

February 8, 2002

**City of Playford**  
**Mr. Paul Alberton**  
Asset Services Business Unit Leader  
Warooka Drive  
Smithfield, SA 5114

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

Dear Mr. Alberton,

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 7 of the 9 Air Conditioning units (only 7 due to wiring configuration) within the Gapper Building for both Pre and Post PermaFrost treatment. This particular site provided an ideal environment in which to demonstrate PermaFrost's effectiveness, as the site was a stand-alone facility whereby, eliminating variables such as multiple units servicing multiple areas as found in larger sites which can lead to distorted readings.

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) .1615

**PermaFrost Savings 19%**

Average daily energy usage	184.41
Average daily savings	35.03kWh
Cost savings per day	\$5.66
Cost savings per annum (260 days)	\$1471.60
PermaFrost Cost	\$3,600.00

**Return on Investment 41%**  
**Pay Back period (Months) 29.35**

I look forward to working with the City of Playford 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  
Playford.”**

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

**PO Box 325  
Lobethal SA 5241**

**Prepared by  
P & M Kruger  
Australian Generation Group  
47 Carrick Hill Drive  
Mitcham SA 5062  
Ph: 08 82716028  
Fax: 08 82715757  
Email: pmkruger@adam.com.au**

**ABN: 63 609 093 853**

## 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 Playford offices.

The results obtained were from data logger's measuring kW, kWh, Average kW and Peak Average kW. The benchmark for the results were based on 7 weeks of Pre-Testing data, compared to 5 weeks of Post-Testing data after treatment.

The time period in the day for testing and recording data was between 9am to 4:30pm 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 2nd week after treatment. Then in the following 3rd to 5th week the savings tended to increase. As can be seen in the "Post & Pre Test Data kWh Comparisons & Daily Temperature Table", the first 2 daily % savings indicates approximately 14% over the benchmark calculations. While the last 2 weeks of testing, indicated approximately a 19% 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 consumption results at times. 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. In this case some of the results have varied savings, but are showing a trend to savings in the last two weeks of testing at approximately 19% over the benchmark calculations.

# 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 Playford 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 7 weeks of Pre-Testing data, compared to 5 weeks of Post-Testing data after treatment. The data selected for the test was between the hours of 9am to 4.30pm Monday to Friday. The reason for this period was consistent usage of systems and Temperature data for this period.

There were 7 weeks of Pre-Testing data of the selected systems, followed by 5 weeks 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.

Benchmarking of Pre Test Data, was done by grouping the average of 9am and 3pm daily temperatures. These were then grouped into temperature groups A, B etc, as displayed in the comparison tables with the red background areas. When benchmarking, each group required at least 3 results from the Pre Test results to be used as a benchmark. Hence only temperature group A, met this criteria and was used for benchmarking.

# REVIEW OF DATA FROM LOGGERS

After receiving data from the logger and checking results for any anomalies and inconsistencies, the only data was lost from 30/8/01 to 12/9/01 due to a malfunction of the logger not recording data when connected over this period.

## RESULTS OF TEST

The collection of Pre-Test data created the benchmark for the comparison. You will note in the attachment “Post & Pre Test Data kWh Comparisons & Daily Temperature Table ” results sheets indicating the various day’s temperatures that were logged. From these sheets, the day’s average temperature between 9am and 3pm created our Temperature benchmark. All temperature groups that did not have at least 3 results for Pre Test Data benchmarking were not used for comparison purposes. The temperatures are highlighted in the comparison tables sheets in red.

When reviewing the data in the “Post & Pre Test Data kWh Comparisons & Daily Temperature Table” attachment, note that the % number in orange and green is the saving over the benchmark results from Pre Test results.

The consistent savings produced by PermaFrost started to appear in the 2nd week after treatment. Then in the following 3rd to 5th week the savings tended to increase. As can be seen in the “Post & Pre Test Data kWh Comparisons & Daily Temperature Table”, the first 2 daily % savings indicates approximately 14% over the benchmark calculations. While the last 2 weeks of testing, indicated approximately a 19% saving.

## 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 with up to 30% savings having been achieved.

The results have shown generally an increase in savings, as the product establishes itself in the systems. It was unfortunate that not more data could be used and compared, but the results that have been used show a substantial saving on energy for the systems that were treated.

