HUSKY

Husky Injection Molding Systems Ltd.

ELECTROFLOW™ SYSTEM – ANNUAL SAVINGS ANALYSIS

Prepared by:

H.H. ANGUS & ASSOCIATES LIMITED
Consulting Engineers

ElectroFlow Canada
"Savings Through Power Quality"

HUSKY

Husky Injection Molding Systems Ltd.

Husky is a global supplier of injection molding systems to the plastics industry. Husky designs and manufactures injection molding machines, molds for PET containers, hot runners and robots. Customers use Husky's equipment to manufacture a wide range of products in the packaging, automotive and technical industries. The Company serves customers in over 100 countries from more than 40 service and sales offices around the world.

Husky Injection Molding Systems Ltd. placed first in the 2002 Corporate Knights annual ranking of Canada's most environmentally responsible companies.

H.H. Angus & Associates Limited

H.H. Angus & Associates Limited is one of Canada's oldest consulting engineering firms. Founded in 1919, the firm was incorporated as H.H. Angus & Associates Limited in 1946. The Angus Engineering Group of Companies is one of the largest in its field and has an acknowledged expertise in a wide variety of engineering disciplines including building engineering, computer applications, process engineering, project management, vertical transportation and the operation and management of buildings. H.H. Angus & Associates is headquartered in Toronto, Canada with regional offices in London, England; Dallas, Texas and Chicago, Illinois. The Company has acted as the principal proponent in a variety of transportation, industrial, commercial and institutional sector projects, both in Canada and abroad, and has worked on interdisciplinary teams with other design professionals.

ElectroFlow Canada

Milan Electric Ltd., the master ElectroFlow™ licensee for Ontario and Western Canada, expanded into the field of energy saving in 1995 with the formation of ElectroFlow Canada. Milan Electric Ltd., established in 1976, serves industry, commerce and institutions in the development and implementation of electrical and energy saving programs. With highly advanced equipment and well-trained distributors, ElectroFlow Canada is able to provide each client with the optimum efficiency in measuring and identifying existing problems and devising solutions. By custom manufacturing ElectroFlow™ systems based on in-depth engineering, each client is guaranteed substantial monetary savings and energy conservation through improvements in power quality.

ElectroFlow™ is based on extensive experience in both theoretical and practical technical knowledge areas, allowing for unique insights into electrical/energy use and conservation. ElectroFlow™ systems have consistently delivered power savings while protecting equipment and machinery and reducing maintenance and downtime.

Electenergy Technologies Inc. is the licensor and engineering firm of the ElectroFlow™ technology. It operates internationally with representation in over 80 countries. Electenergy Technologies Inc. has over 20 years of experience providing customers with electric/energy savings through guaranteed performance of reliable products and services. Electenergy Technologies Inc. has received numerous awards and recognitions for innovation in technologies and products in the field.

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SECTION I

The following report contains content excerpted from an independent, third party study performed by H.H. Angus & Associates Limited (HHA).

Executive Summary

H.H. Angus & Associates Limited were present at site demonstrations, reviewed reports prepared by ElectroFlow Canada and have performed independent analysis in regard to potential savings by installing this product at Husky's facilities.

In summary, the projected savings of nominally $27,800 in the Mold Building Sub. 'B' are anticipated to be achieved or exceeded.

There are additional benefits by having the product installed as stated in the manufacturer's literature, however, the basis of the payback was performed on energy savings alone.

Introduction

H.H. Angus & Associates Limited were retained by Husky to observe site demonstrations on an energy saving product called ElectroFlow™. ElectroFlow Canada had performed an analysis of Husky's facilities and estimated to have annual savings from the electricity bill with it's installation that could be justified by payback analysis.

ElectroFlow Canada has proposed several locations for installation of the technology. Two of the unit locations are targeted at air conditioning loads which were not operating at the time of the tests and hence were not subject of the test. The production area units and the main unit (on the switchboard bus) were demonstrated during the test.

The test comprised of simultaneously switching the units "ON" for a 15 minute period then "OFF" for 15 minutes in several iterations to simulate the effect on a typical electricity meter reading 15 minute demand periods. Both consumption and demand were recorded. The equipment had been recently calibrated and the demand readings were checked and coincided with demand meters installed within the switchgear. Split core CTs were utilized and the intent of the test was to observe the effect with the units "ON" or "OFF" comparing results made with the equipment setup so that any error is inherent to both readings.

Study

ElectroFlow Canada provided the actual data and graphical analysis of the results. These are contained in Appendix I of the report. HHA recorded accumulated kWh readings at the end of each test period to compare the "ON" and "OFF" results.

The 'executive summary' provided by ElectroFlow Canada overly simplified the composition of the electricity bill. Demand charges vary by peak demand season (summer/winter/shoulder) as do consumption charges and the "Off Peak" consumption is at a different rate during these periods. None-the-less the pro-rated reduction in demand and consumption will vary approximately by the percentage reduction since the system acts continuously throughout the year.

The pro-rated reduction in kWh calculated by ElectroFlow Canada used only one digit accuracy as can be observed from the calculation and the data tables. The actual kWh graph values were extrapolated to two digit accuracy and the cumulative kWh readings accorded well with the HHA data recorded during the tests. This extrapolated data is contained in appendix II. Overall, because of single digit accuracy ElectroFlow Canada estimated a 13.1% savings. Based on two digit accuracy we are estimating a 10.9% savings. Regardless of the method of calculation, both figures are considerably more than the 6.7% projected figure that the payback was based on. The consumption billing represents approximately 65% of the total costs.

The demand savings did not achieve the percentage gain projected* (4.7% actual vs. 8.5% projected), however, the demand was reduced and the overall savings to the electricity billing is paramount.

