



July 30th, 2018

Job:

Bakersfield P&DC

USPS Property ID #050464-G03

3400 Pegasus Drive

Bakersfield, CA 93380-9501 EMFS

Project #c21698

For:

Colder Green Air

ConEdison Solutions

U.S. Postal Service

Scope: Proof of Performance Test of Nano LiquiTec® with Graphene Dynamics®

RE: Report on baseline & post install data for systems treated with Nano LiquiTec® with Graphene Dynamics®

To Whom It May Concern,

Air Control Services was contracted to provide a third-party report on the performance of seven 20-ton roof top package units at USPS Property ID #050464-G03 before and after the induction of Nano LiquiTec® with Graphene Dynamics®. This work was performed at 3400 Pegasus Dr, Bakersfield, CA 93308.

The test commenced of nanotechnology that proposes to lower the energy consumption of the HVAC units, offering a return of investment in less than twelve months. Nano LiquiTec® with Graphene Dynamics® claims this is accomplished in 3 parts:

- 1) By eliminating oil fouling and increasing heat transfer.
- 2) By introducing catalyst technology that decreases the temperature of the refrigerant providing for colder supply air.
- 3) By increasing the viscosity of the compressor oil. This process results in a more efficient system with shorter runtimes, thereby reducing energy consumption.

The testing process consisted of current sensors connected to the main breakers of the seven HVAC units. The current sensors were used in conjunction with Onset data loggers. The data from the sensors was read in amps and converted to kWh. A comparison was then made for cooling degree data for that particular day. A baseline was established for 19 days. AC-6 was not operating for the first six days of the base line and those days were removed from the readings. Moreover, AC-5 compressors did not turn on during the baseline so the data for that unit was not used for the report.

Table 1. Below covers baseline data collection.

Table 1 (kwh/CDD)

	AC 1	AC 2	AC 3	AC 4	AC 6	AC 7	CDD
Sunday, June 24, 2018	44.59	40.06	41.39	41.05	NA	47.26	5.7
Friday, May 25, 2018	63.93	59.64	62.97	52.41	NA	67.11	3.6
Saturday, May 26, 2018	67.14	56.85	64.80	57.73	NA	76.16	3.7
Sunday, May 27, 2018	41.72	34.67	39.60	41.29	NA	44.42	6.8
Monday, May 28, 2018	30.01	22.39	25.14	25.50	NA	30.78	11.5
Tuesday, May 29, 2018	25.26	18.28	21.66	18.69	NA	21.65	14.6
Wednesday, May 30, 2018	26.43	21.86	24.56	22.90	21.73	26.15	11.4
Thursday, May 31, 2018	45.74	42.61	45.83	37.99	48.76	46.98	5.1
Friday, June 01, 2018	42.85	38.98	43.76	33.76	39.24	41.95	5.6
Saturday, June 02, 2018	25.56	21.43	24.75	19.61	23.15	23.68	11.2
Sunday, June 03, 2018	22.13	17.29	20.60	17.10	18.70	17.35	15.8
Monday, June 04, 2018	22.54	17.98	21.66	18.82	21.27	21.11	14.9
Tuesday, June 05, 2018	24.19	20.61	23.16	19.75	22.02	23.80	11.8
Wednesday, June 06, 2018	28.24	24.96	28.90	21.95	25.74	27.95	9.3
Thursday, June 07, 2018	34.50	30.94	34.76	26.39	33.29	37.21	7.5
Friday, June 08, 2018	29.51	25.55	28.92	21.87	27.16	29.24	9.4
Saturday, June 09, 2018	30.42	27.14	30.68	23.10	25.47	30.20	8.5
Sunday, June 10, 2018	44.31	40.43	43.96	34.02	39.93	40.20	5.3

Monday, June 11, 2018	29.71	27.54	28.87	24.31	28.58	33.46	8.7
Average	35.72	31.01	34.52	29.38	28.85	36.14	8.97
Total	678.77	589.21	655.96	558.24	375.04	686.67	170.40

For the installation of Nano LiquiTec® with Graphene Dynamics®, the units were checked for operational performance and condensing coils were cleaned. The nanotechnology was then installed in each circuit, for each unit. (4 circuits per unit). A check was then performed on the units' filter drier, where the nanotechnology's removal of oil fouling can build up and capture a clog. Filter driers were replaced as necessary. After installation in accordance with the manufacturer, a 10-day reaction period was allowed.

The post install readings are shown on Table 2 below and were recorded for 25 days.