# CITY OF PLAYFORD

## POST & PRE TEST DATA kWh COMPARISONS WITH DAILY TEMPERATURE TABLES

### PRE TEST DATA

Day	Date	kWh		Max				Max/Min	9am-3pm Avg.	Temp. Group
		9am-4:30pm	kW	Max	Min	9am	3pm	Ave		
Thu	12/07/2001	152.73	39.3	13.7	10.1	11.5	13.2	11.9	12.35	A
Fri	13/07/2001	159.61	39.218	16.6	9	11.5	16.3	12.8	13.9	A
Mon	16/07/2001	153.92	39.771	15.1	9.7	10.6	13.8	12.4	12.2	A
Tue	17/07/2001	158.65	39.022	15.5	10.5	11.1	14.6	13	12.85	A
Wed	18/07/2001	154.58	40.499	13.8	4.7	7.4	12.9	9.25	10.15	A
Thu	19/07/2001	160.88	39.278	14.3	4.9	9.4	12.1	9.6	10.75	A
Fri	20/07/2001	143.85	41.038	14.6	7.4	10.7	13.7	11	12.2	A
Mon	23/07/2001	147.44	38.34	13.2	4.5	9.3	13.2	8.85	11.25	A
Tue	24/07/2001	161.55	38.534	14.8	4.8	8.9	12.8	9.8	10.85	A
Wed	25/07/2001	134.68	38.945	16.2	4.1	11.3	16	10.15	13.65	A
Thu	26/07/2001	147.15	38.907	15.7	4.3	8.6	15.3	10	11.95	A
Fri	27/07/2001	144.53	40.115	15.8	8.6	11.2	15.2	12.2	13.2	A
Mon	30/07/2001	154.69	44.535	20	4.1	10.2	19.8	12.05	15	B
Tue	31/07/2001	134.64	34.205	18.9	10.1	14.8	17.6	14.5	16.2	B
Wed	1/08/2001	139.04	38.945	15.3	6.2	10.4	13.6	10.75	12	A
Thu	2/08/2001	148.64	38.671	15.5	5.9	9.3	14.9	10.7	12.1	A
Fri	3/08/2001	146.63	38.716	16.4	3.7	11.8	16.1	10.05	13.95	A
Mon	6/08/2001	141.81	39.901	15.7	7.9	11.9	14.6	11.8	13.25	A
Tue	7/08/2001	150.61	36.42	13.4	10.6	10.7	12.2	12	11.45	A
Wed	8/08/2001	137.89	38.256	15.8	9.1	12.8	14.8	12.45	13.8	A
Thu	9/08/2001	132.54	37.973	19.2	7.9	11.4	18.9	13.55	15.15	B
Fri	10/08/2001	125.99	33.826	18.3	9.9	14.8	17.9	14.1	16.35	B
Mon	13/08/2001	138.33	37.526	17.6	5.6	11.3	16.3	11.6	13.8	A
Tue	14/08/2001	126.07	34.379	20.7	7	15.1	20.4	13.85	17.75	B
Wed	15/08/2001	122.65	29.535	22.1	12.4	16.8	21.6	17.25	19.2	B
Thu	16/08/2001	133.37	32.033	16.8	16.4	16.7	12.8	16.6	14.75	A
Fri	17/08/2001	138.54	39.628	14.1	8.5	11.2	13.5	11.3	12.35	A
Mon	20/08/2001	136.03	38.287	14.4	11	11.7	11.7	12.7	11.7	A
Tue	21/08/2001	140.02	38.144	14.8	9.7	9.9	11.9	12.25	10.9	A
Wed	22/08/2001	123.10	33.88	15.9	8.6	11.8	14.5	12.25	13.15	A
Thu	23/08/2001	131.99	37.328	15.4	7.6	10.6	13.6	11.5	12.1	A
Fri	24/08/2001	126.28	37.415	19.8	6.6	14	19.2	13.2	16.6	B
Mon	27/08/2001	135.23	37.798	14.8	6.3	11.7	14.3	10.55	13	A
Tue	28/08/2001	120.38	32.839	15.9	10.4	12.9	15.7	13.15	14.3	A
Wed	29/08/2001	130.30	34.204	15.1	6.4	10.8	14.8	10.75	12.8	A

Group A Temp. BENCHMARK CALCULATIONS	
kWh 9am - 4:30pm	
Mon	142.126
Tue	146.244
Wed	136.598
Thu	145.795
Fri	146.631
9am-3pm Avg.	
Group A Temps 9<15 degrees	
Group B Temps 15<21 degrees	
Group C Temps 21<27 degrees	
Group D Temps 27<33 degrees	
Group E Temps 33+ degrees	

