Electric Vehicle Charging Implementation Feasibility Report

Vancouver Fraser Port Authority

Project number: 60661425
Task 3 EV Charging Report

August 23 2021

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AECOM: 2015-04-13

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A	August-23-2021	Draft Submission		Thomas Hoffschild, P.Eng	Senior Project Manager
B	October-29-2021	Final Submission		Thomas Hoffschild, P.Eng	Senior Project Manager

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1. Background

As part of the upgrades to the Annacis Auto Terminal, WWS and VFPA are increasing the electrical vehicle charging capacity throughout the terminal. To support this initiative, AECOM has reviewed the available on-site electrical power and the infrastructure required to accommodate eight EV Charging Stations to be arranged along the east wall of the existing Parts Warehouse. This project also includes the installation of the charging equipment for four of those stations.

Outside of the scope of this current project, WWS has engaged Mott Electric for the installation of two Dual Port Level 2 Chargers and one Level 3 DC Fast Charger. WWS has also commissioned power capacity studies at both the Warehouse Building and Body Shop which are relied upon in this report to assess the available power capacity.

2. Power Capacity Study Review

A site visit conducted by AECOM on August 6, 2021 confirmed the Warehouse Building is fed from three 14.4kV/600V H-Frame mounted transformers located south of the building.

Figure 1: 14.4kV-600V H-Frame Mounted Transformer

The main incoming service to the Warehouse Building is a 200A-600V 3 Phase service which is currently loaded to a peak load of 115kW. However our preliminary review of the Fluke Report indicates possible harmonics issues and as a result we recommend using peak current and not power to determine the available capacity on the distribution system. From the data set the peak current identified was 58.2 A on Phase A and a useable capacity of 100A.

200 A, 600 V, 3 Phase Distribution Useable Capacity (A): 200A X 80% = 160 A useable capacity

160A – 58.2A = 101.8A available capacity

The distribution equipment in the Warehouse Building is comprised of fused disconnect switches for 600V distribution and panelboards for 208V distribution. Figure 2 below shows the 200A main disconnect switch and other distribution equipment in the Warehouse Building.

Figure 2: 347/600V 200A Main Disconnect and Splitter Warehouse Building

The additional load of the three new chargers being installed by Mott Electric is 91kW. These chargers utilize the remaining capacity of this service and may exceed the total capacity in the event of peak loading. In order to ensure the capacity is not exceeded, Mott Electric is proposing the use of chargers with power sharing, which limits the power consumption based on demand and availability. See Table 1 below from the Fluke Study completed by Mott Electric.

Summary of Results
Body Shop – Summary (Instrument info and Measurement Summary see **Appendix A**)
Body Shop – Current Peak Ave (A)= **58.2A** (B) = **45.4A** (C) = **33.4A** (N) = **5A**
Body Shop – Arms – A – Ave = **40.8A**
Body Shop – Arms – B – Ave = **32.3A**
Body Shop – Arms – C – Ave = **25.3A**
Body Shop – Arms – C – Ave = **2.5A**
Body Shop – Active Power – Total – Average = **11.710** kW
Body Shop – Active Energy – Total – Maximum 1 week = **582038** Wh or **582.038** KWh
Body Shop – Power Factor – Total – Average = **99%** @ 95 percentile

Table 1: Fluke Report Summary of Results Warehouse Building

Mott Electric has installed new electrical distribution equipment along the east wall of the Warehouse building to accommodate the new chargers. Refer to Figure 3 below. This new equipment is fed from a 100A fused disconnect switch located along the south wall of the Warehouse Building.

Figure 3: New distribution equipment Installed by Mott Electric East Wall Warehouse Building

The Body Shop is fed from an 800A-600V H-Frame mounted transformer which is currently loaded to an average of 87kW. Refer to Table 2 below for results from the Fluke Study completed by Mott Electric. Based on the conversation with WWS staff it is understood that the Body Shop operations have evolved over time, which has freed up power capacity that can be utilized elsewhere on site. The existing distribution in the Electrical Room utilizes a combination of a fused disconnect switch for the 600V main distribution and panelboards for secondary distribution.

Summary of Results
Summary (Instrument info and Measurement Summary see **Appendix A**)
Current Peak Ave = (A)=**111** A (B) =**123.6** A (C) =**97.2** A (N) =**60.4** A
Arms – A – Ave = **73.7** A
Arms – B – Ave = **82.5** A
Arms – C – Ave = **70.6** A
Arms – C – Ave = **30.2** A
Active Power – Total – Average = **25.3** kW
Active Energy – Total – Maximum 1 week = **1706370**Wh or **1706.370** KWh
Power Factor – Total – Average = **94%** @ 95 percentile

Table 2: Fluke Report Summary of Results Body Shop Building Electrical Room

Although harmonics are not noted as an issue with the distribution in the Electrical Room, we recommend using the current not power to determine the available capacity for the system.

800 A, 600 V, 3 Phase Distribution Useable Capacity (A): 800A X 80% = 640 A useable capacity
640A – 123.4A = 516A available capacity

The total additional load for the 8 new Level 2 EV Chargers is 115.2kW.

Total Load = Power Per Unit Level 2 Chargers X No. of Units
115.2kW = 14.4kW X 8

3. Recommendations

Based on the above analysis it is concluded that there is no capacity within the existing Warehouse Facility to accommodate the eight new chargers. It is recommended that an additional larger service be provided in the Electrical Room at the Body Shop to accommodate the following loads:

- 8 New Level 2 Chargers: 120kW
- Capacity for Processing Building (based on Memo 200504-MEMO-01-R0-A)* : 290kW
  *includes capacity for 6 future Level 2 Chargers and 2 future Level 3 Chargers

Total Proposed Load = New Level 2 Chargers + Capacity for Processing Building
410kW = 120kW + 290kW

It is recommended a new 3P-500A fused disconnect switch be provided in the Electrical Room to feed the proposed total load of 410kW. The new 500A feeder is proposed to be surface-run in a 6” Rigid Galvanized Steel (RGS) conduit along the west face of the Body Shop Building transitioning to 6” directionally drilled Rigid PVC (RPVC) conduit across the pavement to the existing Warehouse Building where the distribution for the additional loads is to be located.

The proposed distribution is comprised of a 600V distribution panel, 600V/208V 3 phase transformer (sizing to be confirmed after the Processing Building loads are finalized), 600V/480V 3 phase transformer, 208V distribution panel, and a 480V distribution panel. The details of the proposed distribution are included in the single line and equipment elevation drawings that will be provided in the final report for the Annacis Auto Terminal Upgrade.

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Appendix A

A.1 Enginutiy Memorandum: 200504-MEMO-01-R0-A

ENGINUITY
ENGINEERING CONSULTING

Memorandum:

200504-MEMO-01-R0-A

To:	Brent Moore, Special Projects Manager WWL Vehicle Services Canada, Ltd. Wallenius Wilhelmsen Solutions #100, 820 Dock Road, Annacis Island, Delta, British Columbia, V3M 6A3
From:	Salman Vayeghan P.Eng., Senior Electrical Engineer Enginuity Consulting Ltd. 8059 North Fraser Way Burnaby, BC, V5J 5M8
Date:	17-Dec-20
Reviewed By:	Ricardo Rivera, B.Eng., Project Coordinator Fero Assadi, P.Eng., Project Manager
Subject:	**Buildings Modification Feasibility – Facility Power Supply Review**
Project:	200504 - WWS - Buildings Modification Feasibility
Attachments:	1. AC Load Power Calculation (200504-TEC-05-R0-B) 2. WWS BC Hydro Usage Annacis Estimates

Dear Brent,

The objective of this letter is to summarize the findings of our feasibility study regarding the existing plant electrical distribution for WWL Vehicle Services Canada, Ltd. (Wallenius Wilhelmsen Solutions) located in Annacis Island (#100, 820 Dock Road, Delta, BC).

To determine if the current supply is sufficient, it is first necessary to identify the existing power supply capacity for the plant electrical room. The existing electrical room is supplied by three (3) pole mounted transformers located outside of the existing electrical room and based on the site visit conducted by Enginuity Consulting Ltd. on August 19th, 2020, we have identified that there is a main switch (600V, 400A, 3Ph) inside the electrical room which provides us with the total KVA capacity. Therefore, the switch total capacity is as follow:

$$KVA_{Total\ Capacity} = 600V * 800 * \sqrt{3}$$
$$= 831.38\ \text{KVA}$$

Figure 1.
Main Switch (Located at North-West side of existing Paint & Body Shop Building)

In addition, it is our assumption that the main switch provides power to the entire plant. Therefore, looking into BC Hydro historical power consumption for 2020 and 2019, the worst-case scenario is 1,362,225 KWH (see attachment 2). Assuming 10 hours a day operation for 7 days a week, we have 3640 hours of operation throughout a year. Therefore:

$$KW_{Total\ Power\ Usage} = \frac{1{,}362{,}225}{3{,}640} = 374.24\ \text{KW}$$

Assuming power factor of 90%, we have

$$KVA_{Total\ Power\ Usage} = \frac{374.24}{0.90} = 415.82\ \text{KVA}$$

Based on the above power consumption, the total available capacity before the expansion project is the following:

$$\begin{aligned} KVA_{Total\ Available\ \boldsymbol{before}\ Expansion} &= KVA_{Total\ Capacity} - KVA_{Total\ \text{Power Usage}} \\ &= 831.38\ KVA - 415.82\ \text{KVA} = 415.56\ \text{KVA} \end{aligned}$$

In addition, we have identified the total KVA for the equipment to be decommissioned, to be relocated to the new building, and to be added as part of future plant expansion, based on the available information at the time of the feasibility study. The detail of each category can be found in the AC Load Power Calculation (see attachment 1). Also, below is the summary of each finding extracted from the AC load calculation spreadsheet:

$$\begin{aligned} KVA_{Total\ Decomission} &= 22.81 \\ KVA_{Total\ Relocate} &= 24.67 \\ KVA_{Total\ Addition} &= 290.66 \end{aligned}$$

Based on the above power analysis, WWS located in Annacis Island has enough capacity to cover the expansion project. Also, they are also left with 123KVA after the expansion project per the following:

$$\begin{aligned} &KVA_{Total\ Available\ \boldsymbol{after}\ Expansion} \\ &\quad = KVA_{Total\ Available\ \boldsymbol{before}\ Expansion} + KVA_{Total\ Decomission} - KVA_{Total\ Relocation} - KVA_{Total\ Addition} \\ &\quad = 123.04\text{KVA} \end{aligned}$$

Based on the above analysis, AC load calculation, BC Hydro Power Consumption, and the fact that the main switch provides power for the entire plant, our conclusion is that WWS located in Annacis Island will have enough capacity to accommodate for the expansion project and they are left with approximately 123KVA after the expansion project is complete. Please note that the values provided in this report can change as more information might emerge during the detail design phase of the project and confirm the validity of our assumption and approach.

Sincerely,
Salman Vayeghan, P.Eng.

Wallenius Wilhelmsen Solutions

Building Modification Feasibility - AC Load Power Calculation

ENGINUITY
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#	TAG	QTY	Building	Description	Make	Status	Service Requirements							
							Power							
							Voltage, V	Current, A	Power, kW	Power Factor	KVA	Phases	Duty Cycle	Notes
1	EXF-1	1	Mechanical #1	Exhaust Fan		Decommission	480	5.35	4.00	0.90	4.44	3	100%	100% duty cycle assumed for worst case scenario. 480V source to be verified.
2	CH-1	1	Mechanical #1	Car Hoist		Relocate	208	11.41	3.70	0.90	4.11	3	100%	To be relocated to New Production Building. 100% duty cycle assumed for worst case scenario. 208V is assumed.
3	RH-1 to 4	4	Mechanical #1	Radiation Heater (120V, 2.4A)		Decommission	120	10.67	1.15	0.90	1.28	1	100%	100% duty cycle assumed for worst case scenario
4	GDO-1 to 5	5	Mechanical #1	Garage door operator (208V, 0.7KW)		Decommission	208	10.79	3.50	0.90	3.89	3	100%	100% duty cycle assumed for worst case scenario
5		60	Mechanical #1	Light Fixtures (120V, 50W, LED)		Decommission	120	27.78	3.00	0.90	3.33	1	100%	100% duty cycle assumed for worst case scenario
6	CH-2 to 6	5	Mechanical #2	Car Hoist (208V, 3.7kW)		Relocate	208	57.06	18.50	0.90	20.56	3	100%	To be relocated to New Production Building. 100% duty cycle assumed for worst case scenario
7	EXF-2	1	Accessory #2	Exhaust Fan		Decommission	480	5.35	4.00	0.90	4.44	3	100%	100% duty cycle assumed for worst case scenario. 480V source to be verified.
8	RH-5 to 6	2	Accessory #2	Radiation Heater (120V, 2.4A)		Decommission	120	5.33	0.58	0.90	0.64	1	100%	100% duty cycle assumed for worst case scenario
9	GDO-6 to 9	4	Accessory #2	Garage door operator (208V, 0.7KW)		Decommission	208	8.64	2.80	0.90	3.11	3	100%	100% duty cycle assumed for worst case scenario
10		30	Accessory #2	Light Fixtures (120V, 50W, LED)		Decommission	120	13.89	1.50	0.90	1.67	1	100%	100% duty cycle assumed for worst case scenario
11	EXF-2	1	New Production Building	Exhaust Fan (480V, 4kW)	Fantech (FLD634DD)	Addition	480	5.35	4.00	0.90	4.44	3	100%	9,500cfm. 100% duty cycle assumed for worst case scenario. 480V source to be verified.
12	EXF-3	1	New Production Building	Exhaust Fan (480V, 2.1kW)	Fantech (FLD568DD)	Addition	480	2.81	2.10	0.90	2.33	3	100%	3,500cfm. 100% duty cycle assumed for worst case scenario. 480V source to be verified.
13	FAN-1 to 12	12	New Production Building	Ventilation Fan (480V, 4kW)	Fantech (FLD634DD)	Addition	480	64.15	48.00	0.90	53.33	3	100%	10,000cfm. 100% duty cycle assumed for worst case scenario.480V source to be verified.
14	FAN-13 to 16	4	New Production Building	Ventilation Fan (480V, 1.1kW)	Fantech (FLD718DD)	Addition	480	5.88	4.40	0.90	4.89	3	100%	7,000cfm. 100% duty cycle assumed for worst case scenario. 480V source to be verified.
15	CH-7 to 10	4	New Production Building	Car Hoist (208V, 1.5kW)	Rotary Lift (SPO12)	Addition	208	18.50	6.00	0.90	6.67	3	100%	100% duty cycle assumed for worst case scenario.
16	RH-7 to 29	22	New Production Building	Radiation Heater (120V, 2.4A)	SunStar (SIU-100)	Addition	120	58.67	6.34	0.90	7.04	1	100%	60Hz, 100% duty cycle assumed for worst case scenario
17	GDO-10 to 32	22	New Production Building	Garage door operator (208V, 0.7KW)	Overhead Door (RSX)	Addition	208	47.50	15.40	0.90	17.11	3	100%	100% duty cycle assumed for worst case scenario
18	EVCS-1 to 6	6	New Production Building	L2 - Electric Vehicle Charge Station (208V, 30A)	Schneider (EV230PDR)	Addition	208	180.00	58.36	0.90	64.85	3	100%	100% duty cycle assumed for worst case scenario
18	EVCS-7 to 8	2	New Production Building	L3 - Electric Vehicle Charge Station (208V, 160A)	Schneider (EVF24050DTR	Addition	208	320.00	103.76	0.90	115.29	3	100%	100% duty cycle assumed for worst case scenario

