SEGMENT 11	PAID: SD-2446	INCREASED PRESSURE	CAUSE: HIGH N2 PRESSURE	ACT: SRO SP OF RV	
		ETHYLENE GLYCOL			CONSEQ: LIFT RV ON POT	RBN=>	
4	IV - A	LINE SEGMENT 11	PAID: SD-2446	REDUCED FLOW	CAUSE: PARTIAL PLUG, LOW N2 PRESSURE	ACT: SRO OTP	
		ETHYLENE GLYCOL			CONSEQ: SLOW ADDITION	RBN=>	
4	IV - A	LINE SEGMENT 11	PAID: SD-2446	REDUCED PRESSURE	CAUSE: LOW N2 PRESSURE	ACT: SRO OTP	
		ETHYLENE GLYCOL			CONSEQ: SLOW ADDITION	RBN=>	
4	IV - B	LINE SEGMENT 12	PAID: SD-2446	NO FLOW	CAUSE: QUENCH CHAMBER MT, PLG	ACT: SRO OTP	
		DRAIN FROM QUENCH CHAMBER			CONSEQ: LOW OR HIGH LEVEL IN QUENCH CHAMBER	RBN=>	
4	IV - B	LINE SERMENT 12	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: VAPOR FLOW FROM QUENCH CHAMBER	ACT: SRO DESIGN (REPLACE VLV WITH PLUG)	
		DRAIN FROM QUENCH CHAMBER			CONSEQ: MELT DOWN	RBN=>	
4	IV - B	LINE SERMENT 12	PAID: SD-2446	REDUCED FLOW	CAUSE: PARTIAL PLG	ACT: SRO DESIGN	
		DRAIN FROM QUENCH CHAMBER			CONSEQ: HIGH LEVEL IN QUENCH CHAMBER	RBN=>	
4	III - C	LINE SERMENT 1	PAID: SD-2446	INCREASED FLOW	CAUSE: PCV-1 OPENS ABOVE SP & FCV BYPASS OPEN, LINE RUPTURE, HI P IN REC	ACT: SRO RV & RD SP'S, SRO OTP (FCV BYPASS CLOSED)	
		INERT VENT LINE			CONSEQ: RV ON REC LIFT, RD ON FLAME ARR BLOW	RBN=>	
4	III - C	LINE SERMENT 1	PAID: SD-2446	INCREASED PRESSURE	CAUSE: PCV-1 FAIL, HI P IN REC., N2 FROM GLYCOL POT	ACT: SAME AS INCREASED FLOW	
		INERT VENT LINE			CONSEQ: SAME AS INCREASED FLOW	RBN=>	