Conclusions

Based on the tests carried out on site and both the calculations from ElectroFlow Canada and our independent calculations it appears that the savings to be realized will actually be higher than those utilized in the projected pay-back analysis; thereby yielding a faster payback than anticipated.

There are additional benefits from the product in addition to energy savings. The manufacturer has named some of these benefits in their marketing materials.

	Projected		ElectroFlow™ Actual		HHA Actual	
	Value	%	Value	%	Value	%
Annual kWD	936	8.5	518	4.7	517.2	4.7
Annual kWD $	$11,391.12	8.5	$6301.00	4.7	$6300.00	4.7
Annual kWh	374,029	6.7	732,576	13.1	608,660	10.9
Annual kWh $	$16,382.47	6.7	$32,087.00	13.1	$26,660.00	10.9
Total	**$27,773.59**	**7.3**	**$38,388.00**	**10.2**	**$32,960.00**	**8.7**

* The figures obtained during this analysis represent a short time period of demand. To demonstrate actual maximum savings would require anticipating when peak demand will occur during any given month and then testing at that specific point in time. Alternatively, continuous on/off testing could be performed for a period of one month.

Appendix I
ElectroFlow™

Performance Evaluation

For:

Husky Injection Molding (Main B)

530 Queen Street South
November 17, 2002

Executive Summary – Power Quality

Recapitulation of the Power Quality results stemming from the data collected, is presented herein:

	ElectroFlow™ "OFF"		ElectroFlow™ "ON"	
	Min	Max	Min	Max
Voltage (Phase A) (V)	464	466	471	473
Voltage (Phase B) (V)	459	461	466	468
Voltage (Phase C) (V)	466	468	473	476
Current (Phase A) (A)	1079	1238	869	1016
Current (Phase B) (A)	1151	1344	945	1119
Current (Phase C) (A)	1159	1342	931	1098
Power Factor (Phase A) (%)	0.84	0.87	0.97	0.99
Power Factor (Phase B) (%)	0.84	0.87	0.98	0.99
Power Factor (Phase C) (%)	0.81	0.84	0.96	0.98
Average Power Factor (%)	0.82	085	0.96	0.98
Average Real Power (KW)	805		767	
Average Apparent Power (KVA)	954		782	
Average Usage (Kwh)	6		5	
Voltage Harmonics				
V THD (Phase A) (%)	0.8	1.1	0.7	1
V THD (Phase B) (%)	0.9	1.2	0.8	1
V THD (Phase C) (%)	0.9	1.3	0.9	1.2
Current Harmonics				
I THD (Phase A) (%)	2.5	3.2	3.4	3.4
I THD (Phase B) (%)	2.6	3.2	3.5	3.5
I THD (Phase C) (%)	2.9	3.6	4	4

Executive Summary – Demand / Energy Usage

Recapitulation of the Demand / Energy Usage results stemming from the data collected, is presented herein:

Electric Bill Analysis

	Existing	Projected
Annual KWD	10,970	10,034
Annual KWD ($)	133,472.65	122,081.53
Annual KWH	5,582,523	5,208,494
Annual KWH ($)	244,523.66	228,141.19
Total ($)	**377,996.31**	**350,222.72**

Percentage in Operation $= \dfrac{\text{P x 12 x 100}}{\text{AKWD}}$ (%)

Percentage in Operation = 95.6

Hrs/Week $= \dfrac{\text{12 x AKWH}}{\text{52 x AKWD}}$

Hrs/Week = 117.4

Pro-rated KW Demand reduction = (805 - 767) x (914/805) = 43.1

Pro-rated Kwh reduction = (6.0-5.0) x 2 x 60 x 117.4 x 52 = 732,576

ElectroFlow™ – Demand/Energy Savings Effects

	Projected		Actual	
	Value	%	Value	%
Annual kWD	936	8.5	518	4.7
Annual kWD $	$11,391.12	8.5	$6,301.00	4.7
Annual kWh	374,029	6.7	732,576	13.1
Annual kWh $	$16,382.47	6.7	$32,087.00	13.1
Total	**$27,773.59**	**7.3**	**$38,388.00**	**10.2**

Annual Demand Reduction = (6 x 12)/6,379 5

Annual Usage Reduction = (116,608)/3,278,444 13

ElectroFlow™ Performance Evaluation

Introduction

The purpose of this study and verification is two-fold:

1. That ElectroFlow™ meets or exceeds the savings projected.
2. That ElectroFlow™ is addressing the power quality issue as expected.

It is very important to establish a base for actual conditions, and parameters to be tested. Hence, the following facts should be used as guidelines for accurately verifying performance of any energy saving devices, including ElectroFlow™:

Rule #1: That ElectroFlow™ is a passive system, and does not consume measurable real power (KW). This can easily be verified by actual measurements taken at ElectroFlow™ main breaker/disconnect switch.

Rule #2: that so called "energy saving devices that connect in series" either alter normal load performance by interference, or adversely affecting system power quality; or both. As a result, their performance must be verified based on:

A: Load output/performance interference, such as: reduced motor speed, reduced light lumens, and so on.

B: Power quality interference, such as: reduced voltage, generated harmonics, increased distortion, and so on.

C: Fail-safe operation, since they connect in series, how trouble-free and responsive their bypass mechanism functions.

Rule #3: ElectroFlow™ connects in parallel. As a result, it is guaranteed that the system is fail-safe. As concluded in Rule # 1 above, it is passive and does not consume measurable real power (KW). Hence, for the purpose of scientific performance evaluation, and the so called "Apples-To-Apples" comparison of ElectroFlow™ "ON", and ElectroFlow™ "OFF" conditions, it is required to tabulate all of the pertinent dependent variables: Demand (KWD), and Usage(KWH), as well as all the independent variables: Hours Of Operation, Percentage Of Operation, Units Of Production, and Degree Hours.

