

C-8 REDUCTION & CONTROL PROGRAMS

STATUS

R. J. ZIPFEL

6-11-87

EID091378

003546-19 - 06/09/87 - RJZ:kst

RJZ026555

EID137075

MEETING AGENDA

- AIM
- GROUNDRULES
- PLAN POLICY AND GOALS
- C-8 SAFETY AND HEALTH INFORMATION
- ENVIRONMENTAL CONTROL PROGRAMS
- WORK ENVIRONMENT PROGRAMS
 - C-8 IN BLOOD HISTORY
 - C-8 IN AIR HISTORY
- PATH FORWARD / ACTION ITEMS
- CONCLUSIONS

RJZ026556

MEETING AIM

TO REVIEW THE FLUOROPRODUCTS
C-8 REDUCTION AND CONTROL PLAN
THROUGH OPEN DISCUSSIONS AROUND
THE HISTORY AND STATUS OF THE C-8
RELATED PROGRAMS TO ASSURE THAT
ALIGNMENT BETWEEN CORPORATE SAFETY
AND SPD BUSINESS OBJECTIVES CONTINUES.

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GROUND RULES

- HOLD QUESTIONS UNTIL END OF PRESENTATION EXCEPT IF MEANING IS NOT CLEAR.

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C-8 CONTROL PLAN POLICY AND GOALS

- REDUCE PUBLIC EXPOSURE THROUGH THE ECONOMICAL IMPLEMENTATION OF THE OPTIMUM TECHNOLOGIES AVAILABLE
- REDUCE EXPOSURE BELOW AEL BY ENGINEERING CONTROLS AND PROTECTIVE EQUIPMENT
- REDUCE EXPOSURE BY ENGINEERING CONTROLS AND PROTECTIVE EQUIPMENT SO THAT ELEVATED ORGANIC FLUORINE LEVELS IN BLOOD WILL DECREASE AND ACCUMULATION OF ORGANIC FLUORIDES IN NEW WORKERS WILL BE LIMITED

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C-8 DATA TO DATE

- IT IS NOT A TERATOGEN
- IT IS NOT AN EMBRYOTOXIN
- IT IS NOT A MUTAGEN
- IT IS MODERATELY TOXIC -- LD 50 540 mg/kg
- IT HAS AN ESTIMATED BIOLOGICAL HALF LIFE OF ONE TO THREE YEARS IN HUMAN BLOOD
- NO KNOWN REPORTS OF HEALTH RELATED EFFECTS REPORTED BY DuPONT
 - 3M HAS HAD ONE EMPLOYEE WITH REVERSIBLE LIVER DAMAGE (UPDATED JANUARY 1987)

RJZ026560

C-8 EXPOSURE LIMITS

AEL IN AIR

0.56 MOLES PER BILLION

0.01 mg/m³

BLOOD LEVELS

NONE ESTABLISHED

PUBLIC EXPOSURE LIMITS

NONE ESTABLISHED

RJZ026561

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C-8 HISTORY

- 8/51 Began use of C-8 in dispersion polymerization. Few precautions in handling.
- 6/07/78 Advised personnel that 3M found elevated organic fluorine levels in blood of workers exposed to fluorinated surfactants. Started internal review and monitoring.
- 9/79 Provisional AEL established by Haskell.
- 3/20/81 3M advised that C-8 caused birth defects in unborn when fed by stomach tube to female rats. All female employees with potential C-8 exposure were promptly transferred to other plant areas.
- 4/10/81 C-8 specific blood test developed and put in use.
- 3/01/82 Studies completed which found C-8 not to be a teratogen and no adverse health effects.
- 5/17/82 Final AEL established at 0.01 mg/m^3 or 0.56 ppb.
- 8/85 First commercial shipment of TBSA from Chambers Works.
- 12/86 Demonstrated feasibility in the laboratory to economically concentrate C-8 in water solutions.