Risk Criticality Code & Frequency		Equip ID	Equipment Description	P&ID	Deviation Description	Caused By: Consequences:	Action Item Request Action Item Response
4	IV - B	LINE SEGMENT 1	INERT VENT LINE	P&ID: SD-2446	REDUCED FLOW	CAUSE: PINCHED VLV'S, PARTIAL FLG, LEAKS, FIC/FT-18 CALIB. CONSEQ: HI P IN REC., MORE GAS USED THAN REQ'D, PROD DUAL PROB	ACT: SRO OTP RBN=>
4	IV - B	LINE SEGMENT 1	INERT VENT LINE	P&ID: SD-2446	REDUCED PRESSURE	CAUSE: LEAK, OVERACTIVE COND., PCV-1 CLOSED, PARTIAL FLG, FICV-18 SHUT CONSEQ: HI P IN REC., VCM RELEASE	ACT: SRO OTP RBN=>
4	IV - B	LINE SEGMENT 1	INERT VENT LINE	P&ID: SD-2446	REDUCED TEMPERATURE	CAUSE: LO AMBIENT TEMP. & HEAT TRACING FAIL, CONSEQ: WET INERT STREAM CAN FREEZE	ACT: SRO HEAT TRACING JLM=>
4	IV - C	LINE SEGMENT 1	INERT VENT LINE	P&ID: SD-2446	REVERSE FLOW	CAUSE: LO P IN REC., HI P IN FLAME ARR., CONSEQ: REC. DON'T VENT, GLYCOL IN REC., SHALL LOSS OF PROD.	ACT: SRO OTP RBN=>
4	IV - B	LINE SEGMENT 2	INERT FROM ARR TO INCIN	P&ID: SD-2446	NO FLOW	CAUSE: LOSS OF AIR P (CLOSE VLV'S), MV'S CLOSED, PLG, RD BLOW, ARR FLG CONSEQ: SAME AS SEGMENT 1	ACT: SRO OTP RBN=>
4	IV - C	LINE SEGMENT 2	INERT FROM ARR TO INCIN	P&ID: SD-2446	REDUCED FLOW	CAUSE: PLG, ARR PLG, MV PINCHED, CONSEQ: INCR GAS USAGE	ACT: SRO OTP RBN=>
4	IV - C	LINE SEGMENT 2	INERT FROM ARR TO INCIN	P&ID: SD-2446	REDUCED PRESSURE	CAUSE: CLOSE ACTUATED VLV, LEAK THRU SIGHTGLASS ON ARR, LK THRU RLD VLV CONSEQ: VCM LEAK, POSSIBLE PROD LOSS	ACT: SRO BLOCK AND BLEED INTERLOCK JDS=>
4	IV - C	LINE SEGMENT 2	INERT FROM ARR TO INCIN	P&ID: SD-2446	REDUCED TEMPERATURE	CAUSE: HEAT TRACING FAILURE & LO AMBIENT TEMP CONSEQ: IF STREAM WET, FREEZE VLV'S	ACT: SRO OTP RBN=>
4	III - C	LINE SEGMENT 3	FUEL GAS TO INCINERATOR	P&ID: SD-2446	REDUCED FLOW	CAUSE: PCV-TB CLOSED BELOW SP, LINKAGE ADJUSTMENT WRONG, LEAK CONSEQ: WRONG AIR/GAS RATIO, GAS CLOUD	ACT: SRO RATIO CONTROL OPTIONS, SRO IGNITION SOURCES & BLEED INTERLOCK MRV=>
4	IV - A	LINE SEGMENT 3	FUEL GAS TO INCINERATOR	P&ID: SD-2446	NO FLOW	CAUSE: GAS S/O, MV/ACT. VLV CLOSED, ARR PLG, FLAME FAILURE CONSEQ: NO FLAME	ACT: SRO OTP RBN=>

Risk Criticality Equip ID		P&ID		Caused By:		Action Item Request	
Code & Frequency		Equipment Description		Deviation Description		Action Item Response	
4	IV - A	LINE SEGMENT 3	P&ID: SD-2446	INCREASED FLOW	CAUSE: PCV-38 OPENS ABOVE SP, MECH. LINKAGE SLIPS OR BREAKS	ACT: SRO RATIO CONTROL OPTIONS	
		FUEL GAS TO INCINERATOR			CONSED: S/D BY PSD-28 (HIGH PRESS). WRONG AIR/GAS RATIO	RBN=>	
4	IV - A	LINE SEGMENT 4	P&ID: SD-2446	NO FLOW	CAUSE: PCV CLOSE, PCV'S & MV'S CLOSED, FLG, MIXER FLG, H2O CONDENSATE	ACT: SRO H2O IN LINE & RECOMMEND SOLUTION	
		PILOT GAS TO INCINERATOR			CONSED: PILOT GOES OUT & WON'T LIGHT, POSSIBLE LOSS OF FROD.	RBN=>	
4	IV - A	LINE SEGMENT 4	P&ID: SD-2446	REDUCED FLOW	CAUSE: PCV CLOSE, VLV'S FINCHED, PARTIAL PLG, LEAK	ACT: SRO OTF	
		PILOT GAS TO INCINERATOR			CONSED: PILOT MAY NOT LIGHT	RBN=>	
4	IV - A	LINE SEGMENT 4	P&ID: SD-2446	REDUCED TEMPERATURE	CAUSE: LOW AMBIENT TEMP	ACT: SRO DESIGN OF LINE AND OTF	
		PILOT GAS TO INCINERATOR			CONSED: POSSIBLE CONDENSATION	RBN=>	
4	IV - B	LINE SEGMENT 4	P&ID: SD-2446	INCREASED FLOW	CAUSE: PCV ABOVE SP, BLEED VLV OPEN, BREAK/LEAK	ACT: SRO INSPECTION PROCEDURES	
		PILOT GAS TO INCINERATOR			CONSED: POSSIBLE PILOT FLAME OUT, GAS CLOUD	RBN=>	
4	IV - B	LINE SEGMENT 5	P&ID: SD-2446	INCREASED FLOW	CAUSE: RUPTURED GASKET UPSTREAM OF INCIN.	ACT: NAP	
		STEAM LINE TO INCINERATOR			CONSED: NO STEAM TO CONTROL FIREBOX TEMP		
4	IV - B	LINE SEGMENT 5	P&ID: SD-2446	NO FLOW	CAUSE: VLV SHUT, BOTTLERS S/D, Y-STRAINER OR LINE PLG, RUPTURE	ACT: SRO FIREBOX TEMP SP & INTERLOCKS	
		STEAM LINE TO INCINERATOR			CONSED: HEAT OF FIREBOX ABOVE NORM, POSS DAMAGE TO BRICK IF TSDH MALFUNC.	RBN=>	
4	IV - B	LINE SEGMENT 5	P&ID: SD-2446	REDUCED FLOW	CAUSE: PINCHED VLV'S, LOW STEAM PRESSURE, PARTIAL PLG, CONDENSATE, LEAK	ACT: SRO SP OF PSDL	
		STEAM LINE TO INCINERATOR			CONSED: INCIN S/D	RBN=>	
4	IV - A	LINE SEGMENT 6	P&ID: SD-2446	REDUCED TEMPERATURE	CAUSE: LOW AMBIENT TEMP	ACT:	
		AIR TO INCINERATOR			CONSED: INEFFICIENT COMBUSTION		