Verification Method

1. Testing and measurements must be conducted using a three-phase power analyzer capable of data logging at a minimum rate of 128 samples per cycle, which equates to 7,680 times per second at 60 Hz, or 6,400 samples per second at 50 Hz. The three-phase variables to be measured, for the purpose of power quality, as well as energy savings, are: voltage, current, power factor, harmonics, Demand (KW), and Usage (KWH).
2. All of the three-phase values must be displayed per-minute, for several consecutive periods of 15 minutes "ON" and 15 minutes "OFF", in a spreadsheet format. This is practically recommended, because most of utility companies' Demand meters register Maximum monthly KW Demand, based on the highest sliding 15-minute interval in that month; which is subsequently billed to and paid by the customer. In addition, such short-duration sampling and comparison, minimizes effects of other independent variables such as: load variation/load profile and change of weather, in such comparison testing.
3. The collected data such as Demand(KW), and/or Usage(KWH) should not be simply averaged, added, or subtracted; as means to analyze the variables. These methods do not take load variation/load profile, and LOAD FACTOR (Load Factor=(KWH x 100)/(KW x Hours)) into account. Such incorrect method completely ignores the "Apples-To-Apples" comparison of the data, as well as other pertinent variables.

In order to correctly analyze effects of the "ON" and "OFF" conditions on Demand (KW), and/or Usage (KWH), ideally, all of the independent variables such as: Hours Of Operation, Percentage Of Operation, Units Of Production, and Degree Hours should be kept constant. You may then proceed to analyze Maximum Demand reduction from the test data of both conditions, where Usage(KWH) reduction can be calculated from the cumulative values of both conditions.

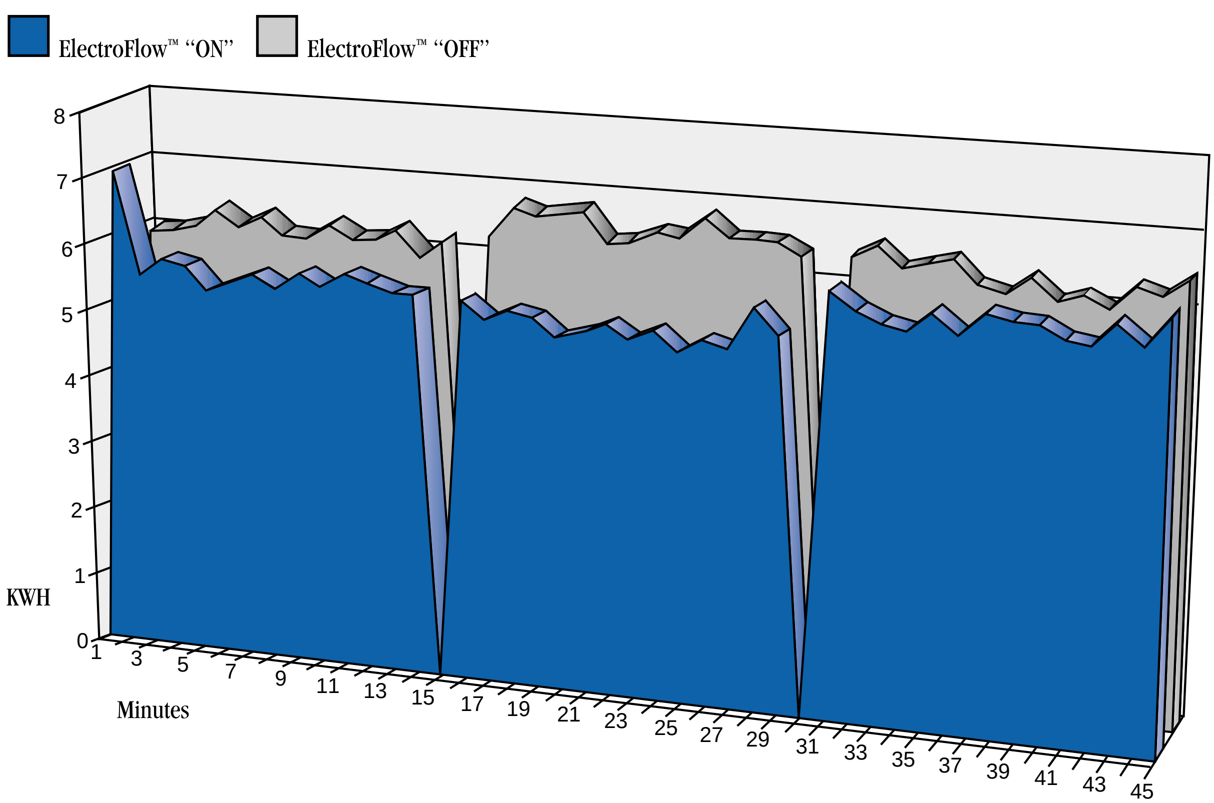
In an event, if one or more of the independent variables such as: Hours Of Operation, Percentage Of Operation, Units Of Production, and Degree Hours may not be kept constant; as dictated by the load. The most accurate method is the correct use of a spreadsheet software, or a statistical software such as Statistical Path Analysis (SPA), SPSS, or SAS. Use of one of the above mentioned software allows accurate comparison of Demand (KW), and/or Usage (KWH) with respect to the above mentioned independent variables; using linear/nonlinear regression method. This facilitates pro-rated analyses of the load variation/load profile based on the per-minute load factor, to accurately determine demand and/or energy savings; even when the load is fluctuating in a rapidly variable load profile. Such data is then compared with the base load profile previously measured and documented. For this purpose, the SPA software is commonly used to evaluate ElectroFlow™ savings effect.

