

Dean Longman
Plant Manager

25th March 2008

Mr. D. Bass
Environmental Protection Officer
Environmental Health Services Division
Huntingdon District Council
Pathfinder House
Huntingdon. PE18 6TN



Dear Dave:

Please find enclosed the following documents for Permit No. 19/93

- Part A - Particulate monitoring for period January 2007 to December 2007

- Part B - St. Neots VOC Emissions for period January 2007 to December 2007.

The calculation is based on the efficiencies measured during the October monitoring when it was observed that the vapour ring efficiency was 99.59 % to 100%.

Net effect of these calculations gives an annual VOC emission figure of 10,105kg compared to 9,522kg in 2006.

Please note that during measurement of CV No. 24 higher than expected VOC's were measured. This was due to a blocked condenser caused by a mixer overflow. This issue has now been resolved and similar repair works will be carried out on the other two mixer condensers to prevent a similar problem occurring in the future.

- Part C - Vent Measurements (18th October 2007)

This is the data from VOC vent monitoring carried out during your October visit and shows how the vent efficiencies have been calculated.

- Part D - Solvent/Product Analysis 2007

This data includes opening and closing inventory, material receipts and usage that have been used to calculate the emission data provided in Part B.

If you have any questions regarding the above information please do not hesitate to contact me.