20		200	New Production Building	Light Fixtures (120V, 50W, LED)		Addition	120	83.33	10.00	0.90	11.11	3	100%	100% duty cycle assumed for worst case scenario. The number of lights is approximate and is based the area of the new production building (36400 sqrft) relative to the existing facility.
21		20	New Production Building	Receptacles (120V, 180W)		Addition	120	30.00	3.24	0.90	3.60	3	100%	100% duty cycle assumed for worst case scenario. The number of receptacle is approximate and it can change during the detail design.

Total Decommission (KVA):	22.81
Total Relocate (KVA):	24.67
Total Addition (KVA):	**290.66**

ATTACHMENT 2 - BC HYDRO HISTORICAL POWER CONSUMPTION

WWS Electricity Usage
ELECTRICITY
KWH

Date	2007	2008	2009	2010	2011	2012	2013	2019	2020	
Jan	175,536	160,641	172,764	156,429	131,976	153,960	136,500	128,459	195,573	
Feb	152,913	147,978	160,218	138,039	139,920	128,400	134,940	262,200	268,140	
Mar	134,433	94,302	153,420	130,492	140,556	117,143	125,820	256,111	213,950	
Apr	145,203	149,940	124,824	110,028	84,498	97,500	117,300	242,040	214,140	
May	121,005	147,660	72,807	127,317	95,454	91,500	111,600	215,054	206,511	
Jun	104,736	100,800	105,756	105,591	87,480	83,700	91,800	299,820	181,200	
Jul	102,381	76,500	104,637	99,515	106,197	77,700	69,900	164,137	121,097	
Aug	101,934	130,110	107,838	109,890	109,890	84,600	67,200	102,720	164,640	
Sep	108,846	122,730	97,602	95,949	51,450	87,300	74,100	186,555	163,280	
Oct	113,718	115,680	118,620	118,032	103,821	100,800	77,400	186,420	149,880	
Nov	144,870	139,884	144,108	141,771	124,138	113,100	87,300	189,729	237,683	
Dec	131,295	145,440	148,407	155,301	144,973	119,100	101,700	239,220	239,220	Assume Dec 2019 is similar to Dec 2020
Total	1,536,870	1,531,665	1,511,001	1,488,354	1,320,353	1,254,803	1,195,560	2,472,465	2,355,314	
Less Richmond								(1,110,240)	(1,110,240)	
Annacis Portion								1,362,225	1,245,074	

Appendix B

B.1 Mott Electric Fluke Power Log Report Body Shop

B.2 Mott Electric Fluke Power Log Report Warehouse Building

Mott Electric GP
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Fluke Power Log Report

WWL Vehicle Services Canada Ltd.

Body Shop Service

820 Dock Rd, #100 Delta,
B.C V3M 6A3

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1.0 INTRODUCTION

1.1 General

This document describes the results generated by a Fluke 435 Power Analyzer installed on the Main Service Entry 600v/800A 3P4W located at WWL Dock Road. The Statistical data represented on the graphs created for this report from the Power Log 430-II software will be used to approximate load demand for possible future growth on the existing service. The Statistics focused for this report are highlighted in Red in Table 1.2 Measurement Methods and Statistics Discussed

1.2 Measurement Method and Statistics Discussed

Vrms, Arms	10/12 cycle contiguous non overlapping intervals using 500/4162 samples per cycle in accordance with IEC 61000-30
Vpeak, Apeak	Absolute highest sample value within 10/12 cycle interval with 40 µs sample resolution
V Crest Factor	Measures ratio between the Vpeak and Vrms
A Crest Factor	Measures ratio between the Apeak and Arms
Hz	Measured every 10 sec in accordance with IEC61000-4-30. Vrms½, Arms½ Value is measured over 1 cycle, commencing at a fundamental zero crossing, and refreshed each half-cycle. This technique is independent for each channel in accordance with IEC 61000-4-30.
Harmonics	Calculated from 10/12-cycle gapless harmonic group measurements on Voltage and Amps according to IEC 61000-4-7
Watt	Full and fundamental real power display. Calculates average value of instantaneous power over 10/12 cycle period for each phase. Total Active Power PT = P1 + P2 + P3.
VA	Full and fundamental apparent power display. Calculates apparent power using Vrms x Arms value over 10/12 cycle period.
VAR	Fundamental reactive power display. Calculates reactive power on fundamental positive sequence components. Capacitive and inductive load is indicated with capacitor and inductor icons.
VA Harmonics	Total disturbance power due to harmonics. Calculated for each phase and for total system based upon total apparent power and fundamental real power.
VA Unbalance	Unbalance power for total system. Calculated using symmetrical components method for fundamental apparent power and total apparent power.
Power factor	Calculated total watt/VA
Cos j	Cosine of angle between fundamental voltage and current
DPF	Calculated fundamental Watt/VA
Energy/energy cost	Power values are accumulated over time for kWh values. Energy cost is calculated from user defined /kWh cost variable
Unbalance	The supply voltage unbalance is evaluated using the method of symmetrical components according to IEC61000-4-30
Flicker	According to IEC 61000-4-15 flicker meter—functional and design specification. Includes 230 V 50 Hz lamp and 120 V 60 Hz lamp models.
Transient capture	Captures waveform triggered on signal envelope. Additionally triggers on dips, swells, interruptions and Amps level
Inrush current	The inrush current begins when the Arms half cycle rises above the inrush threshold, and ends when the Arms half cycle rms is equal to or below the inrush threshold minus a user-selected hysteresis value.

	The measurement is the square root of the mean of the squared Arms half cycle values measured during the inrush duration. Each half-cycle interval is contiguous and non-overlapping as recommended by IEC 61000-4-30. Markers indicate inrush duration. Cursors allow measurement of peak Arms half cycle.
Mains signaling	Measurements are based on: either the corresponding 10/12-cycle rms value interharmonic bin or the rms of the four nearest 10/12-cycle rms value interharmonic bins per IEC 61000-4-30. Limit setup for Monitor mode follows EN50160 standard limits.

2.0 DESIGN SCOPE

2.1 Equipment Background

Body Shop Electrical Service Distribution:

Figure 1: 14.4kv/600v Transformer Service

Figure 2: 347/600v/800A Internal

Figure 3: 347/600v/800A External

3.0 GENERAL DOCUMENT PROCEDURES

This section will outline the procedures performed to observe the onsite system.

3.1 Review

As part of the document procedure MEGP will review information gathered. The information reviewed will be simplified and structured.

3.2 Observations Details

As part of the document procedure MEGP will discuss the observations that are made with the assessed data for a professional understanding of this Power Log

3.3 Risk Assessment

As part of this and study procedure. MEGP can be utilized to discuss any risks that are present based on the observations made on the equipment being connected and serviced for any future proposed changes

3.4 Recommended Actions

As part of the document procedure MEGP will discuss any required and recommended course of action based on the risk assessment and observations made before and after final proposed changes may be presented and communicated through an engineering group

4.0 ELECTRICAL LOAD REPORT REVIEW & RESULTS

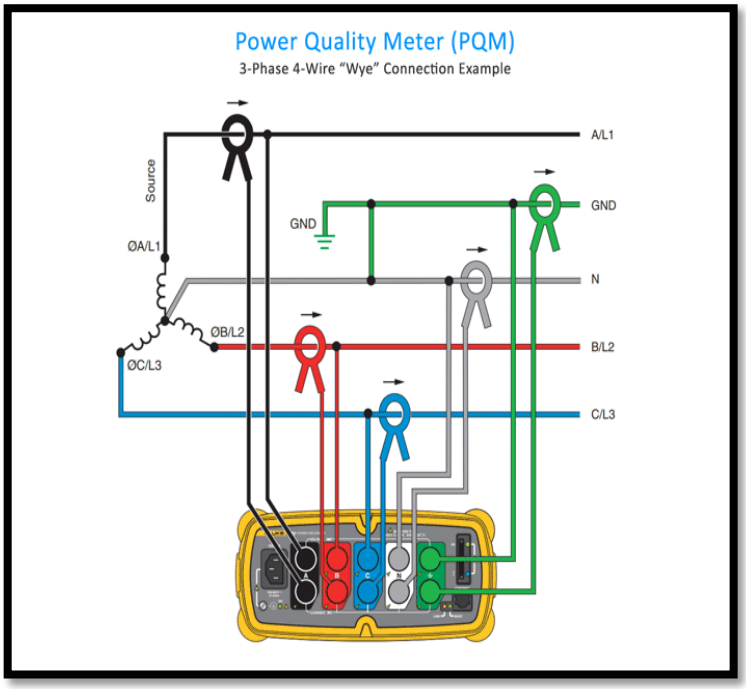
4.1 Summary of Results

This section will describe the results of the load reports collected and printed from the Data shown in Appendix A.

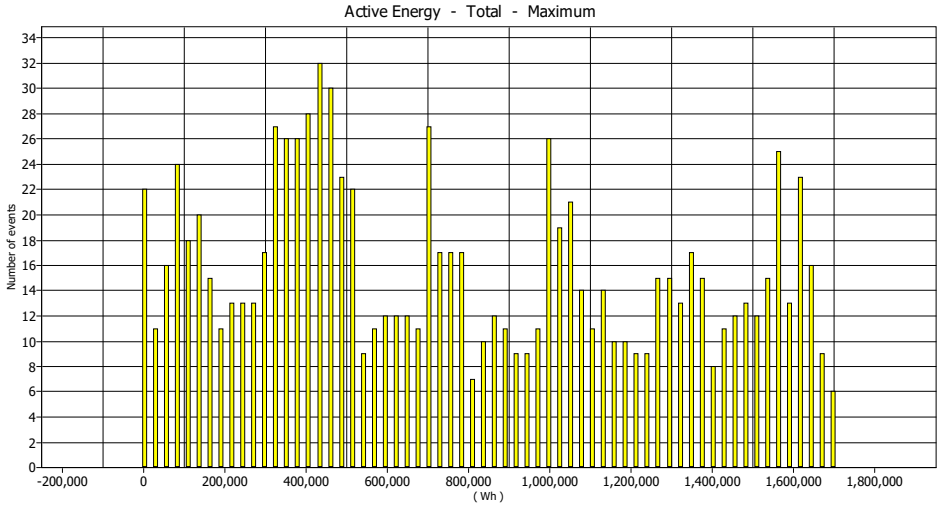
Summary of Results
Body Shop – Summary (Instrument info and Measurement Summary see **Appendix A**)
Body Shop – Current Peak Ave = (A)=**111** A (B) =**123.6** A (C) =**97.2** A (N) =**60.4** A
Body Shop – Arms – A – Ave = **73.7** A
Body Shop – Arms – B – Ave = **82.5** A
Body Shop – Arms – C – Ave = **70.6** A
Body Shop – Arms – C – Ave = **30.2** A
Body Shop – Active Power – Total – Average = **25.3** kW
Body Shop – Active Energy – Total – Maximum 1 week = **1706370**Wh or **1706.370** KWh
Body Shop – Power Factor – Total – Average = **94%** @ 95 percentile
Body Shop – Harmonics – Current Max THD NG = **121.91%** AN = **77.4%** BN = **76.94%** CN = **77.93%**
Body Shop – (Voltage and Current Wave see **Appendix A)**

4.2 System Electrical Load Monitoring

To ensure accurate electrical data was acquired for this study. MEGP obtained electrical data using a calibrated Fluke 435 Series II Analyzer. For accuracy MEGP will provide the Summary for the Electrical Load Report Data produced clarifying the specific details of the Fluke Equipment used. The settings programmed are proved in the summary to ensure directly to the Owner or engineering group that the data provided is secure and able to be used as requested. The Event Summary, Further trends, important statistics and graphs were created from the Fluke Power Log 5.8 Software and the documents are shown in **Appendix A**. The figure below shows how the Fluke 435 Current and Voltage Probes were connected to the 3-Phase 4 Wire ''Wye'' System.



