

August 17, 2001

**City Tea Tree Gully**  
**Mr. Mike Burke**  
Building Assets Coordinator  
571 Montague Rd  
Modbury, SA 5108

**Re: PermaFrost Treatment Results and Pay Back**

Dear Mr. Burke,

On the following pages is the comprehensive report completed by an Energy Consultant specializing in Supply Metering, Electrical Infrastructure Design and Energy Management for Air Conditioning usage within the A/C plant servicing the first level office area (data and results excludes the individual room units).

As per our proposal we guarantee the Council a minimum "Return on Investment" of 40%, which equates to a complete pay back in 2 1/2 years.

Following is a breakdown on costs, savings and payback:

KWh cost 7AM-9PM (Peak)	.118
<b>PermaFrost Savings</b>	<b>18%</b>
Average daily energy usage (7AM-9PM)	381.43kWh
Average daily savings (7AM-9PM)	68.66kWh
Cost savings per day	\$8.10
Cost savings per annum (260 days)	\$2,106.00
PermaFrost Cost	\$4,770.00
<b>Return on Investment</b>	<b>44%</b>
<b>Payback period (Months)</b>	<b>27.2</b>

The results obtained on the "TEST" equipment confirmed PermaFrost's effectiveness even in newer equipment by returning an 18% kWh reduction.

I look forward to working with the City of Tea Tree Gully in reducing further energy consumption within other Council properties.

Kind Regards,  
Enrico Sgarbi

**“Report on Energy consumption for  
refrigerant air conditioning equipment  
treated with PermaFrost at the City of Tea  
Tree Gully Council Offices.”**

**To the Manager  
Enrico Sgarbi  
Polar Oil Company**

**PO Box 325  
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## EXECUTIVE SUMMARY

This report has covered the usage pattern of refrigerant air conditioning systems, before the treatment of PermaFrost. Then compares these results to the consumption pattern of energy, after treatment with PermaFrost. The area conditioned by this equipment was the City of Tea Tree Gully Council Offices.

The results obtained were from data logger's measuring kW, kWh, Average kW and Peak Average kW. The bench mark for the results were based on 5 days of Pre-Testing data, compared to 18 days of Post-Testing data after treatment.

The time period in the day for testing and recording data was between the hours of 0900 to 1750 hours each day, Monday to Friday (excluding weekends). This period was selected as the system for the Councils Offices had consistent usage patterns.

The consistent savings produced by PermaFrost started to appear in the 4th week after treatment. Then in the following 5th to 7th week the savings increased. As can be seen in the "Post & Pre Test Data kWh Comparisons & Daily Temperature Table" week 5 increased but as stated earlier that on the 24/5/01 (highlighted in green results) appears not to fit in the general pattern of energy reduction as all the other results. If we just use Wednesday 90% figure it would. The following week averaged a 14% saving while the final week produced a 22% saving.

From previous tests of other plant and equipment, these results are consistent with the general pattern for the treatment to begin to take effect in a system. The results over the first 7 to 28 days after the PermaFrost treatment can produce erratic and at times higher consumption results. This is a common result as PermaFrost tries to establish itself in the system being treated. After establishing itself in the system a more consistent usage pattern of energy emerges.

## AIM

To compare the usage pattern of refrigerant air conditioning equipment, before and after the treatment of PermaFrost. The test being conducted on the City of Tea Tree Gully Council Offices.

## METHODS OF COMPARISONS

The results obtained were from data logger's measuring kW, kWh, Average kW and Peak Average kW. The results for comparison were based on 10 days of Pre-Testing data, compared to 33 days of Post-Testing data after treatment. The data selected for the test was between the hours of 9am to 5.30pm Monday to Friday. The reason for this period was consistent usage of systems and Temperature data for this period.

There were 5 working days of Pre-Testing data of the selected systems, followed by 18 working days of Post-Testing data of the systems that were selected for comparison purposes. The data was collated at 5-minute intervals, and then summarized into daily usage tables for comparison purposes. These tables indicate each day's consumption figures for the comparisons.

## REVIEW OF DATA FROM LOGGERS

After receiving data from the logger and checking results for any anomalies and inconsistencies. Only one day had test results of which data was used for comparison purposes, but cannot be explained. This day was 24/5/2001 which is highlighted in green on the "Post & Pre Test Data kWh Comparisons & Daily Temperature Table". This day showed a 140% which indicates a 40% increase over Pre Test data, but this did not fit in with the general trend for results achieved. If we leave this result out the 90% result achieved on Wednesday 23/05/01 would fit in the pattern as a 10% saving for that week's period. The pattern without this result, would then be very consistent throughout the test period.