C-8 ENVIRONMENTAL CONTROL PROGRAMS

STATUS VERSUS 1984

<u>AIR</u>	<u>1984</u>	<u>CURRENT</u>
● FINE POWDER DRYER VENT SCRUBBING AND RECOVERY	1988-89	1989

WATER

- | | | |
|--------------------------------|--------------|----------------------------|
| ● REPLACE C-8 WITH TBSA | 100% in 1985 | 15% in 1987
30% in 1990 |
| ● ELIMINATE
SUPERNATE PONDS | --- | NEW ITEM
1H88 |

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WASHINGTON WORKS

OFF PLANT EMISSIONS

POUNDS C-8

	<u>1983</u>	<u>1986</u>
WATER	21,700	19,100
AIR	12,700	16,200
PRODUCT	8,000	8,300
OFF-PLANT DISPOSAL	<u>7,700</u>	<u>8,300</u>
	50,100	51,900

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C-8 LEVELS IN DRINKING WATER

	<u>DISTANCE FROM NO. 5 OUTFALL</u> (miles)	<u>C-8 LEVEL -- PPB</u>	
		<u>1984</u>	<u>1987</u>
PARKERSBURG	7.50 UPSTREAM	ND	ND
WASH. WORKS	0.50 UPSTREAM	ND	ND
LUBECK WATER DISTRICT	0.25 DOWNSTREAM	1.1	1.9
	0.25 DOWNSTREAM	1.5	1.9
LITTLE HOCKING	3.00 DOWNSTREAM	0.6	ND
RAVENSWOOD	29.0 DOWNSTREAM	ND	--

ND = NOT DETECTABLE

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FINE POWDER DRYER C-8 EMISSIONS REDUCTION

LABORATORY STUDIES

- DEMONSTRATED ABILITY TO SCRUB TO 95% EFFICIENCY
- CAN CONCENTRATE TO 5% USING ION EXCHANGE
- CAN CONCENTRATE TO GREATER THAN 10% USING REVERSE OSMOSIS
- DEMONSTRATED SUCCESSFUL POLYMERIZATION USING RECOVERED VIRGIN C-8 FROM ION EXCHANGE

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SURFACTANT RECOVERY ACTION ITEMS

- START UP TEST C-8 SCRUBBER ON FINE POWDER DRYER EXHAUST - 3Q87

- DEMONSTRATE FEASABILITY TO ECONOMICALLY CONCENTRATE AND REUSE C-8 AND OTHER SURFACTANT SOLUTIONS - 4Q87

- COMMERCIAL RECOVERY AND RECYCLE OF C-8 IN FINE POWDER
 - AUTHORIZE \$3MM IN 2Q88

 - STARTUP 2H89

- APPLY ABOVE TECHNOLOGIES TO FEP IF ECONOMICAL

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TBSA REPLACEMENT IN FEP

- NO PANACEA
 - 15% CONVERTED IN 1987 - 1.2 MM LBS. FEP
 - ADVANTAGES
 - REDUCES SURFACTANT DISCHARGE TO OHIO RIVER
- | | |
|------|----------------------------|
| | LBS OF SURFACTANT TO RIVER |
| | IN 1986 |
| | (if 100% of type) |
| | <hr/> |
| C-8 | 17,500 |
| TBSA | 7,400 |
- CAN MAKE UNIQUE HIGH HFPI/LOW MV POLYMERS WITHOUT PENALTY
 - DEMONSTRATED 20% HIGHER POLYMERIZING RATES
 - \$1 MM COMPANY COST SAVINGS POTENTIAL

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TBSA REPLACEMENT IN FEP

● DISADVANTAGES

- 30 - 40% RATE PENALTY IN HUMID
HEAT TREATING - LOSS OF 1.5 - 2.0
MMA CAPABILITY
- QUALITY PROBLEMS - COLOR AND GEL
- DISPERSION AND DRY FLAKE PRODUCTS
REQUIRE FDA CLEARANCE
- EXPECT TBSA TO ACCUMULATE IN THE
BLOOD

Gel levels
in TE-9248
is very low

9250 is high.
No $\text{Ba}(\text{NO}_3)_2$ used
on TBSA products

RJZ026569

EID091392

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RJZ026570

EID137089

TBSA REPLACEMENT IN FEP

● DISADVANTAGES

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- QUALITY PROBLEMS - COLOR AND GEL
- DISPERSION AND DRY FLAKE PRODUCTS REQUIRE FDA CLEARANCE
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RJZ026569