APPENDIX A: Recordings Printed from Fluke Power log 5.8



Summary

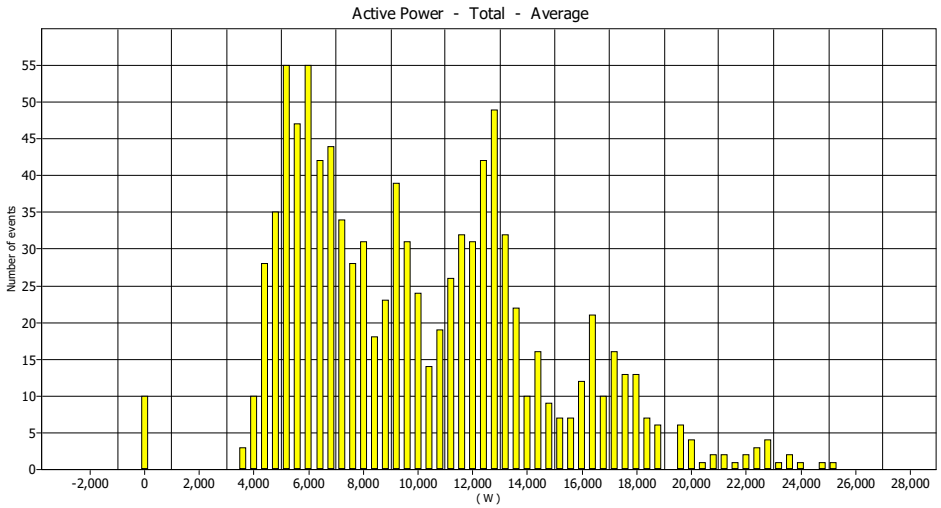
From	2021-04-09 8:50:36 AM	**5% percentile**	8.49E4 Wh
To	2021-04-16 7:40:36 AM	**95% percentile**	1.623E6 Wh
Maximum value	1706370 Wh	**% [85% - 110%]**	0%
At	2021-04-16 7:40:36 AM	**% [90% - 110%]**	0 %
Minimum value	2432 Wh		
At	2021-04-09 8:50:36 AM		
μ (Avg)	797289 Wh		
s	498214 Wh		

Upper extreme values

Date / Time	Value
2021-04-16 7:40:36 AM	1706370
2021-04-16 7:30:36 AM	1706154
2021-04-16 7:20:36 AM	1704348
2021-04-16 7:10:36 AM	1702320
2021-04-16 7:00:36 AM	1700518

Lower extreme values

Date / Time	Value
2021-04-09 8:50:36 AM	2432
2021-04-09 9:00:36 AM	4279
2021-04-09 9:10:36 AM	6325
2021-04-09 9:20:36 AM	8571
2021-04-09 9:30:36 AM	10688



Summary

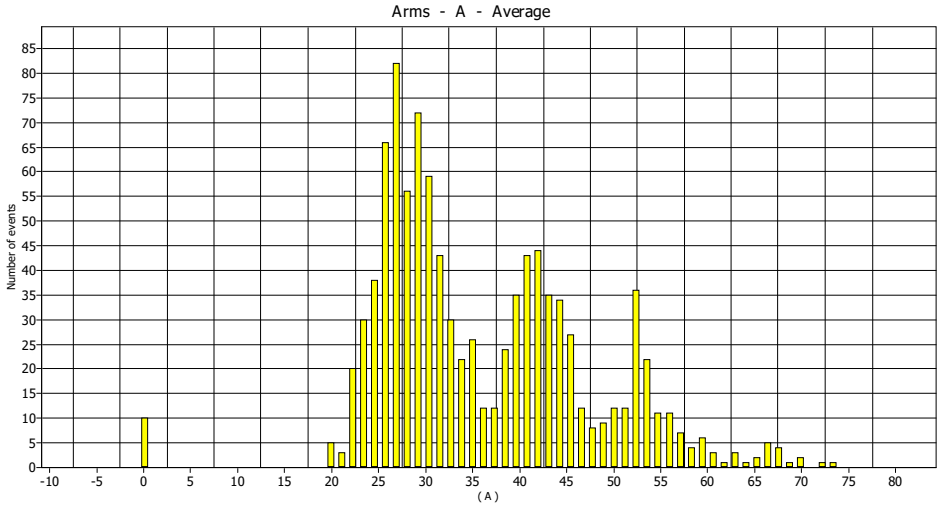
From	2021-04-09 8:50:36 AM	**5% percentile**	4750 W
To	2021-04-16 7:40:36 AM	**95% percentile**	1.815E4 W
Maximum value	25300 W	**% [85% - 110%]**	0%
At	2021-04-13 6:10:36 AM	**% [90% - 110%]**	0 %
Minimum value	0 W		
At	2021-04-09 10:10:36 AM		
μ (Avg)	10227.7 W		
s	4472.1 W		

Upper extreme values

Date / Time	Value
2021-04-13 6:10:36 AM	25300
2021-04-13 5:30:36 AM	24950
2021-04-13 5:50:36 AM	24300
2021-04-13 5:40:36 AM	23750
2021-04-13 5:20:36 AM	23600

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0
2021-04-09 11:30:36 AM	0
2021-04-09 11:20:36 AM	0
2021-04-09 11:10:36 AM	0
2021-04-09 11:00:36 AM	0



Summary

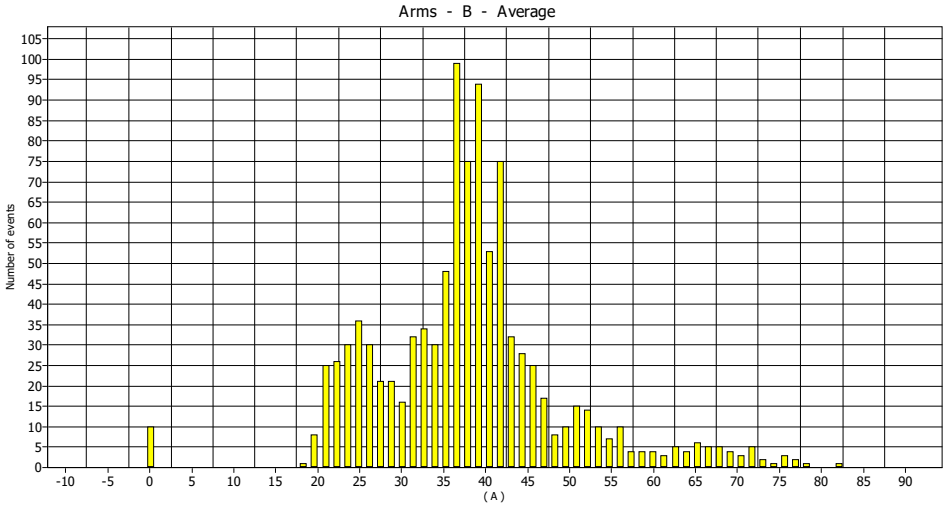
From	2021-04-09 8:50:36 AM	**5% percentile**	23.8 A
To	2021-04-16 7:40:36 AM	**95% percentile**	56.1 A
Maximum value	73.7 A	**% [85% - 110%]**	0%
At	2021-04-13 6:10:36 AM	**% [90% - 110%]**	0 %
Minimum value	0.1 A		
At	2021-04-09 10:10:36 AM		
μ (Avg)	36.584 A		
s	11.2374 A		

Upper extreme values

Date / Time	Value
2021-04-13 6:10:36 AM	73.7
2021-04-13 5:30:36 AM	72.5
2021-04-13 5:50:36 AM	70.7
2021-04-13 5:40:36 AM	70
2021-04-13 6:20:36 AM	69

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0.1
2021-04-09 11:30:36 AM	0.1
2021-04-09 11:20:36 AM	0.1
2021-04-09 11:10:36 AM	0.1
2021-04-09 11:00:36 AM	0.1



Summary

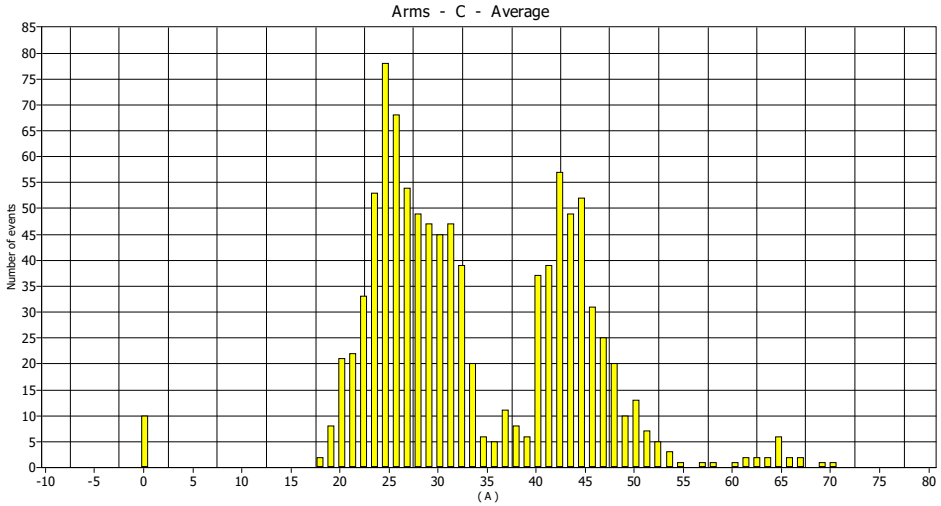
From	2021-04-09 8:50:36 AM	**5% percentile**	22.7 A
To	2021-04-16 7:40:36 AM	**95% percentile**	61.2 A
Maximum value	82.5 A	**% [85% - 110%]**	0%
At	2021-04-13 6:10:36 AM	**% [90% - 110%]**	0 %
Minimum value	0.1 A		
At	2021-04-09 10:10:36 AM		
μ (Avg)	38.6703 A		
s	11.4385 A		

Upper extreme values

Date / Time	Value
2021-04-13 6:10:36 AM	82.5
2021-04-13 5:50:36 AM	79.1
2021-04-13 5:30:36 AM	78.1
2021-04-13 5:20:36 AM	77
2021-04-13 5:40:36 AM	76

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0.1
2021-04-09 11:30:36 AM	0.1
2021-04-09 11:20:36 AM	0.1
2021-04-09 11:10:36 AM	0.1
2021-04-09 11:00:36 AM	0.1



Summary

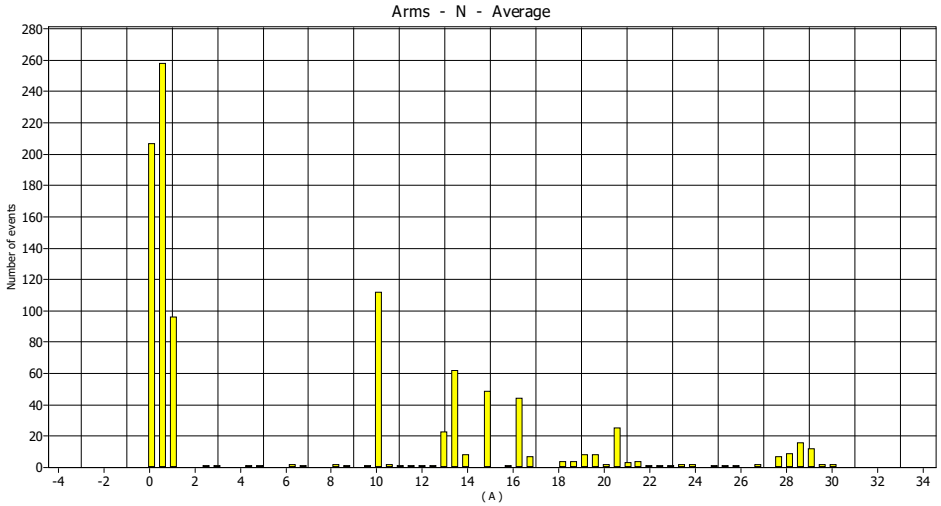
From	2021-04-09 8:50:36 AM	**5% percentile**	21.5 A
To	2021-04-16 7:40:36 AM	**95% percentile**	50.2 A
Maximum value	70.6 A	**% [85% - 110%]**	0%
At	2021-04-09 11:50:36 AM	**% [90% - 110%]**	0 %
Minimum value	0.1 A		
At	2021-04-09 10:10:36 AM		
μ (Avg)	34.3117 A		
s	10.5486 A		

Upper extreme values

Date / Time	Value
2021-04-09 11:50:36 AM	70.6
2021-04-09 12:00:36 PM	69.7
2021-04-09 1:50:36 PM	67.9
2021-04-09 1:20:36 PM	67.5
2021-04-09 12:40:36 PM	66.8

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0.1
2021-04-09 11:30:36 AM	0.1
2021-04-09 11:20:36 AM	0.1
2021-04-09 11:10:36 AM	0.1
2021-04-09 11:00:36 AM	0.1



Summary

From	2021-04-09 8:50:36 AM	**5% percentile**	0.4 A
To	2021-04-16 7:40:36 AM	**95% percentile**	26.1 A
Maximum value	30.2 A	**% [85% - 110%]**	0%
At	2021-04-12 6:10:36 AM	**% [90% - 110%]**	0 %
Minimum value	0.1 A		
At	2021-04-09 10:10:36 AM		
μ (Avg)	7.43628 A		
s	8.51349 A		