HATOF Study Data Report

(Grouped by Risk Codes)

Risk Code	Criticality & Frequency	Equip ID Description	FAID	Deviation Description	Caused By:		Action Item Request Action Item Response
					Consequences:		
4	IV - B	LINE SEGMENT 6 AIR TO INCINERATOR	FAID: SD-2446	NO FLOW	CAUSE: BLWR STOP, INLET TO BLWR PLS. CONDENSATE FREEZE IN INLET CONSEQ: S/D	REN=	ACT: SRO EMERGENCY POWER SUPPLY, SRO COVER FOR BLWR INLET
4	IV - B	LINE SEGMENT 6 AIR TO INCINERATOR	FAID: SD-2446	REDUCED FLOW	CAUSE: LINK SLIPS, DISCH BOOT LEAKS, BLWR BLADES CORRODE, INLET PLG CONSEQ: INADEQUATE COMBUSTION, POSSIBLE LOW PRESS S/D, POSE VCM EMISSION	REN=	ACT: SRO O/P & MAINTENANCE
4	IV - C	LINE SEGMENT 6 AIR TO INCINERATOR	FAID: SD-2446	REVERSE FLOW	CAUSE: BLWR RUNS BACKWARDS CONSEQ: INCIN S/D, CANNOT STARTUP		ACT: SRO ROTATION POS=

HAZOP Study Data Report

(Grouped by Risk Codes)

Risk Criticality Code & Frequency		Equip ID	Equipment Description	PAID	Deviation Description	Caused By: Consequences:	Action Item Request Action Item Response
=====							
** Risk Code 1st							
-		COMBUSTION CHAMBER	PAID: SD-2446	NO FLOW	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		COMBUSTION CHAMBER	PAID: SD-2446	REVERSE FLOW	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		COMBUSTION CHAMBER	PAID: SD-2446	INCREASED FLOW	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		COMBUSTION CHAMBER	PAID: SD-2446	INCREASED PRESSURE	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		COMBUSTION CHAMBER	PAID: SD-2446	REDUCED FLOW	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		COMBUSTION CHAMBER	PAID: SD-2446	REDUCED PRESSURE	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		COMBUSTION CHAMBER	PAID: SD-2446	REDUCED TEMPERATURE	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		FLAME ARRESTOR	PAID: SD-2446	NO FLOW	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		FLAME ARRESTOR	PAID: SD-2446	REVERSE FLOW	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		FLAME ARRESTOR	PAID: SD-2446	INCREASED FLOW	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		FLAME ARRESTOR	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: NAF CONSEQ:	ACT:	
=====							
-		FLAME ARRESTOR	PAID: SD-2446	REDUCED FLOW	CAUSE: NAF CONSEQ:	ACT:	
=====							