Table 2 (kwh/CDD)

	AC 1	AC 2	AC 3	AC 4	AC 6	AC 7	CDD
Sunday, June 24, 2018	17.59	16.60	19.36	16.89	15.45	15.73	16.4
Monday, June 25, 2018	19.44	18.31	21.20	21.88	17.38	18.76	13.8
Tuesday, June 26, 2018	18.24	17.71	19.69	17.13	15.26	15.01	14.9
Wednesday, June 27, 2018	18.93	17.83	20.75	16.12	16.20	17.90	14.4
Thursday, June 28, 2018	21.30	19.91	22.99	17.63	18.36	21.93	12.2
Friday, June 29, 2018	22.09	20.87	24.03	18.45	18.75	23.40	11.9
Saturday, June 30, 2018	20.13	19.69	21.28	21.28	18.87	21.03	15.1
Sunday, July 01, 2018	23.64	19.05	21.60	25.22	20.95	22.14	16.5
Monday, July 02, 2018	20.40	17.97	21.62	24.62	17.55	21.03	15.3
Tuesday, July 03, 2018	20.37	19.01	22.80	20.69	16.69	20.46	14
Wednesday, July 04, 2018	22.49	20.87	25.27	19.90	19.05	22.02	11.9
Thursday, July 05, 2018	22.87	21.44	24.51	20.90	18.16	24.35	11.8
Friday, July 06, 2018	19.71	18.30	21.82	17.67	15.92	18.54	15
Saturday, July 07, 2018	19.00	17.83	21.09	18.65	15.60	19.84	15.4
Sunday, July 08, 2018	19.03	17.64	21.61	18.10	15.31	16.79	16.1
Monday, July 09, 2018	19.71	18.39	22.39	17.21	15.09	20.67	14.3

Tuesday, July 10, 2018	18.78	16.77	20.27	16.07	14.92	17.77	16.2
Wednesday, July 11, 2018	19.12	17.30	20.04	14.44	15.59	19.08	16.3
Thursday, July 12, 2018	18.63	16.58	19.60	14.67	15.04	17.86	16.9
Friday, July 13, 2018	19.25	17.13	20.28	16.28	15.86	17.44	17
Saturday, July 14, 2018	18.50	16.41	19.73	17.29	15.55	18.75	17
Sunday, July 15, 2018	18.78	16.65	19.65	18.35	16.07	17.29	17.4
Monday, July 16, 2018	18.83	15.58	19.49	17.17	16.21	18.63	17
Tuesday, July 17, 2018	18.54	16.10	19.20	14.86	15.08	18.28	17.4
Wednesday, July 18, 2018	17.88	16.02	19.40	14.56	14.38	17.25	17.2
Average	19.73	18.00	21.19	18.24	16.53	19.28	15.26
Total	493.28	449.96	529.67	456.04	413.30	481.96	381.40
Change	44.77%	41.96%	38.63%	37.91%	42.70%	46.66%	

When comparing baseline data to post install data an average increase in system efficiency of 42% was demonstrated across in cooling efficiency across all units.

Table 3 illustrates average baseline kWh/CDD consumption for each unit.

Baseline Data kWh / CDD	AC 1	AC 2	AC 3	AC 4	AC 6	AC 7
	35.72	31.01	34.52	29.38	28.85	36.14

Table 4 illustrates average post install kWh/CDD consumption for each unit.

Post Install Data kWh / CDD	AC 1	AC 2	AC 3	AC 4	AC 6	AC 7
	19.73	18.00	21.19	18.24	16.53	19.28

Table 5 demonstrates the increase in efficiency from baseline to post install data per CDD

Increased Efficiency	AC 1	AC 2	AC 3	AC 4	AC 6	AC 7
	44.77%	41.96%	38.63%	37.91%	42.70%	46.66%

Table 6 provides an estimate of annual saving based on the achieved increase of efficiency using \$0.157 per kWh

	AC 1	AC 2	AC 3	AC 4	AC 6	AC 7	Total
Pre Install							
Post Install	\$ 14,522	\$ 12,332	\$ 13,887	\$ 11,825	\$ 11,378	\$ 14,343	\$ 91,335
Annual Savings	\$ 8,064	\$ 7,107	\$ 8,480	\$ 7,258	\$ 6,476	\$ 7,646	\$ 52,552
	\$ 6,458	\$ 5,225	\$ 5,408	\$ 4,567	\$ 4,902	\$ 6,697	\$ 38,783

Summary:

Units 1,2,3,5,6

These units had their condenser coils cleaned chemically and filters checked.

Unit 4

This unit had two filter driers changed out, in addition to their condenser coils cleaned chemically and filters checked.

Unit 7

This unit had only one filter drier changed out, in addition to their condenser coils cleaned chemically and filters checked.

In conclusion, Nano LiquiTec® with Graphene Dynamics® improved the efficiency of units within a range of 38% to 46%. This was accomplished even with outside wet bulb temperature reaching above 115°F. With the dry and hot weather of the Central Valley, the ROI will be easily met before the forecast of 12 cooling months. Moreover, units in the Central Valley are designed for temperatures not to exceed 105°F to 110°F degrees and will lose efficiency once temperature exceeds the EER threshold. The results from this nanotechnology show these units can handle temperatures over 115°F degrees without degradation in performance.

This product delivered more than what was expected.

Respectfully,

Rich Wagener

Operations Manager
Air Control Services
NBC Supervisor: 16-188-03