Upper extreme values

Date / Time	Value
2021-04-12 6:10:36 AM	30.2
2021-04-12 6:00:36 AM	30.1
2021-04-12 5:50:36 AM	29.7
2021-04-16 5:00:36 AM	29.6
2021-04-16 6:00:36 AM	29.5

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0.1
2021-04-09 11:30:36 AM	0.1
2021-04-09 11:20:36 AM	0.1
2021-04-09 11:10:36 AM	0.1
2021-04-09 11:00:36 AM	0.1

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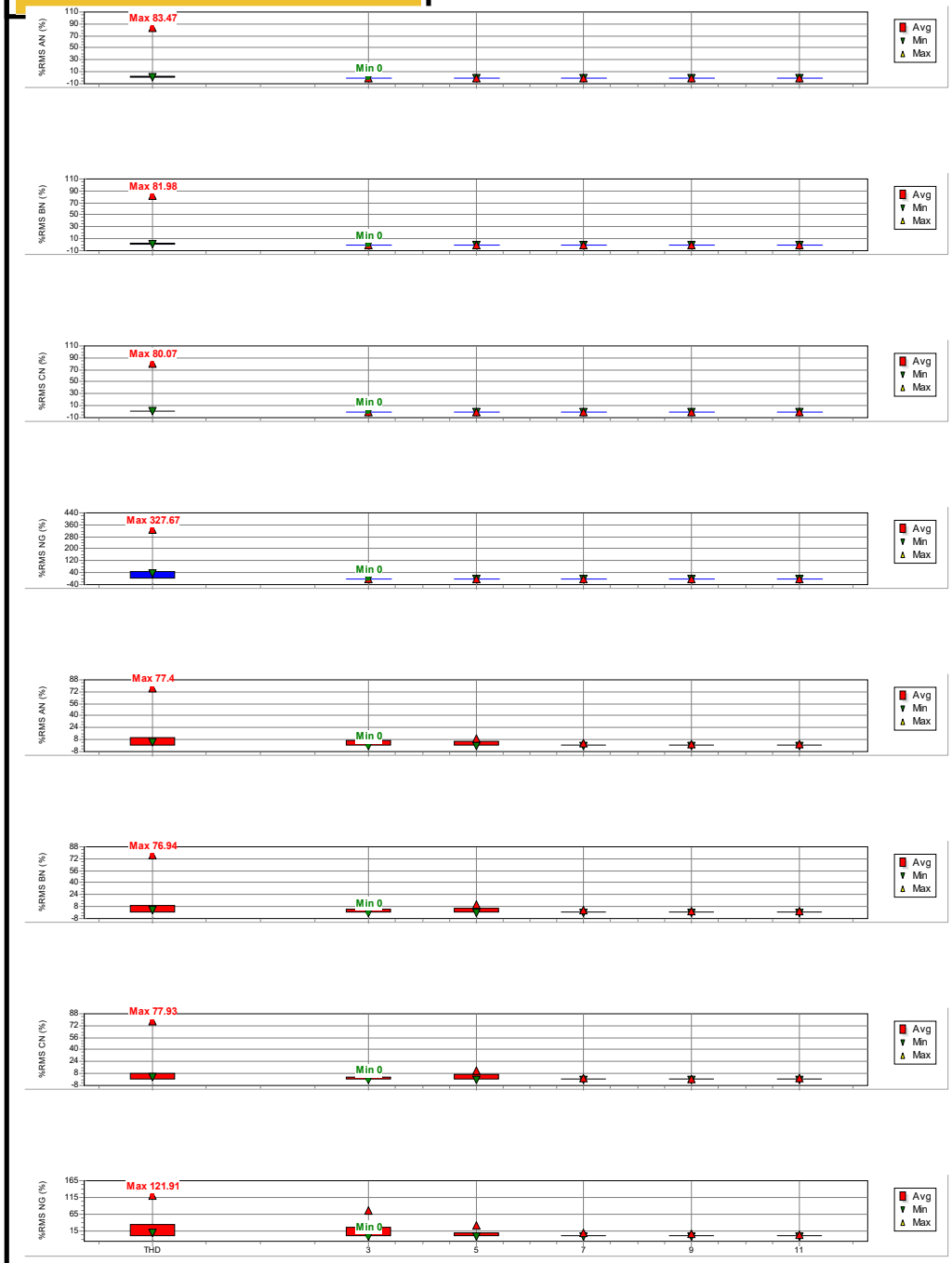
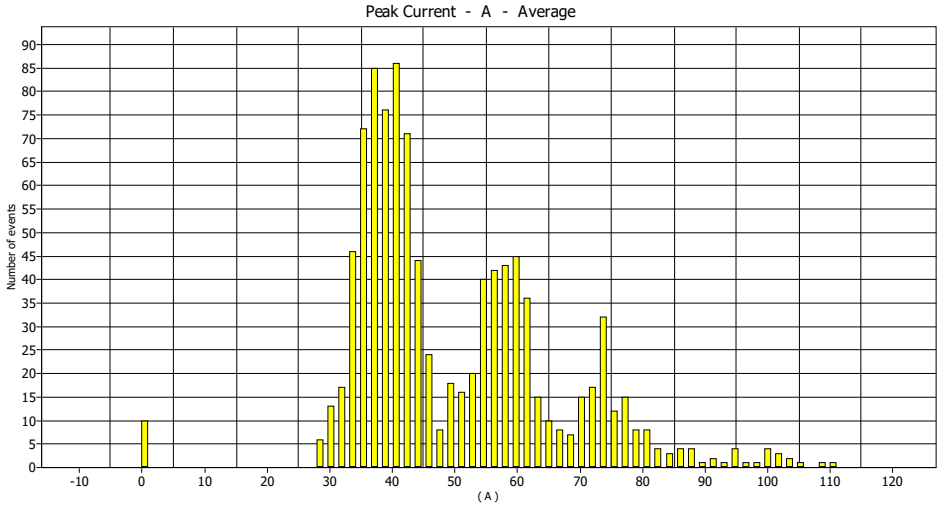
Harmonics. From 2021-04-09 8:50:36 AM To 2021-04-16 7:40:36 AM

Report Date/Time
2021-04-26 9:35:19 AM

Filename
BODY SHOP -- FLUKE 430-II (COM4).fpqo



Statistics. From 2021-04-09 8:50:36 AM To 2021-04-16 7:40:36 AM



Summary

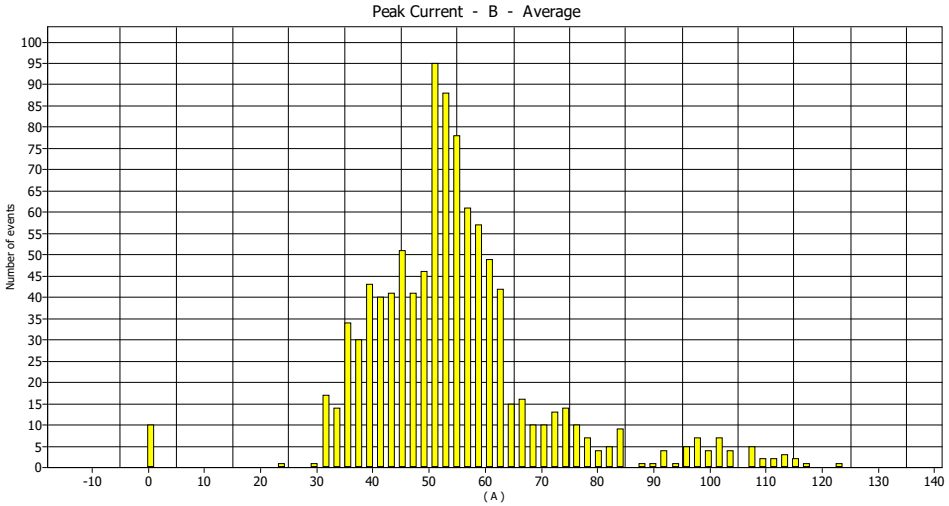
From	2021-04-09 8:50:36 AM	**5% percentile**	33.6 A
To	2021-04-16 7:40:36 AM	**95% percentile**	79.8 A
Maximum value	111 A	**% [85% - 110%]**	0%
At	2021-04-13 6:10:36 AM	**% [90% - 110%]**	0 %
Minimum value	0.4 A		
At	2021-04-09 10:10:36 AM		
μ (Avg)	50.7186 A		
s	16.2993 A		

Upper extreme values

Date / Time	Value
2021-04-13 6:10:36 AM	111
2021-04-13 5:30:36 AM	109.4
2021-04-13 5:50:36 AM	106.6
2021-04-13 5:40:36 AM	104.6
2021-04-13 5:20:36 AM	104

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0.4
2021-04-09 11:30:36 AM	0.4
2021-04-09 11:20:36 AM	0.4
2021-04-09 11:10:36 AM	0.4
2021-04-09 11:00:36 AM	0.4



Summary

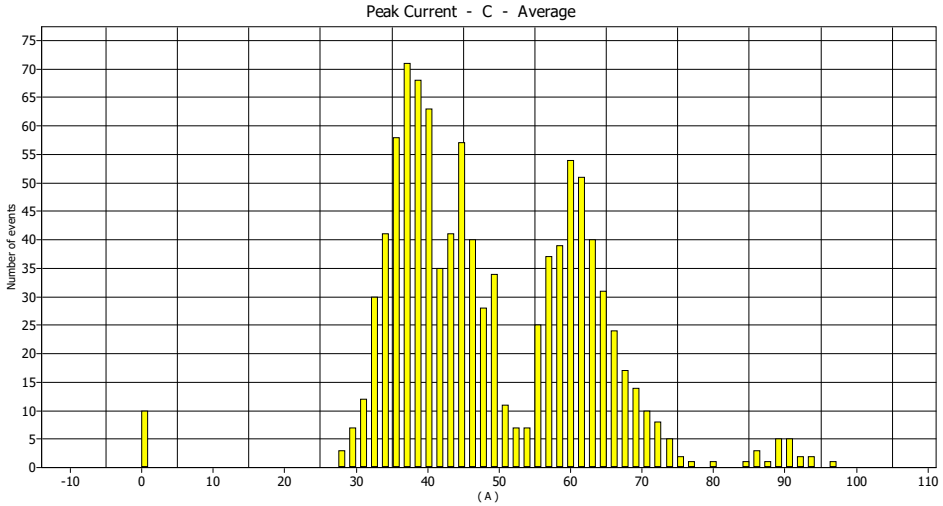
From	2021-04-09 8:50:36 AM	**5% percentile**	36 A
To	2021-04-16 7:40:36 AM	**95% percentile**	86 A
Maximum value	123.6 A	**% [85% - 110%]**	0%
At	2021-04-13 6:10:36 AM	**% [90% - 110%]**	0 %
Minimum value	0.4 A		
At	2021-04-09 10:10:36 AM		
μ (Avg)	55.3631 A		
s	16.224 A		

Upper extreme values

Date / Time	Value
2021-04-13 6:10:36 AM	123.6
2021-04-13 5:50:36 AM	118.4
2021-04-13 5:30:36 AM	116.6
2021-04-13 5:20:36 AM	116
2021-04-13 5:10:36 AM	114.4

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0.4
2021-04-09 11:30:36 AM	0.4
2021-04-09 11:20:36 AM	0.4
2021-04-09 11:10:36 AM	0.4
2021-04-09 11:00:36 AM	0.4



Summary

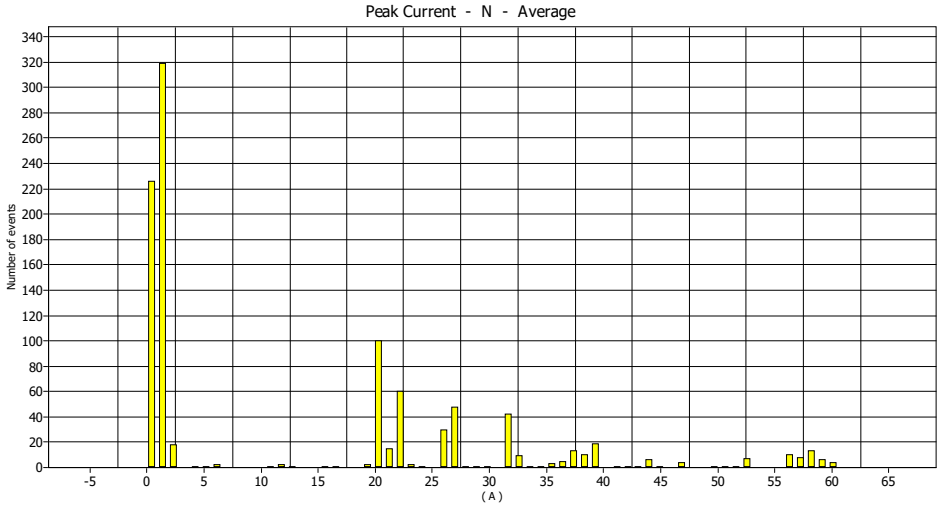
From	2021-04-09 8:50:36 AM	**5% percentile**	33.4 A
To	2021-04-16 7:40:36 AM	**95% percentile**	70.2 A
Maximum value	97.2 A	**% [85% - 110%]**	0%
At	2021-04-09 12:00:36 PM	**% [90% - 110%]**	0 %
Minimum value	0.4 A		
At	2021-04-09 10:10:36 AM		
μ (Avg)	49.6627 A		
s	13.8341 A		

Upper extreme values

Date / Time	Value
2021-04-09 12:00:36 PM	97.2
2021-04-09 1:50:36 PM	95
2021-04-09 1:20:36 PM	94.6
2021-04-09 12:40:36 PM	93.4
2021-04-09 1:10:36 PM	92.2