Risk Code	Criticality & Frequency	Equip ID Description	FAID	Deviation Description	Caused By: Consequences:	Action Item Request Action Item Response
-		FLAME ARRESTOR SAME	FAID: SD-2446	REDUCED PRESSURE	CAUSE: NAP CONSEQ:	ACT:
-		LINE SEGMENT 1 INERT VENT LINE	FAID: SD-2446	INCREASED TEMPERATURE	CAUSE: FIRE, SOLAR HEATING CONSEQ: NAP	ACT:
-		LINE SEGMENT 10 GAS TO SCRUBBER	FAID: SD-2446	N3 FLOW	CAUSE: BLOWER S/D CONSEQ: NAP	ACT:
-		LINE SEGMENT 10 GAS TO SCRUBBER	FAID: SD-2446	REVERSE FLOW	CAUSE: NAP CONSEQ:	ACT:
-		LINE SEGMENT 10 GAS TO SCRUBBER	FAID: SD-2446	INCREASED FLOW	CAUSE: NAP CONSEQ:	ACT:
-		LINE SEGMENT 10 GAS TO SCRUBBER	FAID: SD-2446	INCREASED PRESSURE	CAUSE: NAP CONSEQ:	ACT:
-		LINE SEGMENT 10 GAS TO SCRUBBER	FAID: SD-2446	REDUCED FLOW	CAUSE: BLOWER REDUCED FLOW CONSEQ: NAP	ACT:
-		LINE SEGMENT 10 GAS TO SCRUBBER	FAID: SD-2446	REDUCED PRESSURE	CAUSE: NAP CONSEQ:	ACT:
-		LINE SEGMENT 10 GAS TO SCRUBBER	FAID: SD-2446	REDUCED TEMPERATURE	CAUSE: LOW AMBIENT TEMP CONSEQ: NAP	ACT:
-		LINE SEGMENT 11 ETHYLENE GLYCOL	FAID: SD-2446	REVERSE FLOW	CAUSE: MT POT & VLVS OPEN CONSEQ: NAP	ACT:
-		LINE SEGMENT 11 ETHYLENE GLYCOL	FAID: SD-2446	INCREASED FLOW	CAUSE: HIGH N2 PRESSURE CONSEQ: NAP	ACT:
-		LINE SEGMENT 11 ETHYLENE GLYCOL	FAID: SD-2446	INCREASED TEMPERATURE	CAUSE: NAP CONSEQ:	ACT:

Risk Criticality Equip ID		PAID	Deviation Description	Caused By:	Action Item Request	
Code & Frequency				Consequences:	Action Item Request	Action Item Response
=====						
-	LINE SEGMENT 11	PAID: SD-2446	REDUCED TEMPERATURE	CAUSE: NAP	ACT:	
	ETHYLENE GLYCOL			CONSEQ:		
-	LINE SEGMENT 12	PAID: SD-2446	REVERSE FLOW	CAUSE: NAP	ACT:	
	DRAIN FROM QUENCH CHAMBER			CONSEQ:		
-	LINE SEGMENT 12	PAID: SD-2446	INCREASED FLOW	CAUSE: NAP	ACT:	
	DRAIN FROM QUENCH CHAMBER			CONSEQ:		
-	LINE SEGMENT 12	PAID: SD-2446	INCREASED PRESSURE	CAUSE: NAP	ACT:	
	DRAIN FROM QUENCH CHAMBER			CONSEQ:		
-	LINE SEGMENT 12	PAID: SD-2446	REDUCED PRESSURE	CAUSE: NAP	ACT:	
	DRAIN FROM QUENCH CHAMBER			CONSEQ:		
-	LINE SEGMENT 12	PAID: SD-2446	REDUCED TEMPERATURE	CAUSE: NAP	ACT:	
	DRAIN FROM QUENCH CHAMBER			CONSEQ:		
-	LINE SEGMENT 2	PAID: SD-2446	REVERSE FLOW	CAUSE: NAP	ACT:	
	INERT FROM ARR TO INCIN			CONSEQ:		
-	LINE SEGMENT 2	PAID: SD-2446	INCREASED FLOW	CAUSE: INCREASED P IN FLAME ARR (NO FR GLYCOL)	ACT:	
	INERT FROM ARR TO INCIN			CONSEQ: NAP		
-	LINE SEGMENT 2	PAID: SD-2446	INCREASED PRESSURE	CAUSE: NAP	ACT:	
	INERT FROM ARR TO INCIN			CONSEQ:		
-	LINE SEGMENT 2	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: HIGH ELEC TRACING HEATING	ACT:	
	INERT FROM ARR TO INCIN			CONSEQ: NAP		
-	LINE SEGMENT 3	PAID: SD-2446	REVERSE FLOW	CAUSE: NAP	ACT:	
	FUEL GAS TO INCINERATOR			CONSEQ:		
-	LINE SEGMENT 3	PAID: SD-2446	INCREASED PRESSURE	CAUSE: SAME AS INCREASED FLOW	ACT:	
	FUEL GAS TO INCINERATOR			CONSEQ:		