You will also note on this table are days highlighted in pink, which results were not used for comparisons purposes. All public holidays and the following workday were not used due to large variables in usage. Friday's were not used due to temperature data being greater than plus or minus 4.5 degree's Celsius from the average 9am to 3pm temperature when benchmarking for comparison purposes between the Pre Test and Post Test data. If we did include Fridays the savings for this day start from 30% and end up at 60% by the end of the Post Test Data benchmarking results.

Other days that didn't meet the temperature requirements for comparisons are highlighted in pink. They were Thursday 17/05/01, Tuesday 29/05/01 and Wednesday 30/05/01, these days were all ignored for benchmarking and comparison purposes.

## RESULTS OF TEST

The collection of Pre-Test data created the benchmark for the comparison. You will also note in the attachment "Post & Pre Test Data kWh Comparisons & Daily Temperature Table " results sheet indicating the various day's temperatures that were logged. From this sheet, the day's average temperature between 9am and 3pm created our Temperature benchmark. All temperatures that were greater than plus or minus 4.5% from these figures were not used in the results when comparing. The temperatures are highlighted at the top of the sheet in blue, as the benchmark for comparison purposes.

When reviewing the data in the "Post & Pre Test Data kWh Comparisons & Daily Temperature Table" attachment, note that If the % is greater than 100% then there is an increase in cost, but if it is lower there is a decrease in cost. The difference is the %; e.g. **110%** indicates that energy consumed is 10% greater than the benchmark, while 85% indicates a 15% saving in energy from the benchmark result. I have highlighted all increase usage % in **red**, while the saving are in black.

The consistent savings produced by PermaFrost started to appear in the 4th week after treatment. Then in the following 5th to 7th week the savings

increased. As can be seen in the “Post & Pre Test Data kWh Comparisons & Daily Temperature Table” week 5 increased but as stated earlier that on the 24/5/01 (highlighted in green results) appears not to fit in the general pattern of energy reduction as all the other results. If we just use Wednesday 90% figure it would. The following week averaged a 14% saving while the final week produced a 22% saving.

Also attached are all the results of testing from the data loggers, which in turn relevant data was transposed to the “Post & Pre Test Data kWh Comparisons & Daily Temperature Table”. This was done in a format that can be easily seen to show a pattern of energy consumption when comparing benchmark results with the Post Test results.

## **GENERAL DISCUSSION**

After reviewing data for several premises that have used the PermaFrost product, the results obtained for this site are consistent with other tests carried out. The savings at other sites have varied from 15% through to 30%. The results have shown generally an increase, and at times erratic consumption patterns, in the 7 to 28 days after treatment. If systems are used 24 hours per day then I have noticed a shorter time for consistent savings to occur, as apposed to units that are only run during working hours and not used on week ends can take up to a month to show some consistent results.

PermaFrost usually in the first 7 to 28 days after treatment can cause erratic results for comparisons to benchmarking data. After this period, and once the product can establishes itself in the system, more consistent results can be seen.

There are the odd occasions that results can be difficult to explain, but if the general run of results are going in a certain direction we can tend to ignore the odd result when comparing Post and Pre Test data results.

# Post & Pre Test Data kWh Comparisons & Daily Temperature Table Explanation

The results obtained were from data logger's measuring kW, kWh, Average kW and Peak Average kW. The results for comparison were based on 10 days of Pre-Testing data, compared to 33 days of Post-Testing data after treatment. The data selected for the test was between the hours of 9am to 5.30pm Monday to Friday. The reason for this period was consistent usage of systems and Temperature data for this period.

There were 5 working days of Pre-Testing data of the selected systems, followed by 18 working days of Post-Testing data of the systems that were selected for comparison purposes. The data was collated at 5-minute intervals, and then summarized into daily usage tables for comparison purposes. These tables indicate each day's consumption figures for the comparisons.

Each weekday was compared to the same weekday when benchmarking results. Pre and Post Test data has one day's results for Monday, Tuesday, Wednesday, while Thursday was averaged over two days. Note that both these days had similar temperatures.

Please note the benchmark data for Pre Testing is highlighted in blue, which then is compared to Post Test data. All days highlighted in pink are not used for comparison purposes, due to not meeting the criteria required for benchmarking in this case.