Summary of Benefits

As a recapitulation of ElectroFlow™ Power Quality and Energy Savings effects, following are confirmed:

1. Voltage improvement and stability.
2. Three-phase load balancing.
3. Harmonics filtering, to within acceptable limits.
4. Surge and transients filtering.
5. Power Factor optimization.
6. Reduction of losses.
7. Reduced KW Demand.
8. Reduced KVA Demand.
9. Reduced Energy Consumption.
10. Reduced three-phase currents.
11. Reduction of maintenance and repair.
12. Fail-safe.
13. Design life of 20 years.

Actual KWH,
Client Husky Injection Mold Load Main B



Husky HHA Analysis – Appendix II

	"ON" kW	"ON" kWh	"OFF" kW	"OFF" kWh
1	771		778	
2	788	7.1	772	6
3	796	5.6	775	6.1
4	806	5.9	786	6.2
5	798	5.8	792	6.4
6	774	5.4	793	6.3
7	796	5.6	787	6.4
8	789	5.7	782	6.1
9	790	5.5	781	6.1
10	800	5.8	780	6.3
11	803	5.6	783	6.2
12	807	5.8	787	6.2
13	819	5.7	779	6.3
14	805	5.6	760	5.8
15	776	5.6	769	6.1
16	767		818	
17	774	5.6	812	6.3
18	763	5.3	840	6.8
19	763	5.5	856	6.7
20	752	5.4	869	6.8
21	739	5.2	844	6.8
22	755	5.3	815	6.3
23	750	5.4	823	6.4
24	747	5.2	813	6.6
25	748	5.4	835	6.5
26	731	5.1	847	6.9
27	735	5.3	844	6.6
28	748	5.2	842	6.6
29	809	5.8	814	6.6
30	783	5.4	817	6.4
31	838		872	
32	855	6.2	828	6.4
33	849	5.9	822	6.7
34	824	5.7	811	6.3
35	817	5.6	826	6.4
36	825	6	810	6.5
37	816	5.6	792	6.2
38	831	6	782	6.1
39	853	5.9	785	6.3
40	819	5.9	774	6
41	826	5.7	760	6.1
42	818	5.6	767	5.9
43	834	6	813	6.4
44	823	5.7	799	6.3
45	860	6.2	801	6.5
Average		**5.66**		**6.35**

	Projected use	10.9% savings
Annual kWh	**5,582,523**	**608,660.24**
Annual kWh $	**$244,523.66**	**$26,660.32**

Appendix III

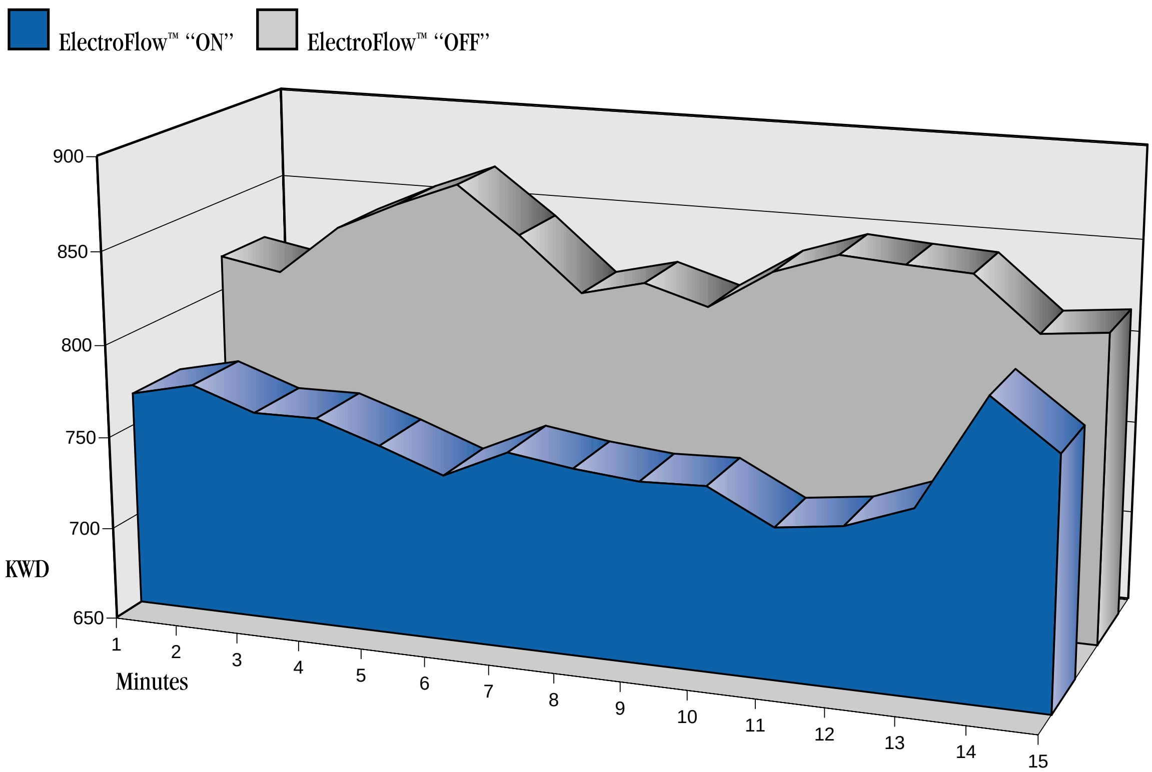
Data – Husky with ElectroFlow™ "OFF"