Hazop Study Data Report

(Grouped by Risk Codes)

Risk Code & Frequency	Equip ID	PAID	Deviation Description	Caused By: Consequences:	Action Item Request Action Item Response
-	LINE SEGMENT 3 FUEL GAS TO INCINERATOR	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: INCREASED AMBIENT TEMPERATURE CONSEQ: NAF	ACT:
-	LINE SEGMENT 3 FUEL GAS TO INCINERATOR	PAID: SD-2446	REDUCED PRESSURE	CAUSE: SAME AS REDUCED FLOW CONSEQ: PSD-39 FSL TRIP AND SHUT DOWN	ACT: NAF
-	LINE SEGMENT 3 FUEL GAS TO INCINERATOR	PAID: SD-2446	REDUCED TEMPERATURE	CAUSE: LOW AMBIENT TEMP CONSEQ: NAF	ACT:
-	LINE SEGMENT 4 PILOT GAS TO INCINERATOR	PAID: SD-2446	REVERSE FLOW	CAUSE: NAF CONSEQ:	ACT:
-	LINE SEGMENT 4 PILOT GAS TO INCINERATOR	PAID: SD-2446	INCREASED PRESSURE	CAUSE: FLG, PCV MALFUNCTIONS CONSEQ: NAF	ACT:
-	LINE SEGMENT 4 PILOT GAS TO INCINERATOR	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: NAF CONSEQ:	ACT:
-	LINE SEGMENT 4 PILOT GAS TO INCINERATOR	PAID: SD-2446	REDUCED PRESSURE	CAUSE: SAME AS REDUCED FLOW CONSEQ:	ACT:
-	LINE SEGMENT 5 STEAM LINE TO INCINERATOR	PAID: SD-2446	REVERSE FLOW	CAUSE: NAF CONSEQ:	ACT:
-	LINE SEGMENT 5 STEAM LINE TO INCINERATOR	PAID: SD-2446	INCREASED PRESSURE	CAUSE: NAF CONSEQ:	ACT:
-	LINE SEGMENT 5 STEAM LINE TO INCINERATOR	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: NAF CONSEQ:	ACT:
-	LINE SEGMENT 5 STEAM LINE TO INCINERATOR	PAID: SD-2446	REDUCED PRESSURE	CAUSE: SAME AS REDUCED FLOW CONSEQ:	ACT:
-	LINE SEGMENT 5 STEAM LINE TO INCINERATOR	PAID: SD-2446	REDUCED TEMPERATURE	CAUSE: BOILER S/O, NET STEAM, LOW AMBIENT TEMP. CONSEQ: NAF	ACT: NAF

Hazof Study Data Report
(Grouped by Risk Codes)