Your Sincerely

Dean Longman
Plant Manager

GRACE

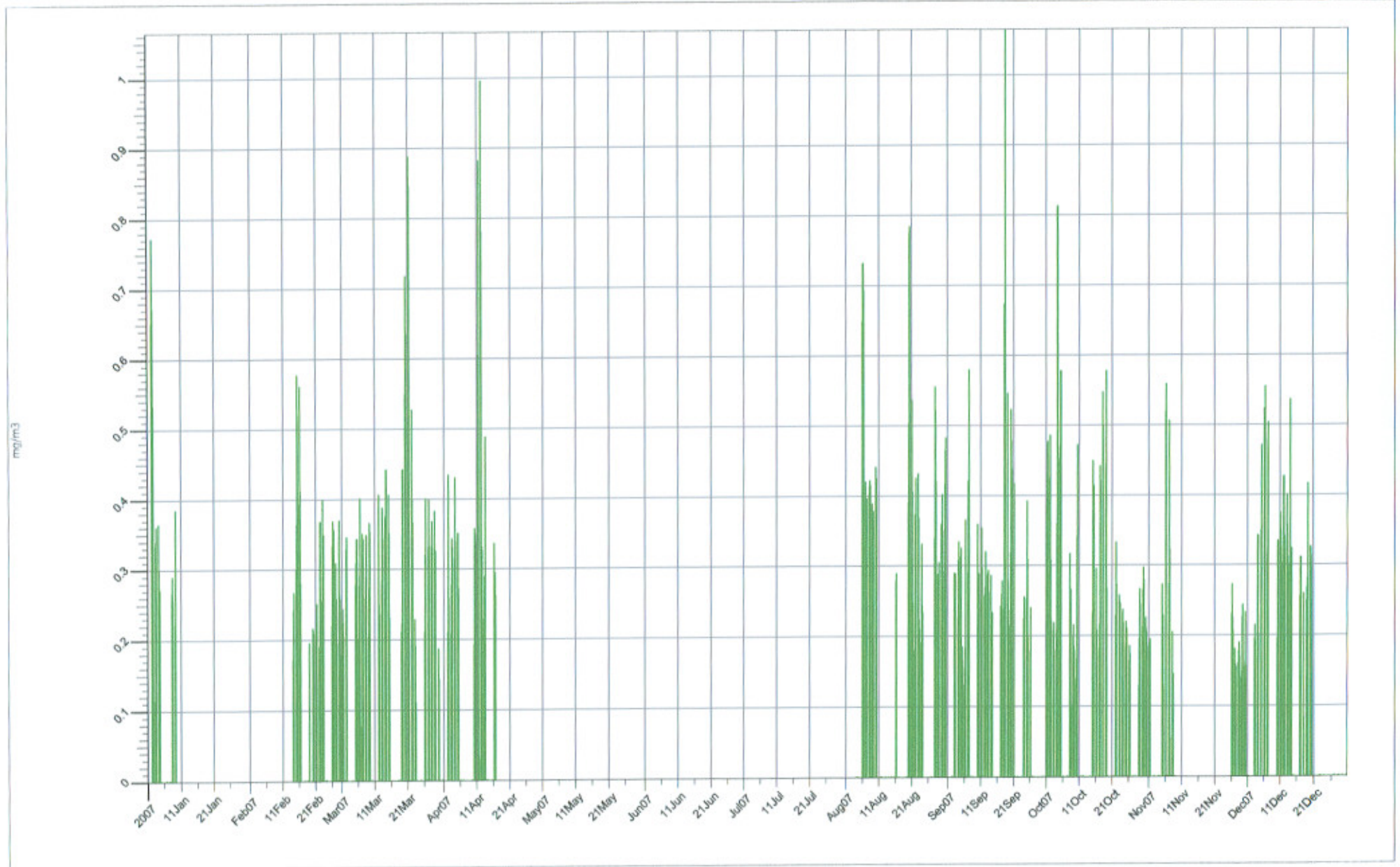
Emission Report

Company: Darex UK Limited Contact: Mr. G. Draper (01480 324459)

Authorisation number (s): 19/93

From: 01 Jan 07 00:00:00 To: 31 Dec 07 00:00:00

Device 0 : --- Banbury Cal Factor: 0.36 (constant) Average: 0.04897 Averaging Period: 10 mins Maximum: 1.065