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0.4
2021-04-09 11:30:36 AM	0.4
2021-04-09 11:20:36 AM	0.4
2021-04-09 11:10:36 AM	0.4
2021-04-09 11:00:36 AM	0.4



Summary

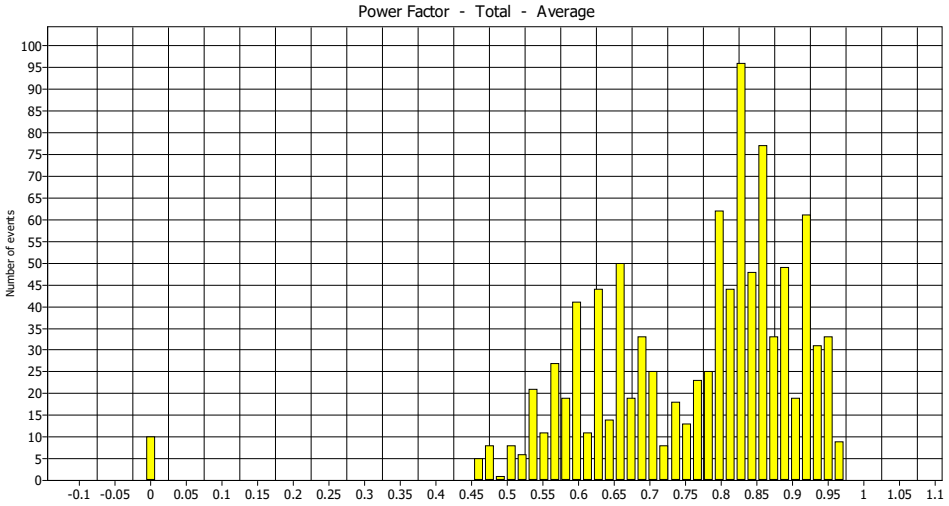
From	2021-04-09 8:50:36 AM	**5% percentile**	1 A
To	2021-04-16 7:40:36 AM	**95% percentile**	50.4 A
Maximum value	60.4 A	**% [85% - 110%]**	0%
At	2021-04-12 5:40:36 AM	**% [90% - 110%]**	0 %
Minimum value	0.4 A		
At	2021-04-09 10:10:36 AM		
μ (Avg)	14.2176 A		
s	16.459 A		

Upper extreme values

Date / Time	Value
2021-04-12 5:40:36 AM	60.4
2021-04-12 5:50:36 AM	60.2
2021-04-12 5:30:36 AM	60.2
2021-04-12 5:20:36 AM	60.2
2021-04-12 6:10:36 AM	60

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0.4
2021-04-09 11:30:36 AM	0.4
2021-04-09 11:20:36 AM	0.4
2021-04-09 11:10:36 AM	0.4
2021-04-09 11:00:36 AM	0.4



Summary

From	2021-04-09 8:50:36 AM	**5% percentile**	0.55
To	2021-04-16 7:40:36 AM	**95% percentile**	0.94
Maximum value	0.97	**% [85% - 110%]**	0%
At	2021-04-13 5:10:36 AM	**% [90% - 110%]**	0 %
Minimum value	0		
At	2021-04-09 10:10:36 AM		
μ (Avg)	0.768443		
s	0.146654		

Upper extreme values

Date / Time	Value
2021-04-15 5:20:36 AM	0.97
2021-04-14 3:50:36 PM	0.97
2021-04-14 3:20:36 PM	0.97
2021-04-13 6:10:36 AM	0.97
2021-04-13 6:00:36 AM	0.97

Lower extreme values

Date / Time	Value
2021-04-09 11:40:36 AM	0
2021-04-09 11:30:36 AM	0
2021-04-09 11:20:36 AM	0
2021-04-09 11:10:36 AM	0
2021-04-09 11:00:36 AM	0

Instrument Information

Model Number	435-II
Serial Number	47923115
Firmware Revision	V05.07

Software Information

Power Log Version	5.8
FLUKE 430-II DLL Version	1.2.0.14

General Information

Recording location	Body Shop
Client	WWL
Notes	

Measurement Summary

Measurement topology	Wye mode
Application mode	Logger
First recording	2021-04-09 8:50:36 AM 129msec
Last recording	2021-04-16 7:40:36 AM 129msec
Recording interval	0h 10m 0s 0msec
Nominal Voltage	347 V
Nominal Current	800 A
Nominal Frequency	60 Hz
File start time	2021-04-09 8:40:36 AM 129msec
File end time	2021-04-16 7:40:36 AM 129msec
Duration	6d 23h 0m 0s 0msec
Number of events	Normal: 8 Detailed: 27
Events downloaded	Yes
Number of screens	0
Screens downloaded	Yes
Power measurement method	Unified
Cable type	Copper
Harmonic scale	%H1
THD mode	THD 40
CosPhi / DPF mode	DPF

Scaling

Phase:	
Current Clamp type	i430TF
Clamp range	N/A
Nominal range	800 A
Sensitivity	x10 AC only
Current ratio	1:1
Voltage ratio	1:1
Neutral:	
Current Clamp type	i430TF
Clamp range	N/A
Nominal range	800 A
Sensitivity	x10 AC only
Current ratio	1:1
Voltage ratio	1:1

Recording Summary

RMS recordings	1002
DC recordings	0
Frequency recordings	1002
Unbalance recordings	1002
Harmonic recordings	1002
Power harmonic recordings	1002
Power recordings	1002
Power unbalance recordings	0
Energy recordings	1002
Energy losses recordings	0
Flicker recordings	0
Mains signaling recordings	0

Events Summary

Dips	1
Swells	0
Transients	1
Interruptions	3
Voltage profiles	0
Rapid voltage changes	6
Screens	0
Waveforms	0
Intervals without measurements	0
Inrush current graphics	0
Wave events	30
RMS events	30

Tarif

Rate 1:	
Start time	00:00
Tarif	0.1000
Rate 2:	
Start time	00:00
Tarif	0.0000
Rate 3:	
Start time	00:00
Tarif	0.0000
Rate 4:	
Start time	00:00
Tarif	0.0000

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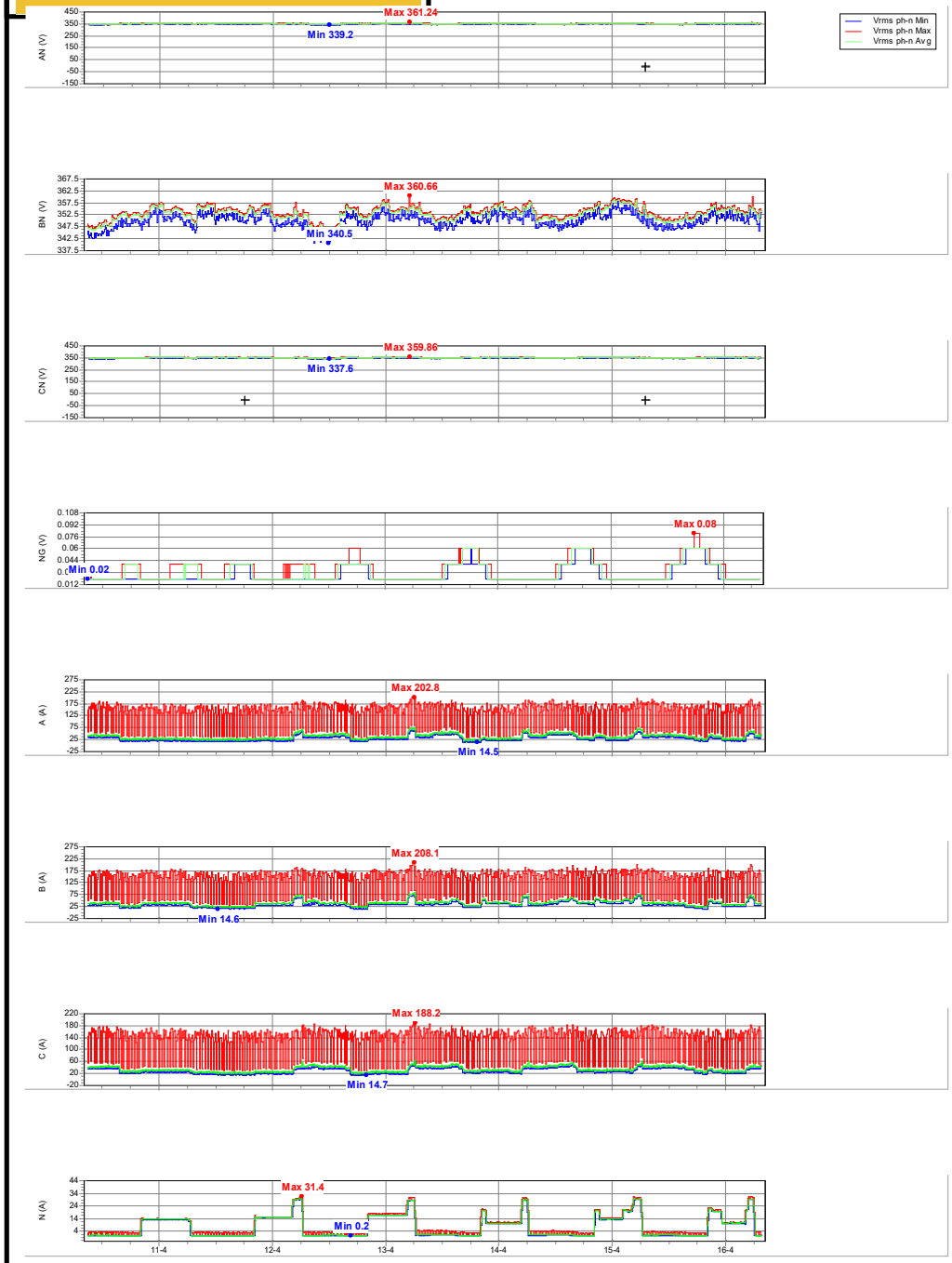
Voltage and Current. From 2021-04-10 8:50:36 AM To 2021-04-16 7:40:36 AM

Report Date/Time
2021-04-26 9:41:33 AM

Filename
BODY SHOP -- FLUKE 430-II (COM4).fpqo



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Fluke Power Log Report

WWL Vehicle Services Canada Ltd.
Warehouse Service

820 Dock Rd, #100 Delta,
B.C V3M 6A3

Issued for Information:
Client and Engineering firm: Brent Moore

Recording File Start: 2021-04-09 8:10:23 AM
Recording File End: 2021-04-16 7:20:23 AM

Mott Electric Project Number:	2-50976
Mott Electric Project Manager:	Brian McNeill
Mott Electric Document Number:	WWL1
Proposal Number:	N/A
Report Composition Creator:	Kyle Steel

Burnaby Address: 100 – 4599 Tillicum Street, Burnaby, BC V5J 3J9 T: 604 522 5757
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Document Preparation

Name	Role
Brian McNeill	Project Lead
Kyle Steel	Service Technician
Xyleen Haban	Document Control
Brian McNeill	Project Manager

Document Approvals

Name	Role	Company	Date	Contact #
Brian McNeill	Project Lead	MEGP	2021-04-05	604-549-5715
Kyle Steel	Service Technician	MEGP	2021-04-05	778-231-8053
Xyleen Haban	Service Coordinator	MEGP	2021-04-05	604-549-5716
Brian McNeill	Project Manager	MEGP	2021-04-05	604-549-5715

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1.0 INTRODUCTION

1.1 General

This document describes the results generated by a Fluke 435 Power Analyzer installed on the Main Service Entry 600v/200A 3P4W located at WWL Dock Road. The Statistical data represented on the graphs created for this report from the Power Log 430-II software will be used to approximate load demand for possible future growth on the existing service. The Statistics focused for this report are highlighted in Red in Table 1.2 Measurement Methods and Statistics Discussed

1.2 Measurement Method and Statistics Discussed

Vrms, Arms	10/12 cycle contiguous non overlapping intervals using 500/4162 samples per cycle in accordance with IEC 61000-30
Vpeak, Apeak	Absolute highest sample value within 10/12 cycle interval with 40 µs sample resolution
V Crest Factor	Measures ratio between the Vpeak and Vrms
A Crest Factor	Measures ratio between the Apeak and Arms
Hz	Measured every 10 sec in accordance with IEC61000-4-30. Vrms½, Arms½ Value is measured over 1 cycle, commencing at a fundamental zero crossing, and refreshed each half-cycle. This technique is independent for each channel in accordance with IEC 61000-4-30.
Harmonics	Calculated from 10/12-cycle gapless harmonic group measurements on Voltage and Amps according to IEC 61000-4-7
Watt	Full and fundamental real power display. Calculates average value of instantaneous power over 10/12 cycle period for each phase. Total Active Power PT = P1 + P2 + P3.
VA	Full and fundamental apparent power display. Calculates apparent power using Vrms x Arms value over 10/12 cycle period.
VAR	Fundamental reactive power display. Calculates reactive power on fundamental positive sequence components. Capacitive and inductive load is indicated with capacitor and inductor icons.
VA Harmonics	Total disturbance power due to harmonics. Calculated for each phase and for total system based upon total apparent power and fundamental real power.
VA Unbalance	Unbalance power for total system. Calculated using symmetrical components method for fundamental apparent power and total apparent power.
Power factor	Calculated total watt/VA
Cos j	Cosine of angle between fundamental voltage and current
DPF	Calculated fundamental Watt/VA
Energy/energy cost	Power values are accumulated over time for kWh values. Energy cost is calculated from user defined /kWh cost variable
Unbalance	The supply voltage unbalance is evaluated using the method of symmetrical components according to IEC61000-4-30
Flicker	According to IEC 61000-4-15 flicker meter—functional and design specification. Includes 230 V 50 Hz lamp and 120 V 60 Hz lamp models.
Transient capture	Captures waveform triggered on signal envelope. Additionally triggers on dips, swells, interruptions and Amps level
Inrush current	The inrush current begins when the Arms half cycle rises above the inrush threshold, and ends when the Arms half cycle rms is equal to or below the inrush threshold minus a user-selected hysteresis value.