Risk Code	Criticality	Equip ID	Equip Description	PAID	Deviation Description	Caused By: Consequences:	Action Item Request Action Item Response
-		LINE SEGMENT 6	AIR TO INCINERATOR	PAID: SD-2446	INCREASED FLOW	CAUSE: NAP CONSEQ:	ACT:
-		LINE SEGMENT 6	AIR TO INCINERATOR	PAID: SD-2446	INCREASED PRESSURE	CAUSE: NAP CONSEQ:	ACT:
-		LINE SEGMENT 6	AIR TO INCINERATOR	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: HIGH AMBIENT TEMP CONSEQ: NAP	ACT:
-		LINE SEGMENT 6	AIR TO INCINERATOR	PAID: SD-2446	REDUCED PRESSURE	CAUSE: SAME AS REDUCED FLOW CONSEQ:	ACT:
-		LINE SEGMENT 7	OT WATER TO QUENCH CHMR	PAID: SD-2446	NO FLOW	CAUSE: CONSEQ:	ACT:
-		LINE SEGMENT 7	OT WATER TO QUENCH CHMR	PAID: SD-2446	REVERSE FLOW	CAUSE: CONSEQ:	ACT:
-		LINE SEGMENT 7	OT WATER TO QUENCH CHMR	PAID: SD-2446	INCREASED FLOW	CAUSE: CONSEQ:	ACT:
-		LINE SEGMENT 7	OT WATER TO QUENCH CHMR	PAID: SD-2446	INCREASED PRESSURE	CAUSE: CONSEQ:	ACT:
-		LINE SEGMENT 7	OT WATER TO QUENCH CHMR	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: CONSEQ:	ACT:
-		LINE SEGMENT 7	OT WATER TO QUENCH CHMR	PAID: SD-2446	REDUCED FLOW	CAUSE: CONSEQ:	ACT:
-		LINE SEGMENT 7	OT WATER TO QUENCH CHMR	PAID: SD-2446	REDUCED PRESSURE	CAUSE: CONSEQ:	ACT:
-		LINE SEGMENT 7	OT WATER TO QUENCH CHMR	PAID: SD-2446	REDUCED TEMPERATURE	CAUSE: CONSEQ:	ACT:

HAZOP Study Data Report
(Grouped by Risk Codes)

Risk Criticality Code & Frequency	Equip ID Equipment Description	PAID	Deviation Description	Caused By: Consequences:	Action Item Request Action Item Response	
					=====	=====
-	LINE SEGMENT 8 WATER TO SCRUBBER	PAID: SD-2446	REVERSE FLOW	CAUSE: NAF CONSEQ:	ACT:	
-	LINE SEGMENT 8 WATER TO SCRUBBER	PAID: SD-2446	INCREASED FLOW	CAUSE: NAF CONSEQ:	ACT:	
-	LINE SEGMENT 8 WATER TO SCRUBBER	PAID: SD-2446	INCREASED PRESSURE	CAUSE: NAF CONSEQ:	ACT:	
-	LINE SEGMENT 8 WATER TO SCRUBBER	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: NAF CONSEQ:	ACT:	
-	LINE SEGMENT 8 WATER TO SCRUBBER	PAID: SD-2446	REDUCED TEMPERATURE	CAUSE: NAF CONSEQ:	ACT:	
-	QUENCH CHAMBER QUENCH CHAMBER	PAID: SD-2446	NO FLOW	CAUSE: CONSEQ:	ACT:	
-	QUENCH CHAMBER QUENCH CHAMBER	PAID: SD-2446	REVERSE FLOW	CAUSE: CONSEQ:	ACT:	
-	QUENCH CHAMBER QUENCH CHAMBER	PAID: SD-2446	INCREASED FLOW	CAUSE: CONSEQ:	ACT:	
-	QUENCH CHAMBER QUENCH CHAMBER	PAID: SD-2446	INCREASED PRESSURE	CAUSE: CONSEQ:	ACT:	
-	QUENCH CHAMBER QUENCH CHAMBER	PAID: SD-2446	INCREASED TEMPERATURE	CAUSE: CONSEQ:	ACT:	
-	QUENCH CHAMBER QUENCH CHAMBER	PAID: SD-2446	REDUCED FLOW	CAUSE: CONSEQ:	ACT:	
-	QUENCH CHAMBER QUENCH CHAMBER	PAID: SD-2446	REDUCED PRESSURE	CAUSE: CONSEQ:	ACT:	

HATOP Study Data Report

(Grouped by Risk Codes)

Risk Criticality Code & Frequency	Equip ID Equipment Description	PAID	Deviation Description	Caused By: Consequences:	Action Item Request	
					Action Item	Response
	QUENCH CHAMBER QUENCH CHAMBER	PAID: SD-2446	REDUCED TEMPERATURE	CAUSE: CORRECTION:	ACT:	

To: HAZOP Team

VISTA

Michael R. Kane
omr

VISTA

P

To Jim & Rendell

Date 3/7/91

HAZOP) will be
December 11 and
rs are asked to

D A

Please indicate, on your copy
of the Incinerator HAZOP,
the responses & comments for
each item on the appropriate
Mitigation Sheet. Return
your comments to me. I'll
issue w/ comments to the
full distribution.

