

Shell Oil Company • Shell Chemical Company

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Deer Park Manufacturing Complex
PO Box 100
Deer Park, Texas 77536

December 14, 1983

Brown and Root
ATTN Bill Briley
Brown and Root Safety

PLAINTIFF'S EXHIBIT

SH-759

Dear Bill,

Attached are the results of monitoring performed by the Industrial Hygiene Department during the August 1983 Shutdown at the Catalytic Cracking Unit. Included in this report are observations and recommendations for future shutdowns.

WELDING FUME SAMPLING

Welders working in areas with poor ventilation were monitored to assess their exposures to welding fumes. The following table lists the permissible exposure level for each specific fume based on an eight hour time-weighted average sample.

TABLE 1

ALLOWABLE CONCENTRATIONS OF METAL FUMES

<u>Substance</u>	<u>DPMC Guideline (mg/m³)</u>
Total Welding Fume	5.0
Chromium, Total	0.5
Nickel, Total	1.0
Iron (Nuisance Dust)	10.0

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Five of the eighteen samples collected exceeded the allowable concentration for total welding fume. Three of these samples also exceeded the permissible exposure level of 10 mg/m³ for nuisance dust. All three of these samples were collected on welders working inside the Regenerator. These measurements continue to support the need for respiratory protection on future shutdowns.

VENTILATION

The number of air movers used during this shutdown was basically the same as that used during the previous two major shutdowns (September 1980 and December 1982).

Measurements were taken with a Davis Rotating Vane Anemometer to determine air flow inside the Reactor and the Regenerator. One set of measurements were taken with the Copous Blowers driven by steam and a second set taken while the blowers were being driven by air. It was found that the Copous Blowers suffer a marked reduction of efficiency when operating under air power. Attachment II is the ventilation summary for the Reactor and Attachment III represents the Regenerator.

RESPIRATOR USE

The use of respiratory protection by personnel working inside the Reactor and Regenerator did not consistently meet or comply with the conditions for entry specified by permit. Frequently contractor employees were observed without the required dust masks. The available exposure monitoring data continues to highlight the need for protecting against dust exposure during CCU shutdowns. This deficiency should be reviewed by the appropriate level of contractor supervision.

RECOMMENDATIONS

There are three areas that need special attention on future shutdowns.

1. Continue the use of the access houses at open manways. An extra effort may be required to assure that all hoses and cords are routed through the appropriate side opening so doors may be fully closed.
2. Continue the use of dust masks and goggles for entry into the Reactor and Regenerator. Craft supervision should be informed of the requirement and should enforce this.

We encourage you to convey these results to all employees involved with the shutdown. If you have any questions please call me at extension 7102. Your cooperation is greatly appreciated.

Sincerely,



P.J. Snyder
Sr. Industrial Hygienist

Attachments

ATTACHMENT 1

PERSONNEL MONITORING RESULTS FOR WELDING FUMES

Name/SSH	Sample		Job	Sample Time, Min.	Remarks	Results, mg/m ³					Personal Pn. Equip.	Total Dust 8 Hr. TWA
	Date	Period				Weld. Fume	Cr, Tot	Iron	Mt, Tot			
	8/4/83	1250-1305 1330-1335 1430-1435	Welder	25	Air arc gouging steam tubes in half.	4.2	<.001	0.91	<0.02		A	0.2
	8/15/83	0755-1254	Welder	239	Welding cracks and plates on outside of fresh feed riser.	1.6	.006	0.2	<.002		A	
	8/15/83	1254-1530	Welder	156	Continued welding cracks and plates on fresh feed riser. Moved to area just inside riser at 1400. Ventilation good but fume cloud rising into face.	1.0	.011	.24	0.03			
	8/15/83			395	Combined total of 2 samples on 8/15/83.	1.3	.009	0.21	.002			1.2
	8/15/83	0759-1330	Welder	329	Air arc gouging ends off air rings in regenerator. Arc gouged plate off wall in 5th floor of regenerator.	21.1	.82	4.0	0.9		B	