Date/Time	KWD	KWH
11/17/2002 13:58	818	
11/17/2002 13:59	812	6.3
11/17/2002 13:59	840	6.8
11/17/2002 14:00	856	6.7
11/17/2002 14:00	869	6.8
11/17/2002 14:01	844	6.8
11/17/2002 14:01	815	6.3
11/17/2002 14:02	823	6.4
11/17/2002 14:02	813	6.6
11/17/2002 14:03	835	6.5
11/17/2002 14:03	847	6.8
11/17/2002 14:04	844	6.6
11/17/2002 14:04	842	6.6
11/17/2002 14:04	814	6.6
11/17/2002 14:05	817	6.4

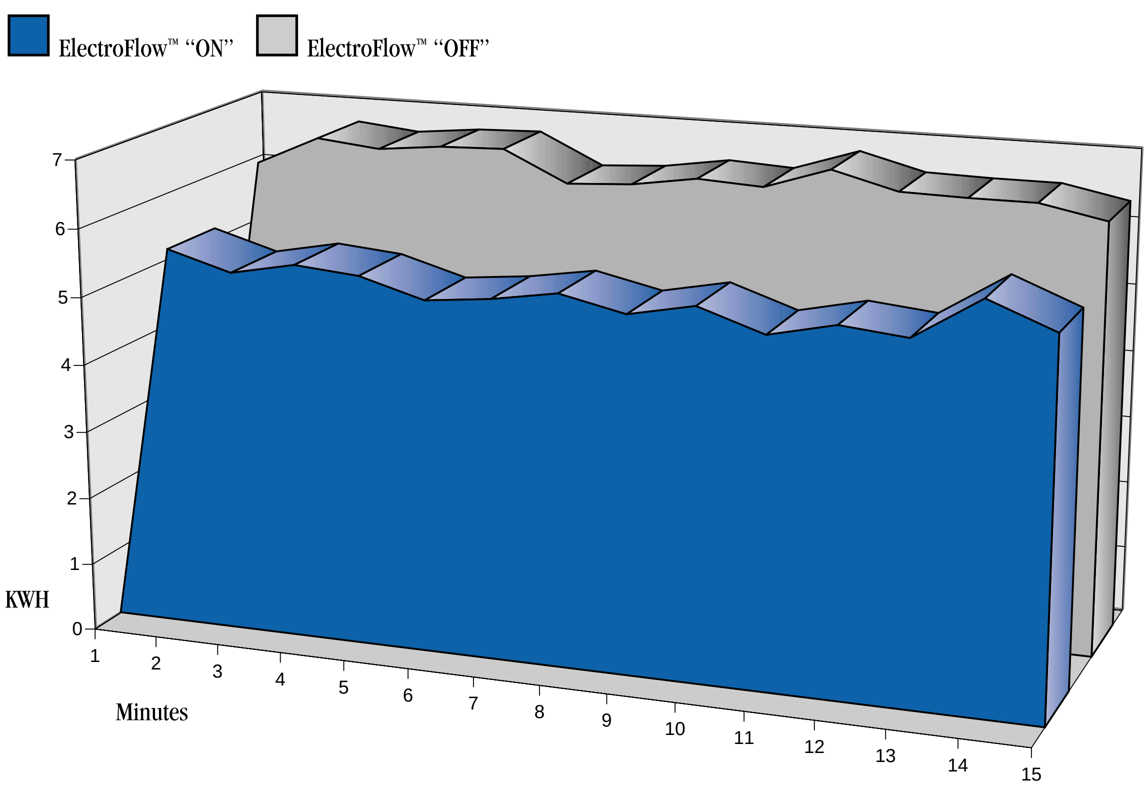
Data – Husky with ElectroFlow™ "ON"

Date/Time	KWD	KWH
11/17/2002 13:50	767	
11/17/2002 13:50	774	5.6
11/17/2002 13:51	763	5.3
11/17/2002 13:51	763	5.5
11/17/2002 13:52	752	5.5
11/17/2002 13:52	739	5.2
11/17/2002 13:53	755	5.3
11/17/2002 13:53	750	5.4
11/17/2002 13:54	747	5.2
11/17/2002 13:54	748	5.4
11/17/2002 13:55	731	5.1
11/17/2002 13:55	735	5.3
11/17/2002 13:56	748	5.2
11/17/2002 13:56	809	5.9
11/17/2002 13:57	783	5.5