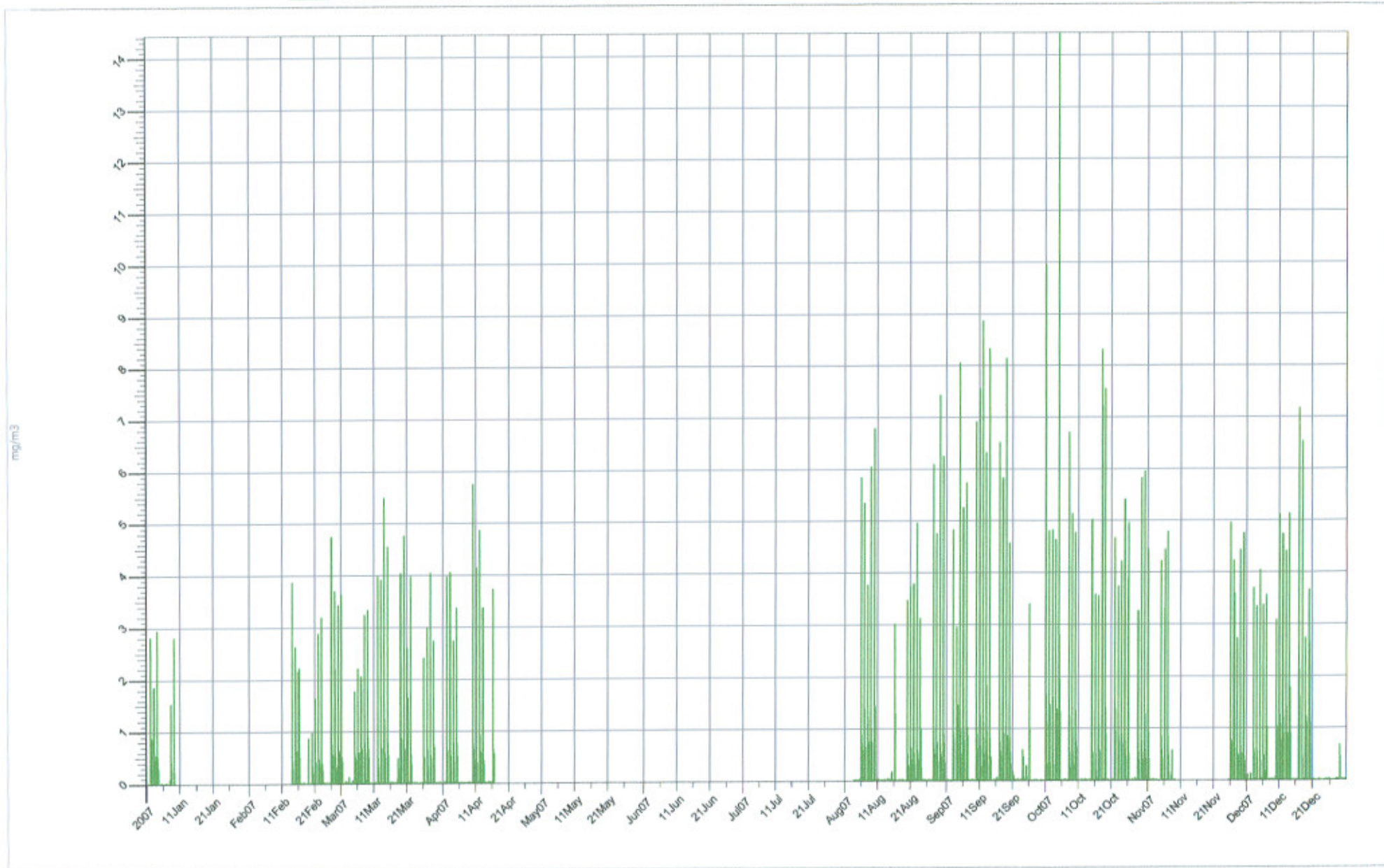
Emission Report

Company:Darex UK Limited Contact:Mr. G. Draper (01480 324459)

Authorisation number (s):19/93

From:01 Jan 07 00:00:00 To:31 Dec 07 00:00:00

Device 0 : --- Conveyor Cal Factor: 7.22 (constant) Average:0.1344 Averaging Period:10 mins Maximum:14.43



Part B

VOC Emissions Inventory (January 2007 - December 2007)

Input Data Sheet

Period for Calculation:

Start Date: Jan-07
End Date: Dec-07

Solvent Receipts:

	<u>Material</u>	<u>Received (kg)</u>	<u>Excel Var.</u>
ST 1	PENTO	5,434	tank1
ST 2	SQUO	1,177,576	tank2
ST 3	SQUO	1,177,576	tank3
ST 4	ACET	64,670	tank4
ST 6	IPA	8,300	tank6
ST 7	SOX	2,980	tank7

Solvent Used in SLC Production:

	<u>Material</u>	<u>Used (kg)</u>	<u>Excel Var.</u>
	ACET	64,241	acet
	IPA	9,718	ipa
	PENTO	5,632	pento
	SOX	3,463	sox
	SQUO	2,359,156	squo

Solvent Production:

	<u>Produced (kg)</u>	<u>Excel Var.</u>
All SLC	4,000,773	slc

SLC Packaging:

	<u>Produced (kg)</u>	<u>Excel Var.</u>
Bulk	389,640	bulk
IBCs	51,423	ibc
Drums	3,511,135	drum
All Other	48,576	other

Results of Annual VBS Monitoring

	<u>Monitored E%</u>	<u>Excel Var.</u>
Mixer solvent loading	100.000%	mixer_e
BT SF loading	99.591%	btsf_e
BT homogenization	100.000%	bthomo_e

Summary of Emissions Estimates (January 2007 - December 2007)

Calculated for following period:

Start Date: Jan-07

End Date: Dec-07

Emission Group	Estimation Technique	VBS E% Max	VBS E% Actual	Estimated Emission, Kg/Yr
Solvent Storage Tanks	EPA AP-42 Breathing & Loading	100%	0.00%	1,935
Mixers: Solvent Loading	EPA AP-42 Loading	100%	100.00%	-
Mixers: Solids Loading & Solvation	EIIP Model	0%	0.00%	5,723
Bulk Tanks: SF Loading	EPA AP-42 Loading	100%	99.59%	56
Bulk Tanks: Homogenization	EPA AP-42 Loading	100%	100.00%	-
Bulk Tanks: Breathing	EPA AP-42 Breathing	0%	0.00%	727
Bulk Packing	EPA AP-42 Loading	100%	75.00%	156
Tote Packing	EPA AP-42 Loading	100%	75.00%	21
Drum Packing	EPA AP-42 Loading	100%	75.00%	1,410
Misc. Packing	EPA AP-42 Loading	0%	0.00%	78
Total Plant				10,105