	The measurement is the square root of the mean of the squared Arms half cycle values measured during the inrush duration. Each half-cycle interval is contiguous and non-overlapping as recommended by IEC 61000-4-30. Markers indicate inrush duration. Cursors allow measurement of peak Arms half cycle.
Mains signaling	Measurements are based on: either the corresponding 10/12-cycle rms value interharmonic bin or the rms of the four nearest 10/12-cycle rms value interharmonic bins per IEC 61000-4-30. Limit setup for Monitor mode follows EN50160 standard limits.

2.0 DESIGN SCOPE

2.1 Equipment Background

Warehouse Electrical Service Distribution:

Figure 1: 14.4kv/600v Transformer Service

Figure 2: 347/600v/200A Disconnect/Splitter

3.0 GENERAL DOCUMENT PROCEDURES

This section will outline the procedures performed to observe the onsite system.

3.1 Review

As part of the document procedure MEGP will review information gathered. The information reviewed will be simplified and structured.

3.2 Observations Details

As part of the document procedure MEGP will discuss the observations that are made with the assessed data for a professional understanding of this Power Log

3.3 Risk Assessment

As part of this and study procedure. MEGP can be utilized to discuss any risks that are present based on the observations made on the equipment being connected and serviced for any future proposed changes

3.4 Recommended Actions

As part of the document procedure MEGP will discuss any required and recommended course of action based on the risk assessment and observations made before and after final proposed changes may be presented and communicated through an engineering group

4.0 ELECTRICAL LOAD REPORT REVIEW & RESULTS

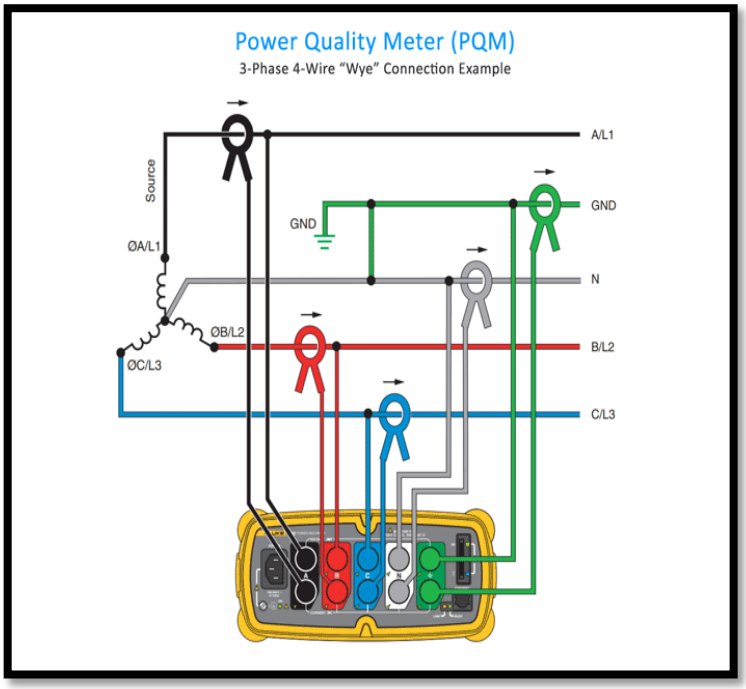
4.1 Summary of Results

This section will describe the results of the load reports collected and printed from the Data shown in Appendix A.

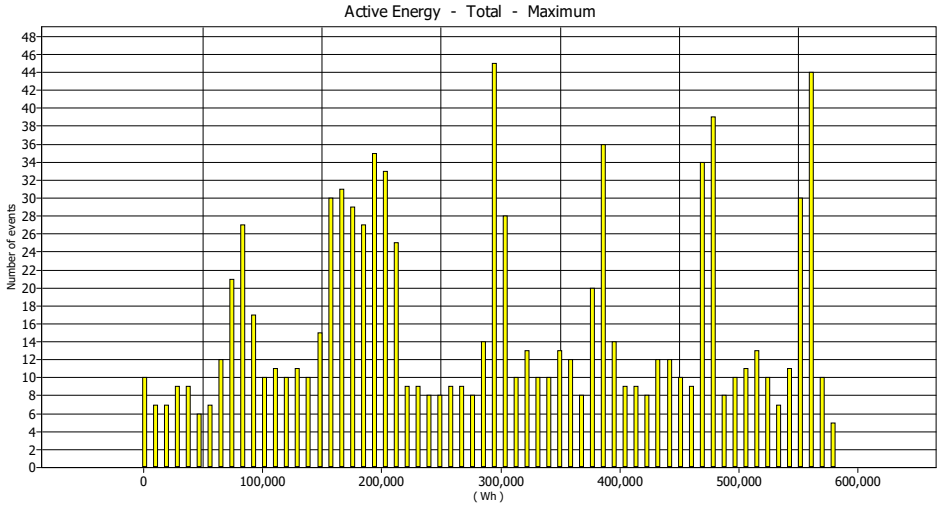
Summary of Results
Body Shop – Summary (Instrument info and Measurement Summary see **Appendix A**)
Body Shop – Current Peak Ave (A)= **58.2A** (B) = **45.4A** (C) = **33.4A** (N) = **5A**
Body Shop – Arms – A – Ave = **40.8A**
Body Shop – Arms – B – Ave = **32.3A**
Body Shop – Arms – C – Ave = **25.3A**
Body Shop – Arms – C – Ave = **2.5A**
Body Shop – Active Power – Total – Average = **11.710** kW
Body Shop – Active Energy – Total – Maximum 1 week = **582038** Wh or **582.038** KWh
Body Shop – Power Factor – Total – Average = **99%** @ 95 percentile
Body Shop – Harmonics – Current Max THD NG = **122.23%** AN =**43.87 %** BN = **39.06%** CN = **42.82%**
Body Shop – (Voltage and Current Wave see **Appendix A)**

4.2 System Electrical Load Monitoring

To ensure accurate electrical data was acquired for this study. MEGP obtained electrical data using a calibrated Fluke 435 Series II Analyzer. For accuracy MEGP will provide the Summary for the Electrical Load Report Data produced clarifying the specific details of the Fluke Equipment used. The settings programmed are proved in the summary to ensure directly to the Owner or engineering group that the data provided is secure and able to be used as requested. The Event Summary, Further trends, important statistics and graphs were created from the Fluke Power Log 5.8 Software and the documents are shown in **Appendix A**. The figure below shows how the Fluke 435 Current and Voltage Probes were connected to the 3-Phase 4 Wire ''Wye'' System.



APPENDIX A: Recordings Printed from Fluke Power log 5.8



Summary

From	2021-04-09 8:20:23 AM	**5% percentile**	5.987E4 Wh
To	2021-04-16 7:20:23 AM	**95% percentile**	5.618E5 Wh
Maximum value	582038 Wh	**% [85% - 110%]**	0%
At	2021-04-16 7:20:23 AM	**% [90% - 110%]**	0 %
Minimum value	1128 Wh		
At	2021-04-09 8:20:23 AM		
μ (Avg)	302314 Wh		
s	162007 Wh		

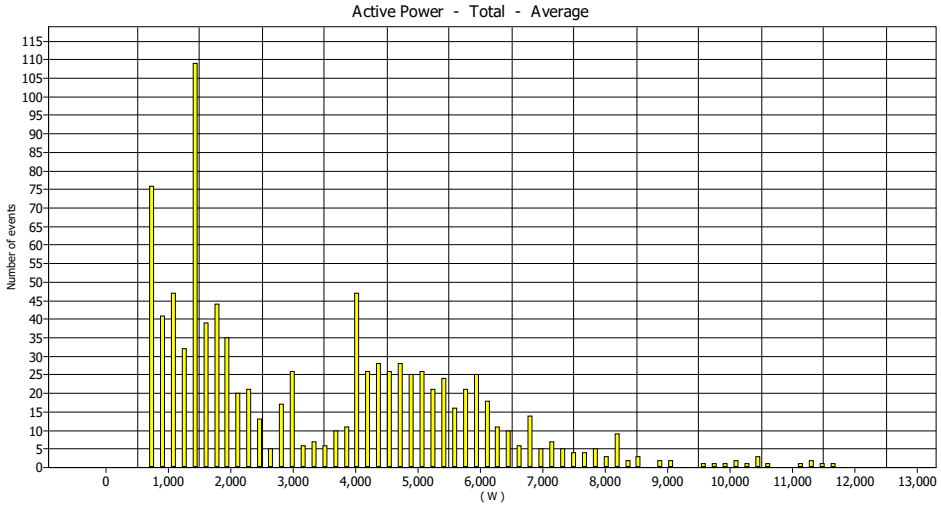
Upper extreme values

Date / Time	Value
2021-04-16 7:20:23 AM	582038
2021-04-16 7:10:23 AM	581878
2021-04-16 7:00:23 AM	581190
2021-04-16 6:50:23 AM	580292
2021-04-16 6:40:23 AM	579480

Lower extreme values

Date / Time	Value
2021-04-09 8:20:23 AM	1128
2021-04-09 8:30:23 AM	1985
2021-04-09 8:40:23 AM	2911
2021-04-09 8:50:23 AM	3767
2021-04-09 9:00:23 AM	4789

Statistics. From 2021-04-09 8:20:23 AM To 2021-04-16 7:20:23 AM



Summary

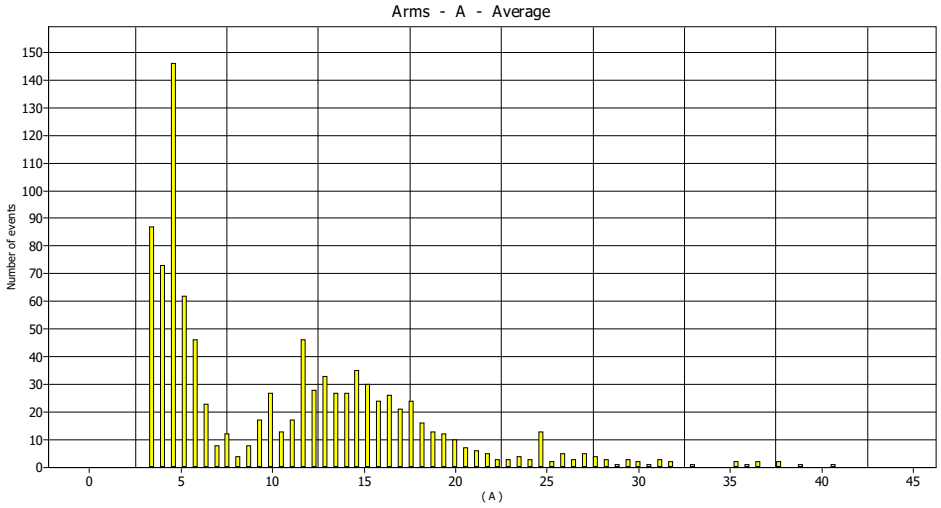
From	2021-04-09 8:20:23 AM	**5% percentile**	850 W
To	2021-04-16 7:20:23 AM	**95% percentile**	7410 W
Maximum value	11710 W	**% [85% - 110%]**	0%
At	2021-04-14 3:20:23 PM	**% [90% - 110%]**	0 %
Minimum value	730 W		
At	2021-04-14 3:30:23 AM		
μ (Avg)	3484.97 W		
s	2264.58 W		

Upper extreme values

Date / Time	Value
2021-04-14 3:20:23 PM	11710
2021-04-12 2:00:23 PM	11580
2021-04-13 4:20:23 PM	11400
2021-04-09 4:00:23 PM	11340
2021-04-12 2:10:23 PM	11280

Lower extreme values

Date / Time	Value
2021-04-14 3:30:23 AM	730
2021-04-14 1:30:23 AM	740
2021-04-14 12:40:23 AM	740
2021-04-16 3:40:23 AM	750
2021-04-16 2:40:23 AM	750



Summary

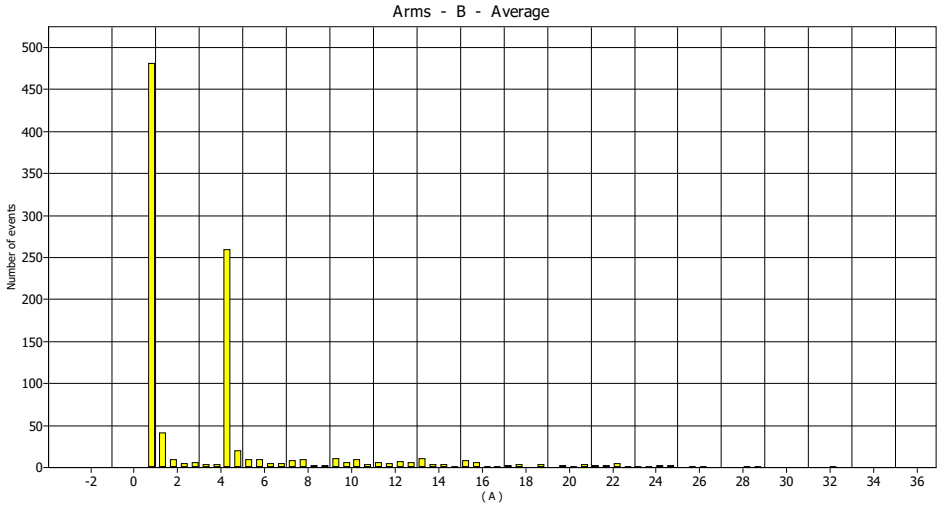
From	2021-04-09 8:20:23 AM	**5% percentile**	3.7 A
To	2021-04-16 7:20:23 AM	**95% percentile**	25 A
Maximum value	40.8 A	**% [85% - 110%]**	0%
At	2021-04-14 3:20:23 PM	**% [90% - 110%]**	0 %
Minimum value	3.4 A		
At	2021-04-14 3:30:23 AM		
μ (Avg)	11.1187 A		
s	7.05828 A		