Actual KWD,
Client Husky Load



Actual KWH,
Client Husky Load



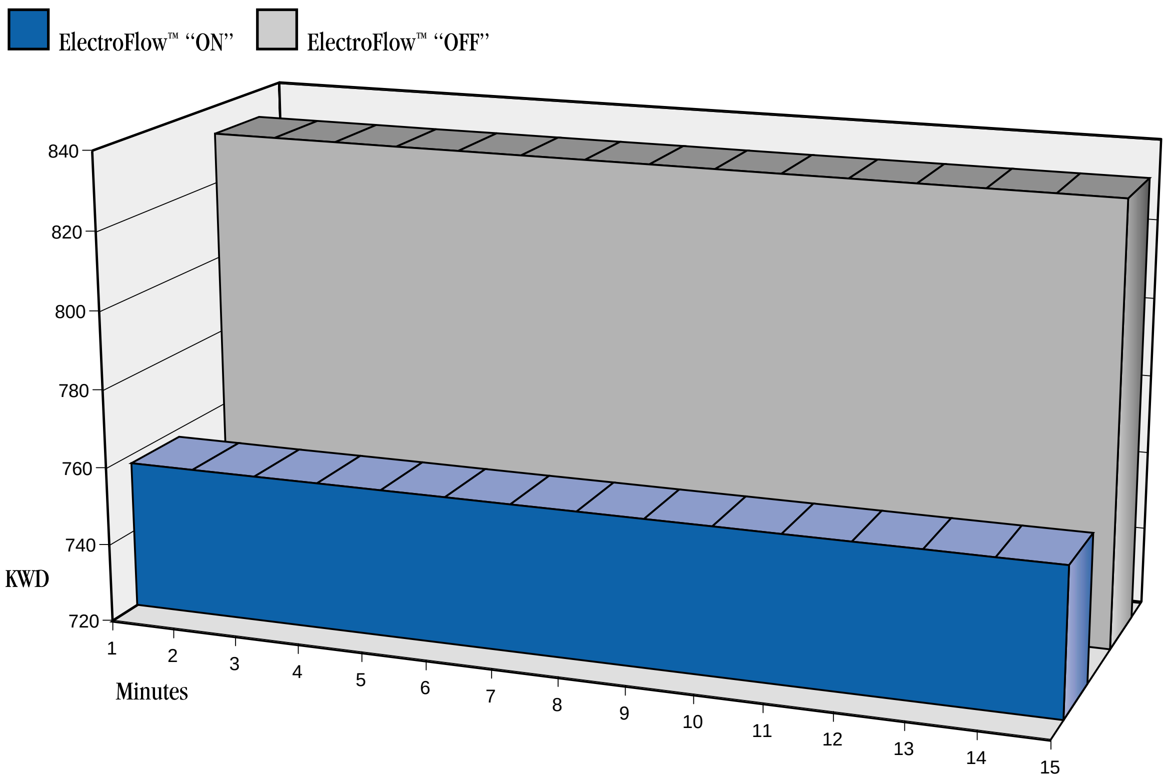
Pro-Rated Analysis – Husky with ElectroFlow™ "OFF"

Date/Time	KWD	KWH
11/17/2002 13:58	833	6.1
11/17/2002 13:59	833	6.1
11/17/2002 13:59	833	6.1
11/17/2002 14:00	833	6.1
11/17/2002 14:00	833	6.1
11/17/2002 14:01	833	6.1
11/17/2002 14:01	833	6.1
11/17/2002 14:02	833	6.1
11/17/2002 14:02	833	6.1
11/17/2002 14:03	833	6.1
11/17/2002 14:03	833	6.1
11/17/2002 14:04	833	6.1
11/17/2002 14:04	833	6.1
11/17/2002 14:04	833	6.1
11/17/2002 14:05	833	6.1

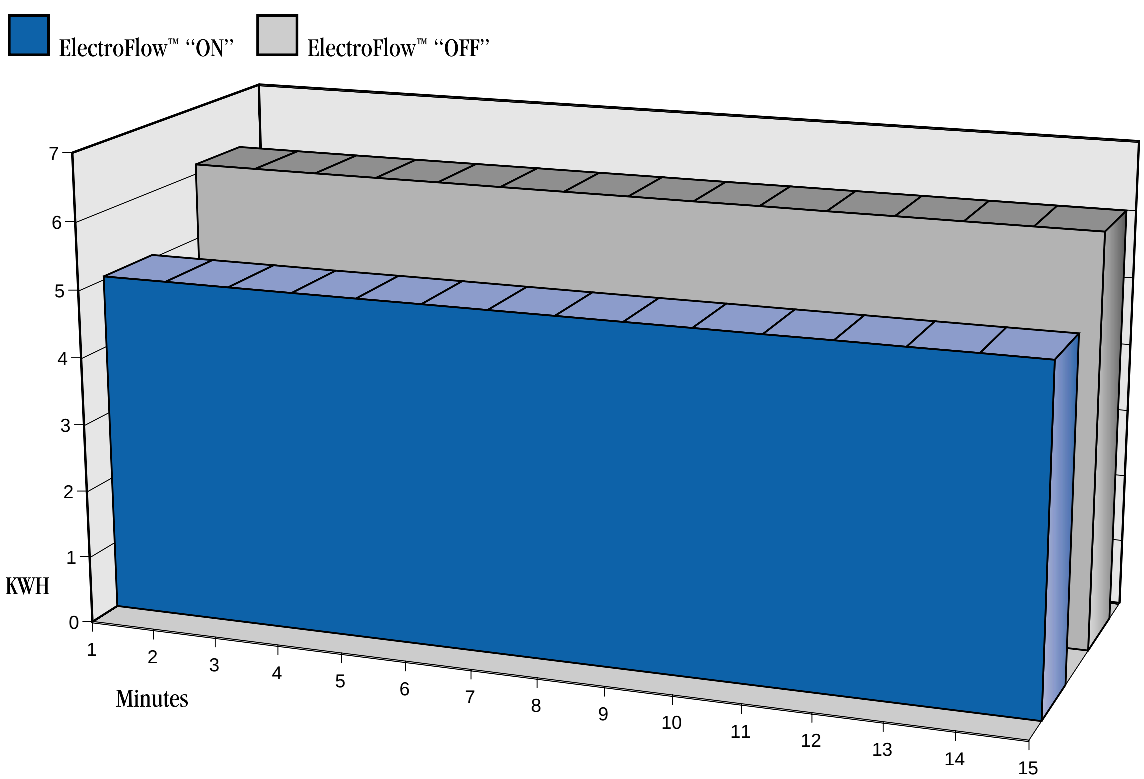
Pro-Rated Analysis – Husky with ElectroFlow™ "ON"

Date/Time	KWD	KWH
11/17/2002 13:50	758	5.0
11/17/2002 13:50	758	5.0
11/17/2002 13:51	758	5.0
11/17/2002 13:51	758	5.0
11/17/2002 13:52	758	5.0
11/17/2002 13:52	758	5.0
11/17/2002 13:53	758	5.0
11/17/2002 13:53	758	5.0
11/17/2002 13:54	758	5.0
11/17/2002 13:54	758	5.0
11/17/2002 13:55	758	5.0
11/17/2002 13:55	758	5.0
11/17/2002 13:56	758	5.0
11/17/2002 13:56	758	5.0
11/17/2002 13:57	758	5.0

Pro-rated KWD, Client Husky Load



Actual KWH, Client Husky Load



Appendix IV

Power Factor Correction Capacitors

Performance Evaluation

For:

Husky Injection Molding (Main B)

530 Queen Street South
October 29, 2002

Executive Summary

This test was performed by ElectroFlow Canada on October 29, 2002 to compare the effects of the existing Power Factor Correction Capacitors (PFCCs) installed at Husky Injection Molding Building Sub. 'B'.