St. Neots VOC Emissions Estimates

Equipment	Matl.	T-put, Kg/yr	Pre- Vapour Balance							Subtotal Kg/yr	VBS E%	Post-VBS		
			Working Losses		Breathing Losses		Total Losses		Subtotal Kg/yr			Kg/yr	Subtotal Kg/yr	
			Lbs/yr	Kg/yr	Lbs/yr	Kg/yr	Lbs/yr	Kg/yr						
Bulk Solvents at Storage Conditions -- 13 C (55 F)														
ST 3	SQUO	1,177,576	1,807	821	-	-	1,807	821		0%	821			
ST 2	SQUO	1,177,576	1,807	821	-	-	1,807	821		0%	821			
ST 1	PENTO	5,434	1	1	-	-	1	1		0%	1			
ST 4	ACET	64,670	150	68	435	198	585	266		0%	266			
ST 6	IPA	8,300	2	1	40	18	41	19		0%	19			
ST 7	SOX	2,980	1	0	14	6	15	7		0%	7			
												1,935	ST	
Solvent Loading to Mixers -- 13 C (55 F)														
	ACET	64,241	149	68	-	-	149	68		100.00%	-			
	IPA	9,718	2	1	-	-	2	1		100.00%	-			
	PENTO	5,632	1	1	-	-	1	1		100.00%	-			
	SOX	3,463	1	0	-	-	1	0		100.00%	-			
	SQUO	2,359,156	3,620	1,645	-	-	3,620	1,645		100.00%	-			
									Mix Solv Load		-	Mix Solv Load		
												1,715		
SLC Products at B/T Loading (SF Reception) Conditions -- 60 C (140 F)														
BT 1	SLC	571,539	4,435	2,016	-	-	4,435	2,016		99.59%	8			
BT 2	SLC	571,539	4,435	2,016	-	-	4,435	2,016		99.59%	8			
BT 3	SLC	571,539	4,435	2,016	-	-	4,435	2,016		99.59%	8			
BT 4	SLC	571,539	4,435	2,016	-	-	4,435	2,016		99.59%	8			
BT 5	SLC	571,539	4,435	2,016	-	-	4,435	2,016		99.59%	8			
BT 6	SLC	571,539	4,435	2,016	-	-	4,435	2,016		99.59%	8			
BT 7	SLC	571,539	3,367	1,530	-	-	3,367	1,530		99.59%	6			
									B/T Loading		56	B/T Loading		
												13,625		
SLC Products at B/T Homog Pass Conditions -- 50 C (122 F) Working Losses x 2 Passes														
BT 1	SLC	571,539	6,352	2,887	-	-	6,352	2,887		100.00%	-			
BT 2	SLC	571,539	6,352	2,887	-	-	6,352	2,887		100.00%	-			
BT 3	SLC	571,539	6,352	2,887	-	-	6,352	2,887		100.00%	-			
BT 4	SLC	571,539	6,352	2,887	-	-	6,352	2,887		100.00%	-			
BT 5	SLC	571,539	6,352	2,887	-	-	6,352	2,887		100.00%	-			
BT 6	SLC	571,539	6,352	2,887	-	-	6,352	2,887		100.00%	-			
BT 7	SLC	571,539	4,733	2,152	-	-	4,733	2,152		100.00%	-			
									B/T Homo		-	B/T Homo		
												19,476		
SLC Products at B/T Breathing Conditions -- 22 C (72 F)														
BT 1	SLC	571,539	-	-	241	110	241	110		0%	110			
BT 2	SLC	571,539	-	-	241	110	241	110		0%	110			
BT 3	SLC	571,539	-	-	241	110	241	110		0%	110			
BT 4	SLC	571,539	-	-	241	110	241	110		0%	110			
BT 5	SLC	571,539	-	-	241	110	241	110		0%	110			
BT 6	SLC	571,539	-	-	220	100	220	100		0%	100			
BT 7	SLC	571,539	-	-	173	78	173	78		0%	78			
									B/T Breathing		727	B/T Breathing		
												727		
SLC Products at Packaging Conditions -- 20 C (68 F)														
Bulk	SLC	389,640	1,377	626	-	-	1,377	626		75%	156			
IBCs	SLC	51,423	182	83	-	-	182	83		75%	21			
Drums	SLC	3,511,135	12,409	5,640	-	-	12,409	5,640		75%	1,410			
All Other	SLC	48,576	172	78	-	-	172	78		0%	78			
									Pkg		1,665	Pkg		
												6,427		
TOTAL EMISSIONS												41970		4383