Upper extreme values

Date / Time	Value
2021-04-14 3:20:23 PM	40.8
2021-04-12 2:00:23 PM	39.4
2021-04-09 4:00:23 PM	38.1
2021-04-13 4:20:23 PM	37.9
2021-04-14 3:30:23 PM	36.9

Lower extreme values

Date / Time	Value
2021-04-16 3:40:23 AM	3.4
2021-04-15 9:00:23 PM	3.4
2021-04-14 3:30:23 AM	3.4
2021-04-16 3:30:23 AM	3.5
2021-04-16 2:40:23 AM	3.5



Summary

From	2021-04-09 8:20:23 AM	**5% percentile**	0.9 A
To	2021-04-16 7:20:23 AM	**95% percentile**	15.4 A
Maximum value	32.3 A	**% [85% - 110%]**	0%
At	2021-04-14 3:20:23 PM	**% [90% - 110%]**	0 %
Minimum value	0.8 A		
At	2021-04-09 10:10:23 PM		
μ (Avg)	4.10534 A		
s	4.93109 A		

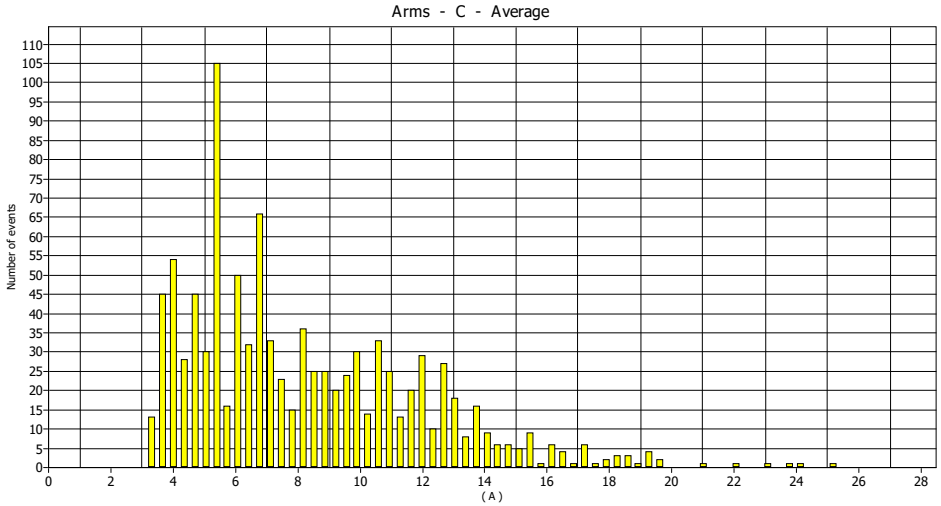
Upper extreme values

Date / Time	Value
2021-04-14 3:20:23 PM	32.3
2021-04-12 2:00:23 PM	28.7
2021-04-14 3:30:23 PM	28.6
2021-04-15 2:20:23 PM	26.4
2021-04-14 3:10:23 PM	25.9

Lower extreme values

Date / Time	Value
2021-04-11 6:40:23 AM	0.8
2021-04-11 6:30:23 AM	0.8
2021-04-11 6:20:23 AM	0.8
2021-04-10 5:00:23 AM	0.8
2021-04-10 4:50:23 AM	0.8

Statistics. From 2021-04-09 8:20:23 AM To 2021-04-16 7:20:23 AM



Summary

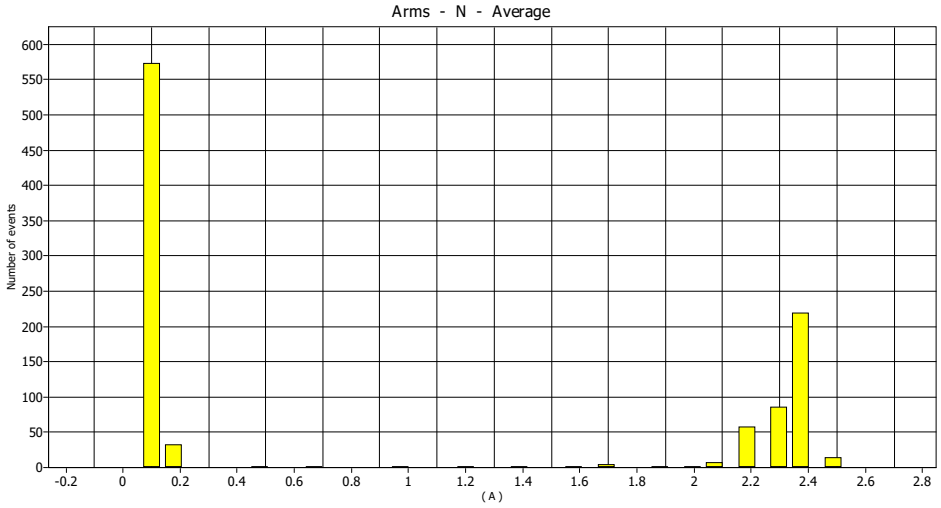
From	2021-04-09 8:20:23 AM	**5% percentile**	3.9 A
To	2021-04-16 7:20:23 AM	**95% percentile**	15.3 A
Maximum value	25.3 A	**% [85% - 110%]**	0%
At	2021-04-09 11:20:23 AM	**% [90% - 110%]**	0 %
Minimum value	3.3 A		
At	2021-04-15 4:50:23 PM		
μ (Avg)	8.39627 A		
s	3.74826 A		

Upper extreme values

Date / Time	Value
2021-04-09 11:20:23 AM	25.3
2021-04-09 11:30:23 AM	24.3
2021-04-09 10:50:23 AM	23.9
2021-04-09 11:10:23 AM	23.1
2021-04-09 11:00:23 AM	22.4

Lower extreme values

Date / Time	Value
2021-04-15 4:50:23 PM	3.3
2021-04-15 6:10:23 PM	3.4
2021-04-15 6:00:23 PM	3.4
2021-04-15 5:50:23 PM	3.4
2021-04-14 6:50:23 PM	3.4



Summary

From	2021-04-09 8:20:23 AM	**5% percentile**	0.09996 A
To	2021-04-16 7:20:23 AM	**95% percentile**	2.4 A
Maximum value	2.5 A	**% [85% - 110%]**	0%
At	2021-04-09 8:20:23 AM	**% [90% - 110%]**	0 %
Minimum value	0.1 A		
At	2021-04-09 5:30:23 PM		
μ (Avg)	0.979218 A		
s	1.08793 A		

Upper extreme values

Date / Time	Value
2021-04-14 3:00:23 PM	2.5
2021-04-14 2:50:23 PM	2.5
2021-04-14 2:40:23 PM	2.5
2021-04-14 2:30:23 PM	2.5
2021-04-14 2:20:23 PM	2.5

Lower extreme values

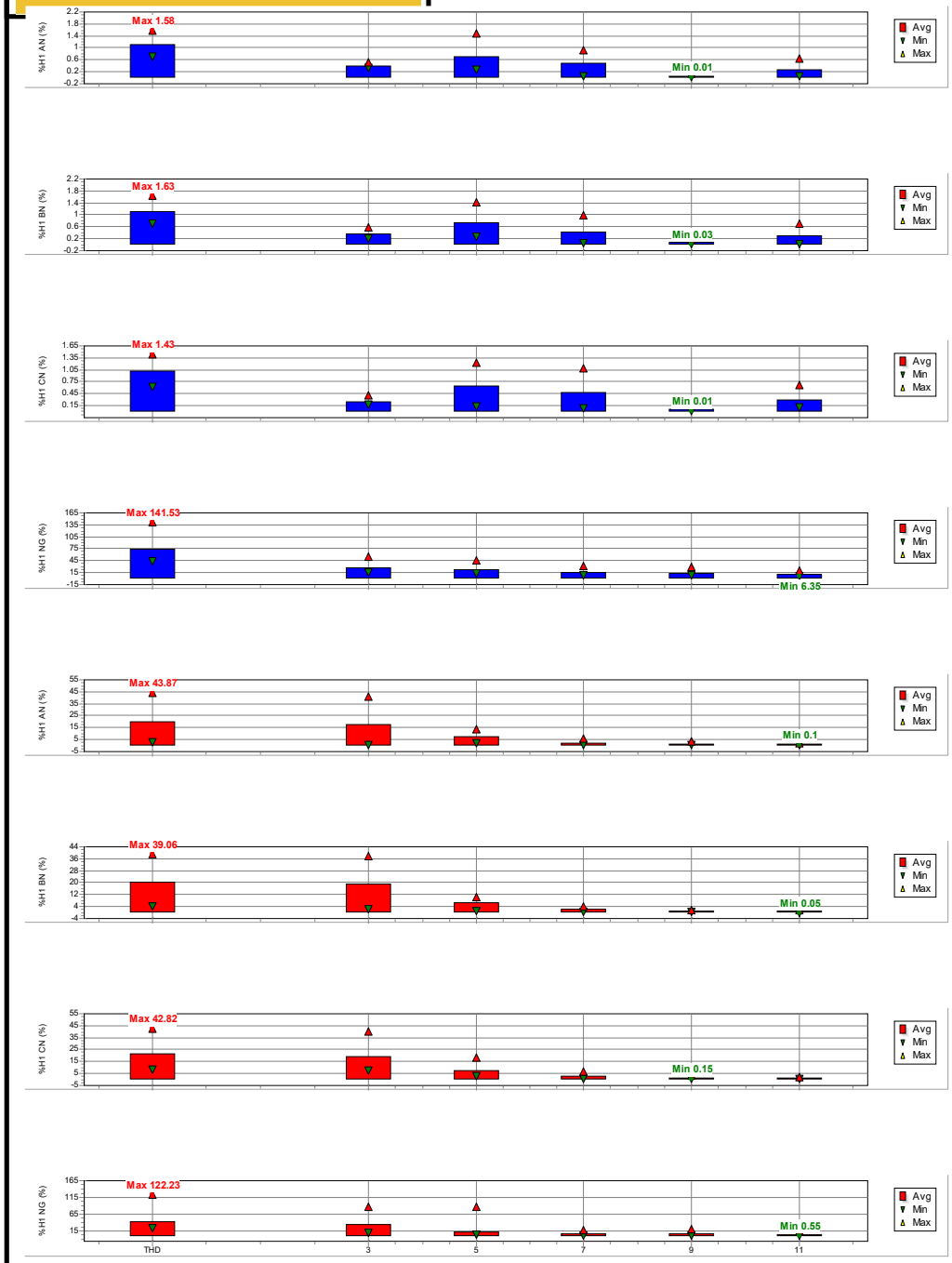
Date / Time	Value
2021-04-16 4:10:23 AM	0.1
2021-04-16 4:00:23 AM	0.1
2021-04-16 3:50:23 AM	0.1
2021-04-16 3:40:23 AM	0.1
2021-04-16 3:30:23 AM	0.1

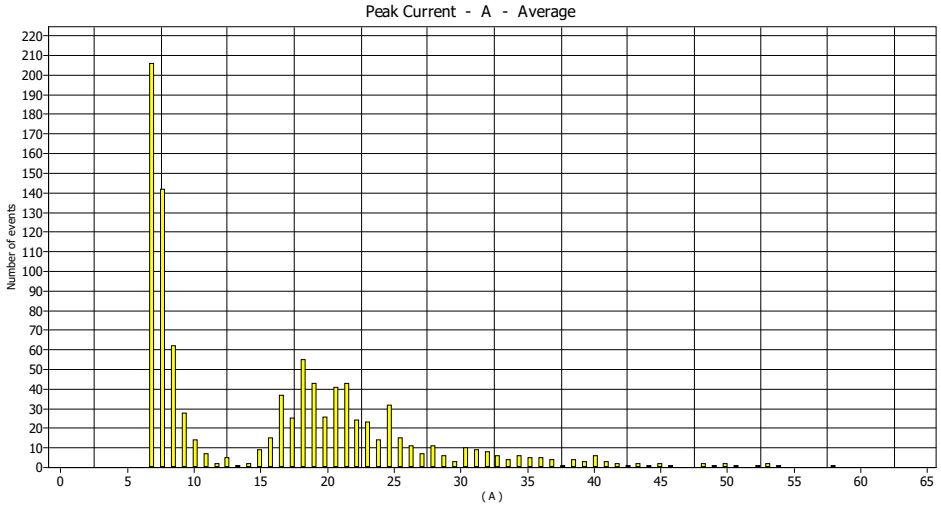
FLUKE®

Harmonics. From 2021-04-09 8:20:23 AM To 2021-04-16 7:20:23 AM

Report Date/Time
2021-04-26 11:46:02 AM

Filename
WHOUSE -- FLUKE 430-II (COM5).fpqo





Summary

From	2021-04-09 8:20:23 AM	**5% percentile**	7.2 A
To	2021-04-16 7:20:23 AM	**95% percentile**	35.6 A
Maximum value	58.2 A	**% [85% - 110%]**	0%
At	2021-04-14 3:20:23 PM	**% [90% - 110%]**	0 %
Minimum value	6.8 A		
At	2021-04-14 3:30:23 AM		
μ (Avg)	16.6259 A		
s	9.69845 A		