7:30 - 7:35 am

7:35 - 7:45 am

7:45 - 8:15 am

8:15 - 8:45 am

8:45 - 9:15 am

N 9:30 - 9:45 am

LW 9:45 - 10:15 am

LL 10:15 - 10:45 am

LL 10:30 - 11:30 am

If I can help, let me know.

Thanks.

Mike

LL 12:00 - 2:00 pm

ALL 2:15 - 4:00 pm

VISTA CHEMICAL COMPANY
CONFIDENTIAL
Aberdeen Chemical Plant

List of Abbreviations

ACT	Actuated
AHM	Accurately Hazardous Materials
ALT	Alternate
ATMOS	Atmosphere
A2-1	Piping spec
A13-1	Piping spec
BLDR	Bleeder
BPCV	Back Pressure Control Valve
CHK	Check
CV	Control valve
DM	Drum
EX	Exchange
FL	Filter
FCV	Flow control valve
F/O	Fail open
H2O	Water
HAZAN	Hazard Analysis
HAZOP	Hazard & Operability Study
ID	Identification
INSUL	Insulation
KOH	Potassium hydroxide
LG	Level gage
LK	Leak
LS	Level switch
MAINT	Maintenance
MALF	Malfunction
MATL	Material
MAX	Maximum
MIN	Minimum

VISTA
COMPANY CONFIDENTIAL
Aberdeen Chemical Plant

List of Abbreviations

MOC	Material of Construction
MOD	Module
MSDS	Material Safety Data Sheet
MV	Manually operated valve
NAP	Not a problem
NORM	Normal
NC	Normally closed
NO	Normally open
OTP	Operator Training & Procedures
PAR	Partially
P&ID	Piping & Instrumentation Diagram
PG	Pressure Gage
PIC	Pressure Indicating Controller
PM	Preventive maintenance
PREP	Preparation
PRESS	Pressure
PROD	Production
PRV	Pressure Relief Valve
PSIG	Pounds per square inch gage
REC	Recommend
REG	Regulator
REV	Revision
RO	Restriction orifice
RV	Relief Valve
SPEC	Specification
SRO	Suggested review of
STD	Standard
TEMP	Temperature
TG	Temperature gauge
TRANS	Transmitter
VAC	Vacuum
VCM	Vinyl Chloride Monomer