When reviewing the data note that if the % is greater than 100% then there is an increase in cost, but if it is lower there is a decrease in cost. The difference is the %, eg 110% indicates that energy consumed is 10% greater than the benchmark, while 85% indicates a 15% saving in energy from the benchmark result. I have highlighted all increase usage percent in red, while the saving are in black



# Post & Pre Test Data for Test Period

## Pre Treatment Test Results





Total kWh	312.637	54.841	Max kW	3751.67	Total Average kW
06/04/01		44.919	Ave MkW	312.639	Check Total kWh
		4312.23	Total MkW	39.0798	Average kW

## Pre Treatment Test Results

Total kWh	198.95	36.668	Max kW	2387.41	Total Average kW
9/04/2001		29.0825	Ave MkW	198.951	Check Total kWh
		2791.92	Total MkW	24.8688	Average kW

Total kWh	196.88	37.767	Max kW	2362.59	Total Average kW
10/04/2001		29.5406	Ave MkW	196.883	Check Total kWh
		2835.89	Total MkW	24.6103	Average kW

Total kWh	178.315	37.971	Max kW	2139.8	Total Average kW
11/04/2001		26.9629	Ave MkW	178.317	Check Total kWh
		2588.43	Total MkW	22.2896	Average kW

Total kWh	164.501	54.487	Max kW	1974.05	Total Average kW
12/04/2001		25.4245	Ave MkW	164.504	Check Total kWh
		2440.75	Total MkW	20.563	Average kW

Total kWh	22.806	4.037	Max kW	273.647	Total Average kW
13/04/2001		3.9825	Ave MkW	22.8039	Check Total kWh
		382.32	Total MkW	2.85049	Average kW

**GOOD FRIDAY**

## Pre Treatment Test Results

Total kWh	22.986	3.929	Max kW	275.847	Total Average kW
16/04/2001	3.87743	Ave MkW	22.9873	Check Total kWh	
<b>EASTER MONDAY</b>	372.233	Total MkW	2.87341	Average kW	

Total kWh	232.664	46.309	Max kW	2791.92	Total Average kW
17/04/2001	34.4132	Ave MkW	232.66	Check Total kWh	
	3303.67	Total MkW	29.0825	Average kW	

Total kWh	292.222	53.632	Max kW	3506.73	Total Average kW
18/04/2001	42.6349	Ave MkW	292.227	Check Total kWh	
	4092.95	Total MkW	36.5284	Average kW	

Total kWh	152.349	45.737	Max kW	1828.24	Total Average kW
19/04/2001	23.6325	Ave MkW	152.353	Check Total kWh	
	2268.72	Total MkW	19.0442	Average kW	


## Post Treatment Test Results

23/04/2001					
<b>TREATMENT DAY</b>					

Total kWh	164.209	35.915	Max kW	1970.46	Total Average kW
24/04/2001	25.5685	Ave MkW	164.205	Check Total kWh	
	2454.58	Total MkW	20.5256	Average kW	

Total kWh	21.819	11.981	Max kW	261.856	Total Average kW
25/04/2001	3.97073	Ave MkW	21.8213	Check Total kWh	
	381.19	Total MkW	2.72767	Average kW	

Total kWh	176.959	38.681	Max kW	2123.5	Total Average kW
26/04/2001	26.1332	Ave MkW	176.959	Check Total kWh	
	2508.79	Total MkW	22.1198	Average kW	

Total kWh	185.38	37.742	Max kW	2224.56	Total Average kW
27/04/2001	27.0697	Ave MkW	185.38	Check Total kWh	
	2598.69	Total MkW	23.1725	Average kW	

## Post Treatment Test Results

Total kWh	208.332	40.22	Max kW	2500.01	Total Average kW
30/04/2001	31.7762	Ave MkW	208.334	Check Total kWh	
	3050.52	Total MkW	26.0418	Average kW	

Total kWh	210.972	42.989	Max kW	2531.67	Total Average kW
1/05/2001	31.2269	Ave MkW	210.973	Check Total kWh	
	2997.79	Total MkW	26.3716	Average kW	

Total kWh	196.985	38.542	Max kW	2363.85	Total Average kW
2/05/2001	29.1909	Ave MkW	196.988	Check Total kWh	
	2802.33	Total MkW	24.6234	Average kW	

Total kWh	170.39	38.049	Max kW	2044.64	Total Average kW
3/05/2001	25.6082	Ave MkW	170.387	Check Total kWh	
	2458.39	Total MkW	21.2983	Average kW	

Total kWh	202.452	41.063	Max kW	2429.45	Total Average kW
4/05/2001	30.1413	Ave MkW	202.454	Check Total kWh	
	2893.57	Total MkW	25.3068	Average kW	

## Post Treatment Test Results

Total kWh	193.904	44.112	Max kW	2326.85	Total Average kW
7/05/2001	28.8004	Ave MkW	193.904	Check Total kWh	
	2764.84	Total MkW	24.238	Average kW	

Total kWh	186.378	40.886	Max kW	2236.55	Total Average kW
8/05/2001	27.9455	Ave MkW	186.379	Check Total kWh	
	2682.77	Total MkW	23.2974	Average kW	

Total kWh	187.018	37.859	Max kW	2244.2	Total Average kW
9/05/2001	27.0291	Ave MkW	187.016	Check Total kWh	
	2594.8	Total MkW	23.377	Average kW	