Mixer Emissions Calculations

Using methods based on:

Emission Inventory Improvement Program

Preferred and Alternative Methods for Estimating Air Emissions from Paint and Ink Manufacturing Facilities
USEPA

4.1.1 Material Loading (loading of solids only)

[equation 8.4-1] $E(\text{VOC}) = 12.46 * S * P * M * Q / T$

variable	value	units	comment
E(VOC)	2195.8861	lb	
S	1	dim'less	assume S = 1 (overestimate)
P	2.00	psia	VP hexane at T=55 F
M	86.00	lb/lb-mol	
Q	527.68	1000 gal	throughput for all mixers x 40%
T	515	T(R)	=T(F) + 460

4.1.2 Heat-up Losses

[equation 8.4-10] $E(\text{VOC}) = \frac{(TVP, T1 / (14.7 - TVP, T1)) + (TVP, T2 / (14.7 - TVP, T2)) * dn * Ma * CYC}{2}$

variable	value	units	comment			
E(VOC)	8883.8134	lb			T	VP
TVP, T1	2	psia	VP at initial batch temp	T1	55	2
TVP, T2	11.7	psia	VP at final batch temp	T2	140	11.7
dn	0.048991	lb-mol/cycle	calc'd by equation 8.4-11, below			
Ma	86	lb/lb-mol	molecular weight		BS	
CYC	1081.29	cycles	batches per period = tput/3700 (avg capacity)	SSW	2400	Kg
				LSW	4800	
				MM	4800	
				ACET SW	2800	
				"Avg"	14800	

[equation 8.4-11] $dn = (V / R) * ((Pa1 / T1) - (Pa2 / T2))$

variable	value	units	comment
dn	0.048991	lb-mol/cycle	
V	26.737968	ft^3	mixer nominal - working capacity = 200 gal
R	10.73	psia "ft^3/lb-mol" R	ideal gas constant
Pa1	12.7	psia	14.7 - TVP, T1 (from above)
Pa2	3	psia	14.7 - TVP, T2 (from above)
T1	515	T(R)	T1 = 55 F
T2	600	T(R)	T2 = 140 F

4.1.4 Surface Evaporation

[equation 8.4-18] $Ex = Mx * Kx * A * Px * 3600 * H * B / R * T$

variable	value	units	comment
Ex	1510.1225	lb	calculate for all species based on tvp and amw
Mx	86	lb/lb-mol	average molecular weight
Kx	0.0044655	ft/sec	calc'd below from equation 8.4-17
A	1.3955556		based on 18" ID mixer hatch
Px	2		calc'd at Tavg
H	2	hr/batch	open vessel batch time = 2 hrs/batch
B	1081.29		batches per period
R	10.73	psia "ft^3/lb-mol" R	
T	515		use T1

[equation 8.4-17] $Kx = 0.00438 * U^{0.78} * (18/Mx)^{0.333}$

variable	value	units	comment
Kx	0.0044655	ft/sec	
U	2	mile/hr	assume wind speed in closed vessel is 2 mph
Mx	86	lb/lb-mol	average molecular weight

St. Neots VOC Emissions Inventory

Material Properties

Bulk Solvents at Storage Conditions -- 13 C (55 F)