<u>Name/SSH</u>	<u>Date</u>	<u>Sample Period</u>	<u>Job</u>	<u>Sample Time, Min.</u>	<u>Remarks</u>	<u>Weld, Fume</u>	<u>Results, mg/m³</u>		<u>Ni, Tot</u>	<u>Personal Pro. Equip.</u>	<u>Total Dust 8 Hr. TWA</u>
	8/15/83	1300-1515	Welder	135	Air gouging ends off air rings and plates of wall of regenerator.	7.9	.28	1.67	.32	B	
				464	Combined total for 2 samples taken on 8/15/83.	16.0	0.61	3.1	0.68		15.4
	8/15/83	0800-1305	Welder	305	Air arc gouging ends of air rings in regenerator.	5.6	.22	1.64	0.28	B	
	8/15/83	1400-1525	Welder	85	Air arc gouging ends off air rings in regenerator. Only about 10 minutes of arc gouging during sample period.	<1.2	<.006	<.007	<.006	B	
	8/15/83			390	Combined totals for 2 samples taken on 8/15/83.	4.6	.18	1.3	0.22		3.75
	8/16/83	1250-1430	Welder	100	Arc gouging fresh feed riser at expansion joint. At 1320 began stick welding cracks in fresh feed riser.	3.7	.011	1.11	<.005	B	
	8/16/83	1430-1530	Welder	60	Stick welding cracks in fresh feed riser.	2.6	.02	.43	<.009		

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<u>Name/SSH</u>	<u>Date</u>	<u>Sample Period</u>	<u>Job</u>	<u>Sample Time, Min.</u>	<u>Remarks</u>	<u>Results, mg/m³</u>			<u>Personal Prot. Equip.</u>	<u>Total Dust 8 Hr. TWA</u>
						<u>Cr, Tot</u>	<u>Iron</u>	<u>Ni, Tot</u>		
	8/16/83			160	Combined totals for 2 samples taken on 8/16/83.	.013	.82	.007		1.1
	8/22/83	0835-1525	Welder	355	Welding expansion joint to spent cat riser. Ventilation is fair but position of welder sometimes causes fume cloud to rise into his face.	.016	.073	.005		0.5
	8/22/83	1245-1535	Welder	170	Welding cones in secondary stage of regenerator.	.009	.076	.014		0.2
	8/23/83	0810-1437	Welder	387	Welding inside spent cat riser. At 1300 began welding on outside of spent cat riser.	.016	.055	.003		0.5
	8/23/83	0823-1450	Welder	387	Air arc gouging on cones at 9th floor of regenerator.	.046	.75	.047	B	0.4
	8/23/83	0825-1305	Welder	270	Air arc gouging air nozzles on rings at fifth floor.	.012	1.46	.014	B	
	8/23/83	1305-1445	Welder	100	Same as above.	.039	5.7	0.043	B	

<u>Name/SSII</u>	<u>Date</u>	<u>Sample Period</u>	<u>Job</u>	<u>Sample Time, Min.</u>	<u>Remarks</u>	<u>Results, mg/m³</u>				<u>Personal PPE, Equip.</u>	<u>Total Dust 8 Hr. IWA</u>
						<u>Weld. Fume</u>	<u>Cr. Tot</u>	<u>Iron</u>	<u>Mn. Tot</u>		
				370	Combined totals for two samples collected on 8/23/83.	5.8	.022	2.62	.020		4.35
	8/24/83	0845-1315	Welder	270	Arc gouging air nozzles and air rings on fifth floor of regenerator.	21.9	.73	3.8	.63	8	12.3
	8/24/83	1255-1500	Welder	125	Welding braces to cones on 9th floor of regenerator.	1.7	.019	.104	.006	8	0.4
	8/24/83	0835-1200	Welder	260	Welding expansion joint on spent cat riser. Welding donut to inside of spent cat riser.	0.7	.024	.126	.005		0.4

Personal Protective Equipment

A - 3M9920 Dust and Fume Mask
 B - Half-face Air Supplied Welders Respirator

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VENTILATION SURVEY
AIR FLOW MEASUREMENTS

REACTOR - STEAM POWERED COPOUS BLOWERS

See Drawing 1 for location of sample points.