Total kWh	187.808	37.313	Max kW	2253.72	Total Average kW
10/05/2001	28.54	Ave MkW	187.81	Check Total kWh	
	2739.84	Total MkW	23.4763	Average kW	

Total kWh	179.026	40.079	Max kW	2148.28	Total Average kW
11/05/2001	28.0917	Ave MkW	179.024	Check Total kWh	
	2696.8	Total MkW	22.378	Average kW	

## Post Treatment Test Results

Total kWh	217.302	45.838	Max kW	2607.67	Total Average kW
14/05/2001		32.7578	Ave MkW	217.306	Check Total kWh
		3144.75	Total MkW	27.1632	Average kW

Total kWh	180.703	38.746	Max kW	2168.45	Total Average kW
15/05/2001		26.4064	Ave MkW	180.704	Check Total kWh
		2535.02	Total MkW	22.588	Average kW

Total kWh	160.875	35.865	Max kW	1930.5	Total Average kW
16/05/2001		24.4761	Ave MkW	160.875	Check Total kWh
		2349.7	Total MkW	20.1094	Average kW

Total kWh	151.009	34.945	Max kW	1812.05	Total Average kW
17/05/2001		23.6018	Ave MkW	151.004	Check Total kWh
		2265.77	Total MkW	18.8755	Average kW

Total kWh	135.293	33.248	Max kW	1623.48	Total Average kW
18/05/2001		21.2984	Ave MkW	135.29	Check Total kWh
		2044.64	Total MkW	16.9112	Average kW

## Post Treatment Test Results

Total kWh	20.924	3.837	Max kW	251.107	Total Average kW
21/05/2001		3.77719	Ave MkW	20.9256	Check Total kWh
		362.61	Total MkW	2.6157	Average kW

**ADELAIDE CUP**

Total kWh	187.721	41.602	Max kW	2252.66	Total Average kW
22/05/2001		28.546	Ave MkW	187.722	Check Total kWh
		2740.41	Total MkW	23.4652	Average kW

Total kWh	160.786	37.186	Max kW	1929.51	Total Average kW
23/05/2001		25.3726	Ave MkW	160.792	Check Total kWh
		2435.77	Total MkW	20.099	Average kW

Total kWh	222.319	42.867	Max kW	2667.81	Total Average kW
24/05/2001		33.0267	Ave MkW	222.318	Check Total kWh
		3170.56	Total MkW	27.7897	Average kW

Total kWh	183.933	38.569	Max kW	2207.22	Total Average kW
25/05/2001		28.3717	Ave MkW	183.935	Check Total kWh
		2723.69	Total MkW	22.9919	Average kW

## Post Treatment Test Results

Total kWh	162.575	41.836	Max kW	1950.87	Total Average kW
28/05/2001	24.8673	Ave MkW	162.572	Check Total kWh	
	2387.26	Total MkW	20.3215	Average kW	

Total kWh	159.81	36.656	Max kW	1917.69	Total Average kW
29/05/2001	24.1037	Ave MkW	159.808	Check Total kWh	
	2313.96	Total MkW	19.9759	Average kW	

Total kWh	164.685	36.314	Max kW	1976.21	Total Average kW
30/05/2001	25.4001	Ave MkW	164.684	Check Total kWh	
	2438.41	Total MkW	20.5855	Average kW	

Total kWh	140.931	40.188	Max kW	1691.14	Total Average kW
31/05/2001	21.7296	Ave MkW	140.928	Check Total kWh	
	2086.05	Total MkW	17.616	Average kW	

Total kWh	120.274	29.701	Max kW	1443.34	Total Average kW
1/06/2001	19.176	Ave MkW	120.278	Check Total kWh	
	1840.89	Total MkW	15.0348	Average kW	

## Post Treatment Test Results

Total kWh	193.713	44.204	Max kW	2324.52	Total Average kW
4/06/2001	29.7825	Ave MkW	193.71	Check Total kWh	
	2859.12	Total MkW	24.2138	Average kW	

Total kWh	153.368	38.685	Max kW	1840.41	Total Average kW
5/06/2001	23.0467	Ave MkW	153.367	Check Total kWh	
	2212.48	Total MkW	19.1709	Average kW	

Total kWh	124.014	32.937	Max kW	1488.14	Total Average kW
6/06/2001	18.3058	Ave MkW	124.012	Check Total kWh	
	1757.36	Total MkW	15.5015	Average kW	

Total kWh	105.798	42.208	Max kW	1269.58	Total Average kW
7/06/2001	16.4587	Ave MkW	105.798	Check Total kWh	
	1580.03	Total MkW	13.2248	Average kW	