Matl.	Annual Avg. Storage Temp., F	Avg. Diurnal Temp. Change, F	TVP, psia	Avg. MW, lbs/lb-mol	Note	Temp. Con.	
						C	F
SQUO	55	0	2	82.4		Bulk Storage	13 55
ACET	55	0	2.9	58		Packaging	20 68
PENTO	55	13.5	0.5	100		B/T Breathing	22 72
						Homog Pass	50 122
						B/T Loading	60 140
						initial bp, SQUO	55 131

SLC Products at B/T Loading (SF Reception) Conditions -- 60 C (140 F)

Matl.	Annual Avg. Storage Temp., F	Avg. Diurnal Temp. Change, F	TVP, psia	Avg. MW, lbs/lb-mol	Note
100A	140	na	11.7	83.8	100% SQUO
9291	140	na	11.7	83.8	100% SQUO
235	140	na	8.1	91.9	50:50 SQUO:PENTO
239	na	na	na	na	100% ACET

SLC Products at B/T Homog Pass Conditions -- 50 C (122 F)

Matl.	Annual Avg. Storage Temp., F	Avg. Diurnal Temp. Change, F	TVP, psia	Avg. MW, lbs/lb-mol	Note
100A	122	na	8.4	83.6	100% SQUO
9291	122	na	8.4	83.6	100% SQUO
235	122	na	5.7	91.8	50:50 SQUO:PENTO
239	na	na	na	na	100% ACET

SLC Products at B/T Breathing Conditions -- 22 C (72 F)

Matl.	Annual Avg. Storage Temp., F	Avg. Diurnal Temp. Change, F	TVP, psia	Avg. MW, lbs/lb-mol	Note
100A	72	6	2.9	82.7	100% SQUO
9291	72	6	2.9	82.7	100% SQUO
235	72	6	1.9	91.4	50:50 SQUO:PENTO
239	na	na	na	na	100% ACET

SLC Products at Packaging Conditions -- 20 C (68 F)

Matl.	Annual Avg. Storage Temp., F	Avg. Diurnal Temp. Change, F	TVP, psia	Avg. MW, lbs/lb-mol	Note
100A	68	na	2.7	82.7	100% SQUO
9291	68	na	2.7	82.7	100% SQUO
235	68	na	1.7	91.4	50:50 SQUO:PENTO
239	68	na	na	na	100% ACET

Part C

Vent Measurements: 18th October 2007

Mass Emission is calculated from Ideal Gas Law

mass emission mg/min = ppm x flow rate x molecular weight x P /RT

$n = PV/RT$

V = measured flow rate (m3/min)	
P = 101325 Pa (760 mm Mercury)	101325
T = 293 K	293
R = molar gas constant 8.314 (m3Pa/mol K)	8.314
Molecular weight for solvent = 90	90
R x T	2436.002
P/RxT	41.595

		Solvent Tank to Mixer	Mixer to Buk Tank	Homogenisation Tank to Tank
		ST2 to MM	SS to BT6	BT3 to BT2
Mean ppm	ppm	0.04	104.27	0.00
Flow Volume	m3/min	1.89	1.89	1.89
Emission rate	gm/min	0.00028	0.73589	0.00000
Emission Rate MR	kg/min	0.00000	0.00074	0.00000
Prebalanced Rate (PBR)	kg/min	0.18000	0.18000	0.04400
MR/PBR		0.00000	0.00409	0.00000
Efficiency 1-MR/PBR		1.00000	0.99591	1.00000
EFFICIENCY PERCENT	%	100.000	99.591	100.000