The resulting analysis was performed by Electenergy Technologies Inc. in the same manner as the ElectroFlow™ "ON" and "OFF" comparison.

Conclusions

In conclusion, the data shows an increase in KWD and KWH when the PFCCs are on.

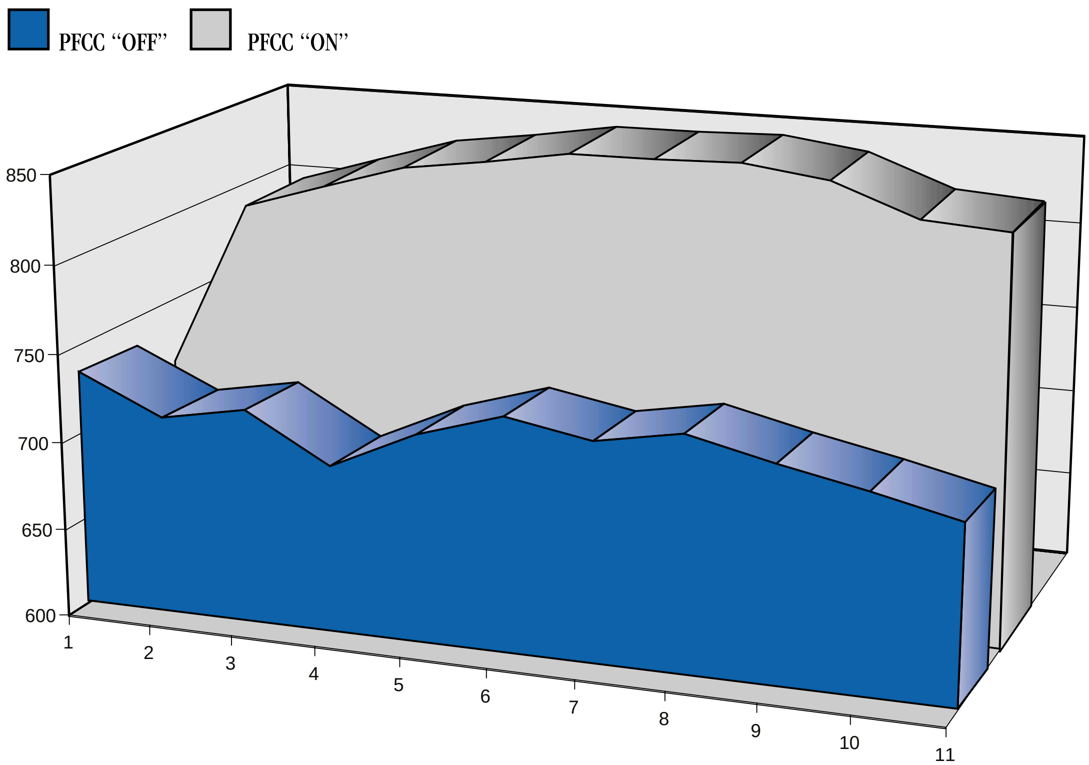
Data – with PFCCs "OFF"

Date/Time	KWD	KWH
10/29/2002 12:52	752	8
10/29/2002 12:52	729	7
10/29/2002 12:53	738	7
10/29/2002 12:53	709	7
10/29/2002 12:54	732	7
10/29/2002 12:54	747	8
10/29/2002 12:55	737	7
10/29/2002 12:55	746	7
10/29/2002 12:55	733	7
10/29/2002 12:56	721	7
10/29/2002 12:56	709	7
Average Total	**732.1**	**7.2**

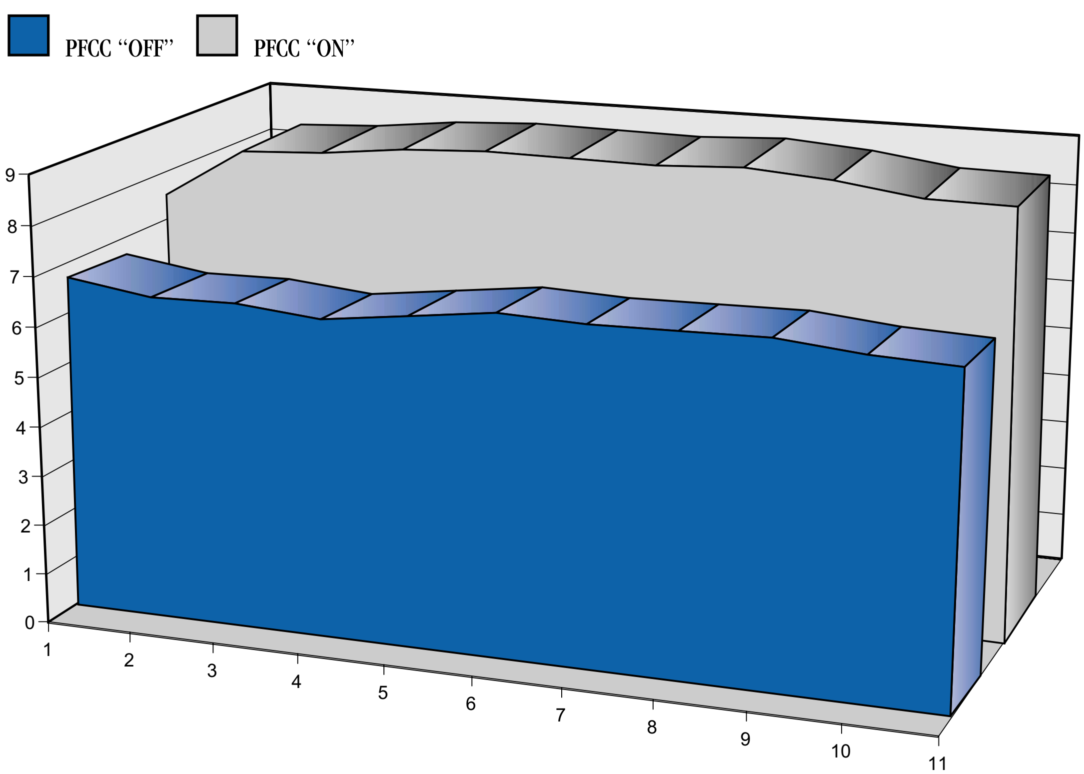
Data – with PFCCs "ON"