EID091392

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RJZ026570

EID137090

TBSA CONVERSION ACTION ITEMS

- CONTINUE WITH TRANSITION AS BUSINESS OPPORTUNITIES EXIST
 - FORECAST OF 30% CONVERSION BY 1990
- EXPAND HUMID HEAT TREATING CAPABILITY
- SEEK FDA APPROVAL OF TBSA BASED RESINS

EID091393

RJZ026571

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SUPERNATE POND ELIMINATION

BENEFIT -- ELIMINATE C-8 CONTAMINATION OF
LUBECK WATER SYSTEM AQUIFER
FROM THESE PONDS

STATUS -- PROJECT APPROVED (\$320M) 11/86
-- PERMIT APPROVAL 3Q87
-- START-UP 11/87

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RJZ026572

EID137092

WORK ENVIRONMENT PROGRAMS

(in place since 1981)

EQUIPMENT DESIGN

- EQUIPMENT SEALS AND GASKETS
- LEAK MAINTENANCE
- OVERALL BUILDING VENTILATION CONTROL
- VENTILATED HOODS OVER DRYER DOORS
- VENT STACK HEIGHT FOR PROPER DISPERSION
- INGREDIENT MAKEUP STATION

PROTECTIVE EQUIPMENT

- COMFO HALF MASK RESPIRATORS
- BREATHING AIR RESPIRATORS
- LATEX RUBBER GLOVES

MONITORING

- AFFECTED PERSONNEL BLOOD LEVELS
- PERSONAL AIR MONITORING
- CRITICAL AREA AIR MONITORING

RJZ026573

EID091395

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EID137093

C-8 TRENDS IN AIR

C-8 IN AIR (MPB)

PERSONAL SAMPLES

AEL = 0.56 MPB

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
FEP POLYKETTLE								(YTD)

OPERATOR	--	0.12	0.09	0.09	0.19	0.08	0.13	0.08
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FEP WET FINISHING
OPERATOR

	0.95	0.30	0.09	0.11	0.09	0.17	0.12	0.08
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RAW DISPERSION
A/C OPERATOR

	1.20	0.26	0.09	0.21	0.20	0.36	0.76	0.30
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FINE POWDER DRYER
OPERATOR

	1.40	0.56	0.15	0.06	0.10	0.78	0.87	0.11
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EID137094

C-8 TREND IN BLOOD

	<u>C-8 IN BLOOD (PPM)</u>					
	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
FEP PROCESS OPERATOR (17)	1.53	1.48	1.14	1.09	1.09	1.22
FEP SERVICE OPERATOR (18)	0.60	0.59	0.57	0.53	0.53	0.56
RAW DISPERSION PROCESS OPERATOR (18)	7.66	6.67	6.36	6.38	5.96	6.57
GRANULAR PROCESS OPERATOR (7)	3.44	3.12	2.64	2.70	2.38	2.93
FINE POWDER SERVICE OPERATOR (19)	2.25	2.07	1.74	1.59	1.37	1.37
MONOMER OPERATOR (31)	1.01	1.02	0.83	0.82	0.81	--
ALL TEFLON* OPERATORS (490)	0.98	0.92	--	--	--	--

* DuPont's registered trademark for its fluorocarbon resin

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FINE POWDER DRYING
C-8 IN AIR HISTORY

- 1980 - 1981 - INITIAL CONTROL PROGRAM
- 1982 - 1985 - C-8 LEVELS BELOW 0.6 MPB
- JUNE - DEC '85 - "FRESH AIR" TO DRYER SWITCHED
FROM DRYER ROOM TO EXTERNAL
- INSTALLED NEW LARGE DRYER
- C-8 LEVELS ROSE TO 2.3 MPB

ACTION TO RESPOND

- INSTALLED VENTS ON FLOAT TANKS
- RELOCATED PACKOUT ROOM H&V
INTAKE
- INSTALLED LARGER DRYER ROOM
EXHAUST FAN
- PROVIDED FRESH AIR TO DRYER
CONTROL ROOM
- AUG '86 - C-8 LEVELS FELL TO 0.9 MPB