Location

1. 3705 feet per minute (fpm) - electric air mover
20" manway diameter
8078 cubic feet per minute (cfm)
2. 2475 FPM - Copous Blower
20" manway diameter
5397 CFM
3. 3375 FPM - electric air blower
24" manway diameter
10598 CFM
4. 2750 FPM - Copous Blower
24" manway diameter
8635 CFM
5. 750 FPM
60" manway diameter
14,718 CFM
6. 690 FPM
24" manway
2166 CFM
7. 8000 FPM - air conditioner duct
24" manway diameter
25,120 CFM
8. 300 FPM
30" manway diameter
1472 CFM
9. 175 FPM
54" manway diameter
2782 CFM

REACTOR - AIR CHANGES PER HOUR

<u>Location</u>	<u>(-) Net Air Flow, Out</u>	<u>(+) Net Air Flow, In</u>
1.	-8078	
2.	-5397	
3.	-10598	
4.	-8635	
5.		14718
6.		2166
7.		25120
8.		1472
9.		2782
TOTAL AIR FLOW	-32708	46258

Air Changes Per Hour = N

$$N = 60(R)/Q$$

$$N = \frac{60(46,258)}{32,000}$$

$$N = 86$$

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REGENERATOR WITH STEAM ON

See Drawing 2 For Location of Sample Points

Location No.

1. 602 (FPM) Copous Blower
30" manway diameter
2953 (CFM)
2. 1488 FPM - electric air mover
24" manway diameter
4672 CFM
3. 1492 FPM - electric air mover
20" manway diameter
3253 CFM
4. 2074 FPM - Copous Blower
24" manway diameter
6512 CFM
5. 3480 FPM - Copous Blower
24" manway diameter
10,972 CFM
6. 754 FPM
84" manway diameter
29,003 CFM
7. 8100 FPM - air conditioner duct
24" manway diameter
25,434 CFM
- 8a. 4776 FPM - steam adductor
24" manway diameter
14,997 CFM
- 8b. 540 FPM
14" manway diameter
577 CFM
9. 200 FPM
20" manway diameter
436 CFM
10. 3744 FPM - electric air mover
30" manway diameter
18,369 CFM

REGENERATOR - STEAM OFF, AIR POWER

Location

1. Not available
2. 1272 FPM - electric air mover
24" manway diameter
3994 CFM
3. 1752 FPM - electric air mover
20" diameter
3820 CFM
4. 2608 FPM - Copous Blower
24" manway diameter
8189 CFM
5. 1020 FPM - Copous Blower
24" manway diameter
3202 CFM
6. 350 FPM
84" manway diameter
13,462 CFM
7. 560 FPM
24" manway diameter
1758 CFM
8. Not available
9. 245 FPM
20" manway diameter
534 CFM
10. Not available

REGENERATOR - AIR CHANGES PER HOUR

A. STEAM ON

<u>Location</u>	<u>(-) Net Air Flow, Out</u>	<u>(+) Net Air Flow, In</u>
1.	-2953	
2.	-4672	
3.	-3253	
4.	-6512	
5.	-10972	
6.		29003
7.		25434
8a.	-14997	
8b.		577
9.		436
10.	<u>-10369</u>	
TOTAL AIR FLOW	-61728	55450

Air Changes Per Hour = N

R = Net Air Flow

Q = Vessel Volume

$$N = 60(R)/Q$$

$$N = \frac{60(55,450)}{83,000}$$

$$N = 40$$

B. STREAM OFF, AIR SUPPLY TO COPOUS BLOWERS

<u>Location</u>	<u>(-) Net Air Flow, Out</u>	<u>(+) Net Air Flow, In</u>
1.	N/A	
2.	-3994	
3.	-3820	
4.	-8189	
5.	-3202	
6.		13462
7.		1758
8.	N/A	
9.		534
10.	N/A	
TOTAL AIR FLOW	<u>-19205</u>	15754

Air Changes Per Hour = N

$$N = 60(R)/Q$$

$$N = \frac{60(15,754)}{83,000}$$

$$N = 11$$

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