HAZARD RATING INDEX

→
-N-

CRITICALITY RATING

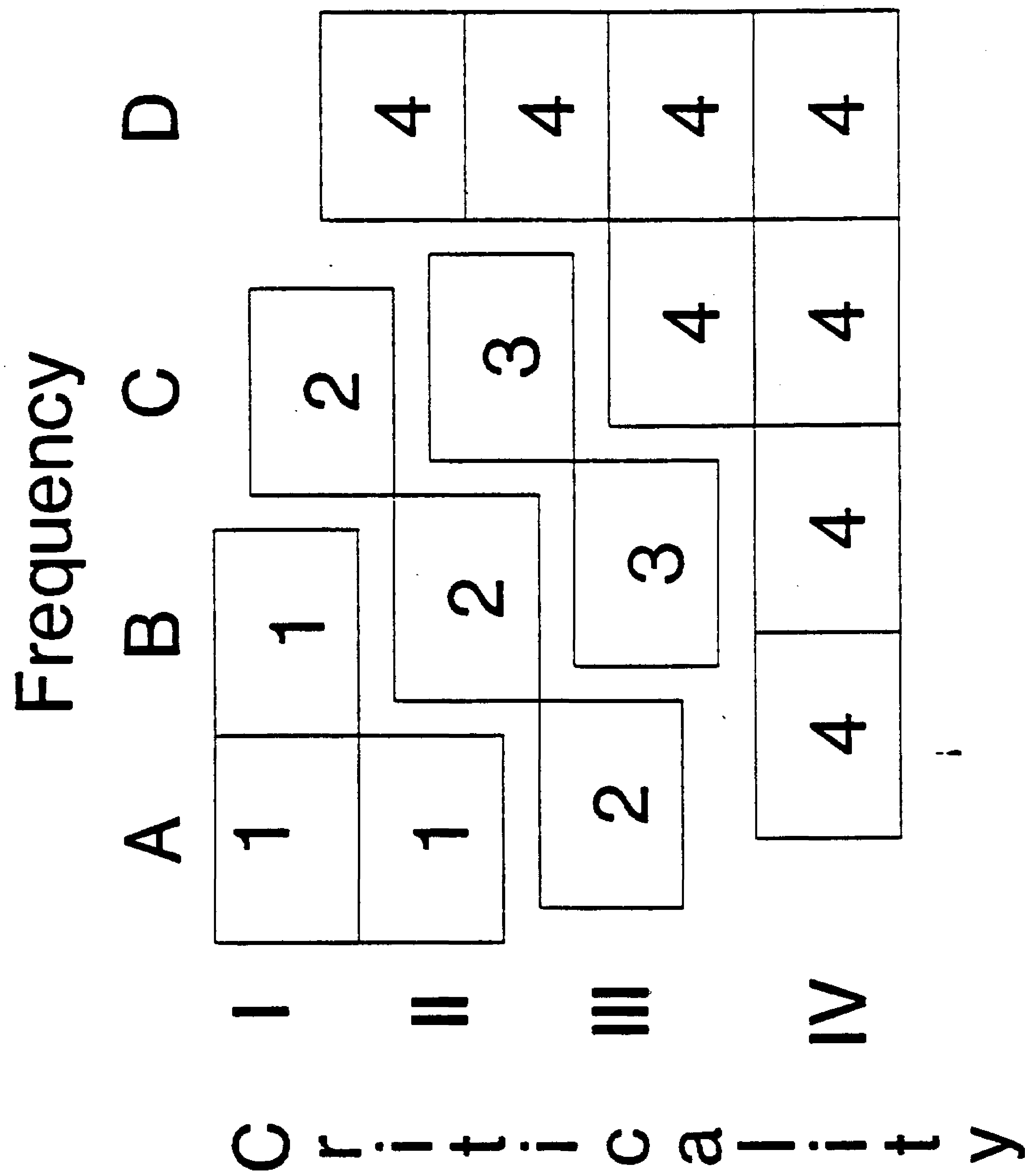
- | | | |
|-----|--------|---|
| I | Major | Loss of containment of substantial amounts of flammable/explosive material or asphyxiant which may result in major damage or production loss greater than \$1,000,000 |
| II | Severe | Loss of containment of flammable/explosive material which may result in severe damage or production loss between \$100,000 to \$1,000,000 |
| III | Mod | Loss of containment of small amounts of flammable material which may result in moderate damage or production loss between \$10,000 to \$100,000 |
| IV | Slight | Loss of containment of small amounts of flammable material which may result in slight damage or production loss less than \$10,000 |

HAZARD RATING INDEX

Frequency Rating

- A Frequent Expected to occur frequently in the life of a single plant, i.e., may occur more frequently than once per year
- B Probable Expected to occur in the life of a single plant i.e., may occur between 1 and 100 years
- C Occasional^a Could occur in the life of a single plant but expected to occur once in the life of multiple plants, i.e., may occur between 100 and 10,000 years
- D Remote Unlikely to occur in the life of multiple plants, i.e., may occur less frequently than once per 10,000 years

RISK RANKING MATRIX



RISK RANKING

- | | |
|-------------------------|--|
| 1 Unacceptable | Mitigation planning should be completed within six months using engineering and/or administrative controls to reduce the risk ranking to a 3 or less. |
| 2 Undesirable | Mitigation planning should be completed within twelve months using engineering and/or administrative controls to reduce the risk ranking to a 3 or less. |
| 3 Acceptable w/controls | Should be verified that procedures or controls are in place. |
| 4 Accepted as is | No mitigation action required |