Date/Time	KWD	KWH
10/29/2002 12:57	706	7
10/29/2002 12:57	799	8
10/29/2002 12:58	814	8
10/29/2002 12:58	828	8
10/29/2002 12:58	835	8
10/29/2002 12:59	843	8
10/29/2002 12:59	843	8
10/29/2002 13:00	845	9
10/29/2002 13:00	840	8
10/29/2002 13:01	823	8
10/29/2002 13:01	821	8
Average Total	**817.3**	**8**

Actual KWD, Client Load



Actual KWH, Client Load



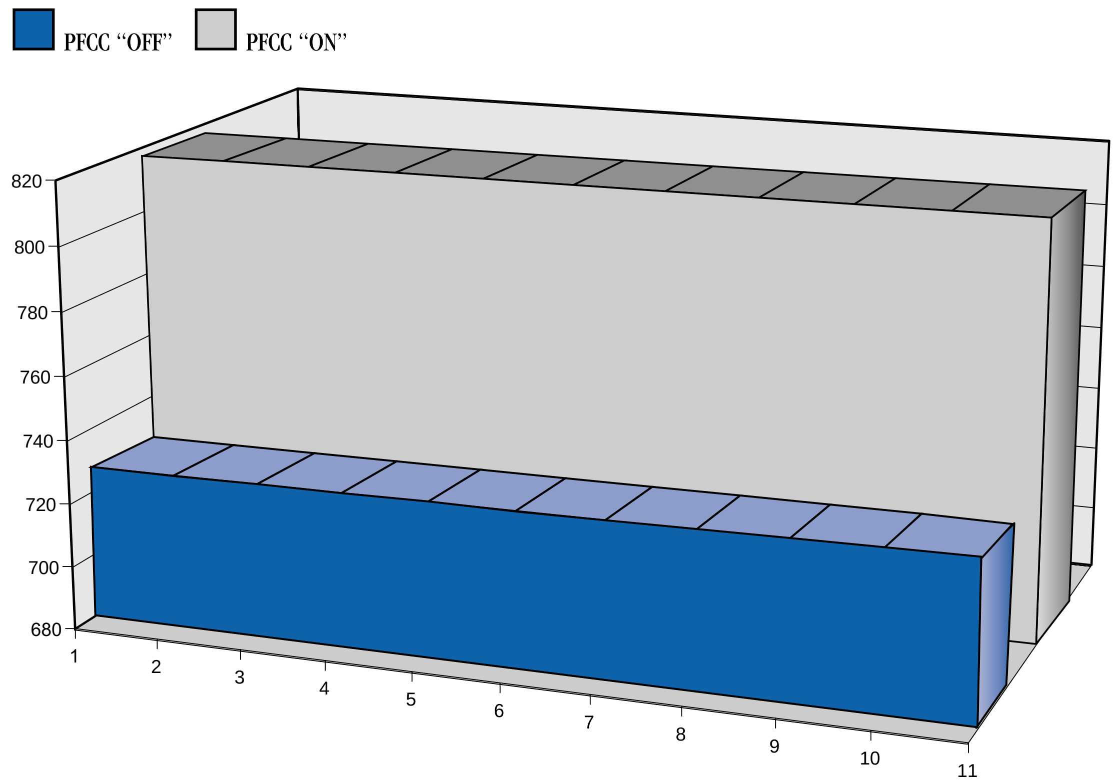
Pro-Rated Analysis – with PFCCs “OFF”

Date/Time	KWD	KWH
10/29/2002 12:52	732	7
10/29/2002 12:52	732	7
10/29/2002 12:53	732	7
10/29/2002 12:53	732	7
10/29/2002 12:54	732	7
10/29/2002 12:54	732	7
10/29/2002 12:55	732	7
10/29/2002 12:55	732	7
10/29/2002 12:55	732	7
10/29/2002 12:56	732	7
10/29/2002 12:56	732	7

Pro-Rated Analysis – with PFCCs “ON”

Date/Time	KWD	KWH
10/29/2002 12:57	818	8
10/29/2002 12:57	818	8
10/29/2002 12:58	818	8
10/29/2002 12:58	818	8
10/29/2002 12:58	818	8
10/29/2002 12:59	818	8
10/29/2002 12:59	818	8
10/29/2002 13:00	818	8
10/29/2002 13:00	818	8
10/29/2002 13:01	818	8
10/29/2002 13:01	818	8

Pro-rated KWD, Client Load



Pro-rated KWH, Client Load