ACTION ITEM

- REPLACED GASKETS ON NO.3 DRYER
- DEC '86 - TODAY - C-8 LEVELS FELL TO 0.2 MPB

ACTIVITY AT OTHER SITES

<u>SITE</u>	<u>ACTIVITY</u>
● DORDRECHT	-- Initial blood sampling -- C-8 in air monitoring
● MDF	-- No blood sampling -- C-8 in air monitoring
● CHAMBERS WORKS	-- Initial blood and air sampling -- Not sampling today
● 3M	-- Blood sampling for organic fluoride -- Highest levels now below 10 ppm
● SPRUANCE	-- Initial blood and air sampling -- Not sampling today
● OUTSIDE DuPONT END USER (CHEMFAB)	-- Notified of birth defect problem -- Told to continue existing practices -- No sampling
● C & P	-- No blood sampling for other telomer products including TBSA

RJZ026577

ACTION ITEMS

ADMINISTRATIVE

- ESTABLISH A MAXIMUM SAFE C-8 IN BLOOD CONCENTRATION
- ESTABLISH A MAXIMUM SAFE C-8 IN DRINKING WATER LEVEL
- USE AIR AND BLOOD MONITORING AT ALL DIRECT USER SITES FOR THOSE PERSONNEL AND AREAS WHERE EXPOSURE IS GREATEST
 - ESTABLISH A MINIMUM THRESHOLD LEVEL
 - PERIODIC SAMPLING TO MONITOR PERFORMANCE
- REVIEW C-8 IN BLOOD DATA IN DETAIL TO DETERMINE IF ADDITIONAL CONTROL DEVICES ARE REQUIRED

MAINTENANCE

- MAINTAIN PRIORITY ON SEALING OF NEW DRYER AT WASHINGTON WORKS

RJZ026578

PROCESS

- EXAMINE BENEFITS OF PURCHASE OF AQUEOUS SOLUTIONS OF C-8 VERSUS POWDER
- CONTINUE TO EXAMINE NEW SURFACTANTS LIKE C-9, C-10 AND C-12

EID091400

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CONCLUSIONS

- SIGNIFICANT ENVIRONMENTAL REDUCTIONS ARE EXPECTED BY 1989.
- PRESENT CONTROL SYSTEMS HAVE REDUCED C-8 IN BLOOD CONCENTRATIONS FROM 1979 LEVELS. FURTHER REDUCTIONS ARE EXPECTED IN THE FUTURE.
- ELIMINATION OF C-8 IN EMPLOYEES BLOOD APPEARS UNLIKELY.

EID091401

RJZ026579

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EID137099

KEY POINTS

- Karrh agreed to work directly with his counterpart at 3M to get the 3M C-8 chronic study in rats released.
- Karrh stated that we should consider reducing the pressure on the conversion of C-8 to TBSA in FEP. It was agreed that business needs should drive this program.
- Karrh and Todd asked if there was a way to determine if there was an aquifer water flow from under the supernate ponds to the Lubeck Water System wells. R. J. Zipfel has lead on this.
- Karrh asked if supernate shipment to Chambers Works was the long term solution for the disposal of supernate containing C-8. Zipfel answered yes, but there is a low probability chance on the development of a new strain of bacteria which could destroy the C-8 or recovery using the technology being developed for the fine powder dryer vent.
- Karrh asked what is the significance of the high C-8 concentration in the blood of the raw dispersion operator.
- It was stated that all people who have had their blood tested have had their C-8 levels reported to them.
- Karrh requested that we get information on the accumulation of other fluorine containing surfactants in the blood of employees. Of specific note was TBSA in Chambers Works personnel.
- Karrh asked why progress in our use of aqueous C-8 solution in lieu of powder has been so slow. Zipfel responded that liquid C-8 is presently on order by Chambers Works and Dordrecht.
- Karrh stated that we need to continue to pursue those programs aimed at reducing the public exposure to C-8 as vigorously as we can. He further stated that he agreed that our people will continue to have measureable C-8 levels in blood.
- The action items recommended by Zipfel were all agreed to.

EID091402

RJZ026580

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