POST TEST DATA NEXT PAGE

POST TEST DATA			Treatment : September 13th, 2001							% SAVINGS Over Benchmark		
Day	Date	kWh	Max					Max/Min	9am-3pm	Temp. Group	Daily	Weekly
		9am-4:30pm	kW	Max	Min	9am	3pm	Ave	Ave			
Mon	17/09/2001	118.61	27.447	18.1	6.8	13.7	16.8	12.45	15.25	B	*	
Tue	18/09/2001	139.16	35.92	24.1	9.3	18.1	23.7	16.7	20.9	B	*	
Wed	19/09/2001	136.39	33.956	28.7	13.2	22.8	28.7	20.95	25.75	C	*	
Thu	20/09/2001	116.90	32.678	21.1	14.5	15.1	18.9	17.8	17	B	*	
Fri	21/09/2001	125.58	28.622	25.1	10.4	19.5	24.5	17.75	22	C	*	
Mon	24/09/2001	123.88	26.911	17.6	10.8	10.8	17.5	14.2	14.15	A		12.8
Tue	25/09/2001	123.39	30.138	15.4	11.1	12	14.5	13.25	13.25	A		15.6
Wed	26/09/2001	108.83	27.334	16.9	6.1	12.5	16.3	11.5	14.4	A		20.3
Thu	27/09/2001	117.02	27.44	20.6	9.6	14.8	20.4	15.1	17.6	B	*	16.3
Fri	28/09/2001	132.00	33.798	26	14.4	20.5	25.3	20.2	22.9	C	*	
Mon	1/10/2001	104.45	22.314	17.2	12.6	14	17.1	14.9	15.55	B	*	
Tue	2/10/2001	124.66	27.51	16.3	10	11	15	13.15	13	A		14.8
Wed	3/10/2001	139.18	27.434	17.3	10	14.1	16.5	13.65	15.3	B	*	
Thu	4/10/2001	121.23	26.982	16.1	8.1	12.3	13.9	12.1	13.1	A		16.9
Fri	5/10/2001	125.06	26.081	18.3	5.8	13.2	17	12.05	15.1	B	*	15.8
Mon	8/10/2001	126.04	26.858	17.8	7.5	12.9	16.3	12.65	14.6	A		11.3
Tue	9/10/2001	142.87	33.389	22.8	9.6	17.4	22.2	16.2	19.8	B	*	11.3
Wed	10/10/2001	122.07	27.05	22.3	14.8	20	20	18.55	20	B	*	
Thu	11/10/2001	133.78	26.794	16.8	10.3	14.4	16.4	13.55	15.4	B	*	
Fri	12/10/2001	134.44	30.306	16.7	10.9	14.3	15.9	13.8	15.1	B	*	
Mon	15/10/2001	116.26	26.764	21.7	6.6	15.5	20.5	14.15	18	B	*	
Tue	16/10/2001	123.52	32.245	23.2	10.6	15.8	20.6	16.9	18.2	B	*	
Wed	17/10/2001	110.71	26.315	18.2	11.4	12.9	17.5	14.8	15.2	B	*	
Thu	18/10/2001	108.95	26.365	16	11.2	14.3	14.3	13.6	14.3	A		25.7
												25.7

**GENERAL NOTES ON DATA SHEETS**

For benchmarking of kWh, the time frame used for this test were between the hours of 9am and 4:30pm, Monday through to Friday.

All areas highlighted in yellow indicate these results, for the selected period in kWh's used.

Benchmarking of Pre Test Data was done by grouping the average of the 9am and 3pm daily temperatures. These were then grouped into temperature groups of A, B etc, as displayed in the red back ground areas. When benchmarking, each group required at least 3 results from pre test results to be used as a bench mark.

\*When a temperature group did not have at least 3 results, then there was insufficient data for comparisons. Only temperature group A had more than 3 results for each week day, for comparison purposes.

% savings have been indicated above as a daily figure against the benchmark in orange, while the weekly figures are indicated in green.

**SUMMARY NOTES OF RESULTS**

As can be seen by the results, the general trend produced results of savings when comparing Post and Pre Test Data. The savings varied between 11.3% to 25.7% over the period of testing.

From the data gathered, the general trend is increased savings as the product establishes itself in the system.