Vent Measurements: 18th October 2007

Reading Seq.	Activity	Solvent Tank to Mixer	Mixer to Buk Tank	Homogenisation Tank to Tank
	Tanks	ST2 to MM	SS to BT6	BT3 to BT2
	Interval (secs)	Unit		
		ppm	ppm	ppm
1	6	0.0	209.0	0.0
2	12	0.0	103.0	0.0
3	18	0.0	87.0	0.0
4	24	0.0	24.0	0.0
5	30	0.0	32.0	0.0
6	36	0.0	61.0	0.0
7	42	0.0	136.0	0.0
8	48	0.0	168.0	0.0
9	54	0.0	215.0	0.0
10	60	1.0	47.0	0.0
11	66	0.0	140.0	0.0
12	72	0.0	147.0	0.0
13	78	0.0	192.0	0.0
14	84	0.0	95.0	0.0
15	90	0.0	49.0	0.0
16	96	0.0	183.0	0.0
17	102	0.0	304.0	0.0
18	108	0.0	159.0	0.0
19	114	0.0	71.0	0.0
20	120	0.0	146.0	0.0
21	126	0.0	111.0	0.0
22	132	0.0	86.0	0.0
23	138	0.0	24.0	0.0
24	144	0.0	33.0	0.0
25	150	0.0	61.0	0.0
26	156	0.0	38.0	0.0
27	162	0.0	188.0	0.0
28	168	0.0	187.0	0.0
29	174	0.0	74.0	0.0
30	180	0.0	96.0	0.0
31	186	0.0	112.0	0.0
32	192	1.0	90.0	0.0
33	198	0.0	246.0	0.0
34	204	0.0	109.0	0.0
35	210	0.0	136.0	0.0
36	216	1.0	88.0	0.0
37	222	0.0	67.0	0.0
38	228	0.0	121.0	0.0
39	234	0.0	86.0	0.0
40	240	0.0	75.0	0.0
41	246	0.0	98.0	0.0
42	252	0.0	37.0	0.0
43	258	0.0	50.0	0.0
44	264	0.0	77.0	0.0
45	270	0.0	43.0	0.0
46	276	0.0	17.0	0.0
47	282	0.0	22.0	0.0
48	288	0.0	147.0	0.0
49	294	0.0	57.0	0.0
50	300	0.0	82.0	0.0
51	306	0.0	244.0	0.0
52	312	0.0	177.0	0.0
53	318	0.0	55.0	0.0
54	324	0.0	61.0	0.0
55	330	0.0	14.0	0.0
56	336	0.0	137.0	0.0
57	342	0.0	23.0	0.0
58	348	0.0	118.0	0.0
59	354	0.0	286.0	0.0
60	360	0.0	131.0	0.0
61	366	0.0	74.0	0.0
62	372	0.0	82.0	0.0
63	378	0.0	119.0	0.0
64	384	0.0	159.0	0.0
65	390	0.0	228.0	0.0
66	396	0.0	203.0	0.0
67	402	0.0	70.0	0.0
68	408	0.0	75.0	0.0
69	414	0.0	41.0	0.0
70	420	0.0	121.0	0.0
71	426	0.0	248.0	0.0
72	432	0.0	94.0	0.0
73	438	0.0	214.0	0.0
74	444	0.0	235.0	0.0
75	450	0.0	74.0	0.0
76	456	0.0	46.0	0.0
77	462	0.0	49.0	0.0
78	468	0.0	70.0	0.0
79	474	0.0	127.0	0.0
80	480	0.0	35.0	0.0
81	486	0.0	17.0	0.0
82	492	0.0	25.0	0.0

Vent Measurements: 18th October 2007

Reading Seq.	Interval (secs)	Activity	Solvent Tank to Mixer	Mixer to Buk Tank	Homogenisation Tank to Tank
		Tanks	ST2 to MM	SS to BT6	BT3 to BT2
		Unit	Unit	Unit	Unit
		ppm	ppm	ppm	ppm
83	498	0.0	29.0	0.0	
84	504	0.0	27.0	0.0	
85	510	0.0	143.0	0.0	
86	516	0.0	149.0	0.0	
87	522	0.0	45.0	0.0	
88	528	0.0	11.0	0.0	
89	534	0.0	43.0	0.0	
90	540	0.0	27.0	0.0	
91	546	0.0	25.0	0.0	
92	552	0.0	51.0	0.0	
93	558	1.0	37.0	0.0	
94	564	0.0	44.0	0.0	
95	570	0.0	29.0	0.0	
96	576	0.0	32.0	0.0	
97	582	0.0	43.0	0.0	
98	588	0.0	217.0	0.0	
99	594	0.0	103.0	0.0	
100	600	0.0	20.0	0.0	
101	606	0.0	19.0	0.0	
102	612	0.0	68.0	0.0	
103	618	0.0	44.0	0.0	
104	624	0.0	64.0	0.0	
105	630	0.0	68.0	0.0	
106	636	0.0	82.0	0.0	
107	642	0.0	44.0	0.0	
108	648	0.0	72.0	0.0	
109	654	0.0	77.0	0.0	
110	660	0.0	162.0	0.0	
111	666	0.0	140.0	0.0	
112	672	0.0	152.0	0.0	
113	678	0.0	77.0	0.0	
114	684	0.0	288.0	0.0	
115	690	0.0	143.0	0.0	
116	696	0.0	214.0	0.0	
117	702	0.0	385.0	0.0	
118	708	0.0	131.0	0.0	
119	714	0.0	126.0	0.0	
120	720	0.0	70.0	0.0	
121	726	0.0	49.0	0.0	
122	732	0.0	58.0	0.0	
123	738	0.0	93.0	0.0	
124	744	0.0	131.0	0.0	
125	750	0.0	127.0	0.0	
126	756	0.0	50.0	0.0	
127	762	0.0	65.0	0.0	
128	768	0.0	132.0	0.0	
129	774	0.0	109.0	0.0	
130	780	0.0	82.0	0.0	
131	786	0.0	96.0	0.0	
132	792	0.0	68.0	0.0	
133	798	0.0	49.0	0.0	
134	804	0.0	50.0	0.0	
135	810	0.0	93.0	0.0	
136	816	1.0	82.0	0.0	
137	822	0.0	77.0	0.0	
138	828	0.0	57.0	0.0	
139	834	0.0	67.0	0.0	
140	840	0.0	107.0	0.0	
141	846	0.0	86.0	0.0	
142	852	0.0	123.0	0.0	
143	858	0.0	291.0	0.0	
144	864	0.0	144.0	0.0	
145	870	0.0	98.0	0.0	
146	876	0.0	175.0	0.0	
147	882	0.0	185.0	0.0	
148	888	1.0	170.0	0.0	
149	894	0.0	198.0	0.0	
150	900	0.0	150.0	0.0	
TOTAL		6.00	15641.00	0.00	
Mean		0.04	104.27	0.00	
Flow Rate (m3/sec)		1.0	1.0	1.0	
Flow Volume (m3/min)		1.89	1.89	1.89	

Foot Note:

Radius 0.1
Pie 3.142

Part D

Solvent/Product Analysis: 2007 (Base Data for VOC Calculation)

Solvent Analysis

Solvent	Op. Bal.	Receipts	Cl. Bal.	Usage		
ACETONE	10172	64670	10601	64241		
ISOPROPANOL	6036	5000	4425	6611	9718	
N-PROPANOL	372	3300	565	3107		
HEPTANES	1330	5434	1132	5632		
HEXANES	2309	104852	5096	102065		
CYCLOHEXANE	2496	12480	1236	13740	2359156	1179578
HYDROCARBON	36262	2237820	30731	2243352		
IMS	1532	2980	1049	3463		
TOTAL	60509	2436536	54834	2442211	1,558,563	38.96%

Production Analysis

Production Volume Jan - Dec 2007					
Product	Tanker	IBC	Drum	Poly	Total
SLC 100A	104,400	40,923	2,205,988	3,328	2,354,639
SLC 160	-	-	797,600	-	797,600
SLC 235	285,240	-	212,160	-	497,400
SLC 239G	-	-	102,220	192	102,412
SLC 9291ES	-	-	93,984	96	94,080
SOLV 1E	-	-	8,442	128	8,570
SOLV 3	-	-	13,600	-	13,600
NDF 20/27T DF	-	-	27,018	1,206	28,224
SP 1427	-	10,500	48,832	1,216	60,548
DL	-	-	571	4,482	5,053
LF	-	-	-	180	180
NW	-	-	720	7,790	8,510
CSF	-	-	-	2,662	2,662
DREM	-	-	-	27,296	27,296
Total	389,640	51,423	3,511,135	48,576	4,000,773