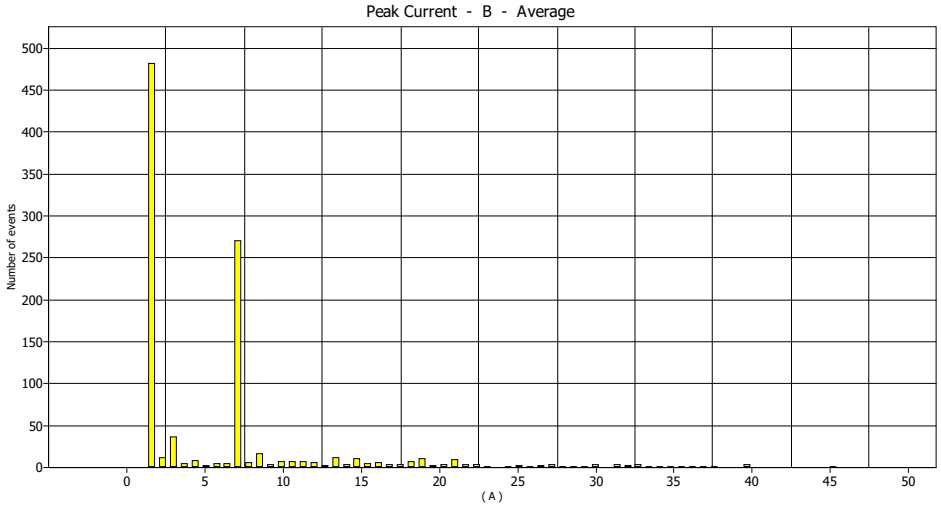
Upper extreme values

Date / Time	Value
2021-04-14 3:20:23 PM	58.2
2021-04-12 2:00:23 PM	54.4
2021-04-13 4:20:23 PM	53.2
2021-04-09 4:00:23 PM	53.2
2021-04-14 3:30:23 PM	53

Lower extreme values

Date / Time	Value
2021-04-16 3:40:23 AM	6.8
2021-04-15 9:00:23 PM	6.8
2021-04-14 3:30:23 AM	6.8
2021-04-16 3:50:23 AM	7
2021-04-16 3:30:23 AM	7

Statistics. From 2021-04-09 8:20:23 AM To 2021-04-16 7:20:23 AM



Summary

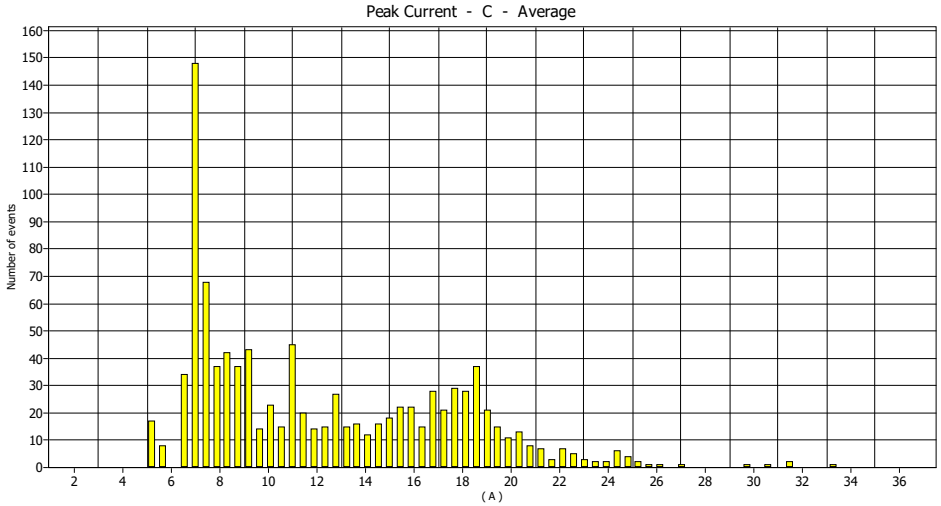
From	2021-04-09 8:20:23 AM	**5% percentile**	1.6 A
To	2021-04-16 7:20:23 AM	**95% percentile**	21.2 A
Maximum value	45.4 A	**% [85% - 110%]**	0%
At	2021-04-14 3:20:23 PM	**% [90% - 110%]**	0 %
Minimum value	1.6 A		
At	2021-04-09 8:50:23 PM		
μ (Avg)	6.40917 A		
s	6.9197 A		

Upper extreme values

Date / Time	Value
2021-04-14 3:20:23 PM	45.4
2021-04-12 2:00:23 PM	40
2021-04-15 2:20:23 PM	39.8
2021-04-14 3:30:23 PM	39.8
2021-04-09 4:00:23 PM	37.8

Lower extreme values

Date / Time	Value
2021-04-16 4:00:23 AM	1.6
2021-04-13 8:50:23 PM	1.6
2021-04-12 7:40:23 PM	1.6
2021-04-12 7:20:23 PM	1.6
2021-04-12 7:10:23 PM	1.6



Summary

From	2021-04-09 8:20:23 AM	**5% percentile**	6.8 A
To	2021-04-16 7:20:23 AM	**95% percentile**	21 A
Maximum value	33.4 A	**% [85% - 110%]**	0%
At	2021-04-09 11:20:23 AM	**% [90% - 110%]**	0 %
Minimum value	5.2 A		
At	2021-04-14 6:50:23 PM		
μ (Avg)	12.461 A		
s	5.19007 A		

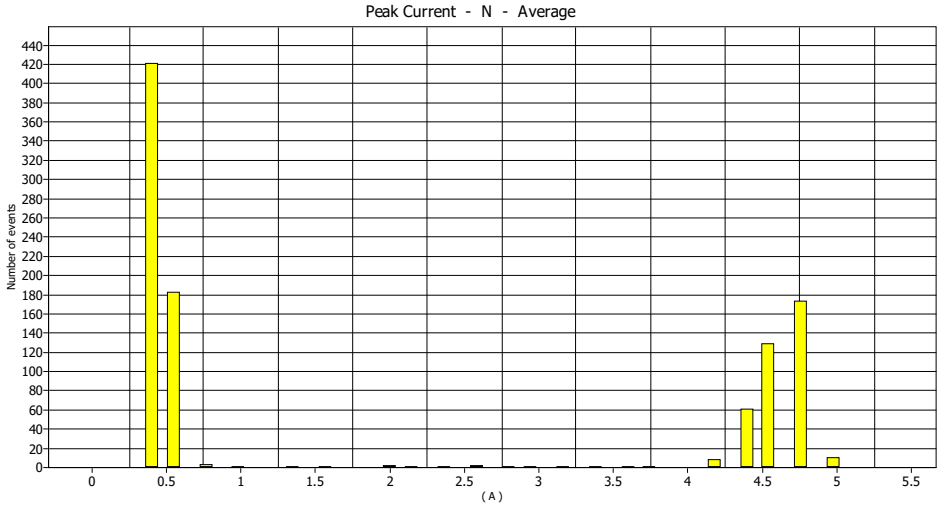
Upper extreme values

Date / Time	Value
2021-04-09 11:20:23 AM	33.4
2021-04-09 11:30:23 AM	31.8
2021-04-09 10:50:23 AM	31.6
2021-04-09 11:10:23 AM	30.6
2021-04-09 11:00:23 AM	29.8

Lower extreme values

Date / Time	Value
2021-04-15 6:10:23 PM	5.2
2021-04-15 6:00:23 PM	5.2
2021-04-15 5:50:23 PM	5.2
2021-04-14 6:50:23 PM	5.2
2021-04-15 5:40:23 PM	5.4

Statistics. From 2021-04-09 8:20:23 AM To 2021-04-16 7:20:23 AM



Summary

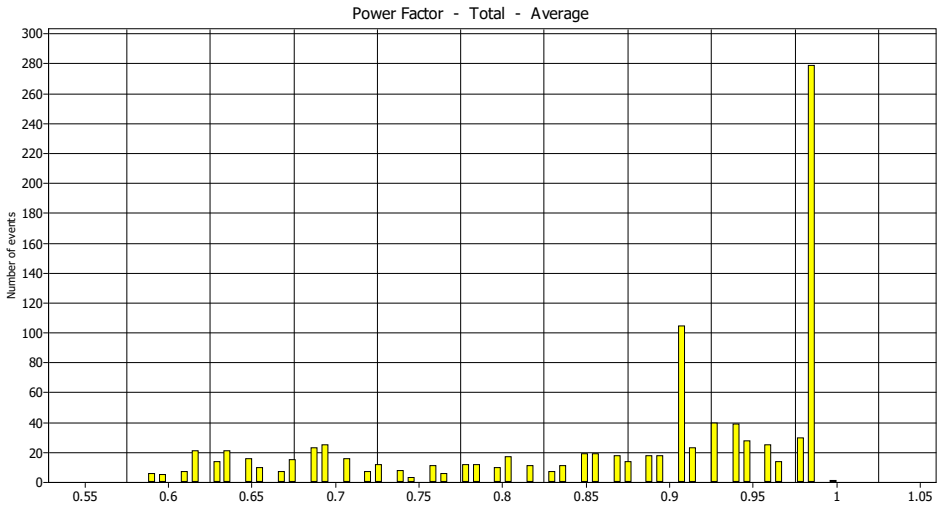
From	2021-04-09 8:20:23 AM	**5% percentile**	0.4 A
To	2021-04-16 7:20:23 AM	**95% percentile**	4.8 A
Maximum value	5 A	**% [85% - 110%]**	0%
At	2021-04-14 1:20:23 PM	**% [90% - 110%]**	0 %
Minimum value	0.4 A		
At	2021-04-09 8:50:23 PM		
μ (Avg)	2.08774 A		
s	2.03629 A		

Upper extreme values

Date / Time	Value
2021-04-14 2:50:23 PM	5
2021-04-14 2:40:23 PM	5
2021-04-14 2:30:23 PM	5
2021-04-14 2:20:23 PM	5
2021-04-14 2:10:23 PM	5

Lower extreme values

Date / Time	Value
2021-04-16 4:10:23 AM	0.4
2021-04-16 4:00:23 AM	0.4
2021-04-16 3:50:23 AM	0.4
2021-04-16 3:40:23 AM	0.4
2021-04-16 3:30:23 AM	0.4



Summary

From	2021-04-09 8:20:23 AM	**5% percentile**	0.63
To	2021-04-16 7:20:23 AM	**95% percentile**	0.99
Maximum value	1	**% [85% - 110%]**	0%
At	2021-04-09 1:40:23 PM	**% [90% - 110%]**	0 %
Minimum value	0.59		
At	2021-04-15 4:50:23 PM		
μ (Avg)	0.873769		
s	0.122552		

Upper extreme values

Date / Time	Value
2021-04-09 1:40:23 PM	1
2021-04-16 7:20:23 AM	0.99
2021-04-16 7:10:23 AM	0.99
2021-04-16 7:00:23 AM	0.99
2021-04-16 6:50:23 AM	0.99

Lower extreme values

Date / Time	Value
2021-04-15 6:10:23 PM	0.59
2021-04-15 6:00:23 PM	0.59
2021-04-15 5:50:23 PM	0.59
2021-04-15 5:40:23 PM	0.59
2021-04-15 5:30:23 PM	0.59

FLUKE ®

Voltage and Current. From 2021-04-09 8:20:23 AM To 2021-04-16 7:20:23 AM

Report Date/Time
2021-04-26 11:41:40 AM

Filename
WHOUSE -- FLUKE 430-II (COM5).fpqo

Instrument Information

Model Number	435-II
Serial Number	37943102
Firmware Revision	V05.07

Software Information

Power Log Version	5.8
FLUKE 430-II DLL Version	1.2.0.14

General Information

Recording location	Warehouse
Client	WWL
Notes	

Measurement Summary

Measurement topology	Wye mode
Application mode	Logger
First recording	2021-04-09 8:20:23 AM 299msec
Last recording	2021-04-16 7:20:23 AM 299msec
Recording interval	0h 10m 0s 0msec
Nominal Voltage	347 V
Nominal Current	200 A
Nominal Frequency	60 Hz
File start time	2021-04-09 8:10:23 AM 299msec
File end time	2021-04-16 7:20:23 AM 299msec
Duration	6d 23h 10m 0s 0msec
Number of events	Normal: 18 Detailed: 10
Events downloaded	Yes
Number of screens	0
Screens downloaded	Yes
Power measurement method	Unified
Cable type	Copper
Harmonic scale	%H1
THD mode	THD 40
CosPhi / DPF mode	DPF

Scaling

Phase:	
Current Clamp type	i430TF
Clamp range	N/A
Nominal range	200 A
Sensitivity	x10 AC only
Current ratio	1:1
Voltage ratio	1:1
Neutral:	
Current Clamp type	i430TF
Clamp range	N/A
Nominal range	200 A
Sensitivity	x10 AC only
Current ratio	1:1
Voltage ratio	1:1

Recording Summary

RMS recordings	1003
DC recordings	0
Frequency recordings	1003
Unbalance recordings	1003
Harmonic recordings	1003
Power harmonic recordings	1003
Power recordings	1003
Power unbalance recordings	0
Energy recordings	1003
Energy losses recordings	1003
Flicker recordings	1003
Mains signaling recordings	1003

Events Summary

Dips	0
Swells	0
Transients	8
Interruptions	0
Voltage profiles	0
Rapid voltage changes	20
Screens	0
Waveforms	0
Intervals without measurements	0
Inrush current graphics	0
Wave events	28
RMS events	28

Tarif

Rate 1:	
Start time	00:00
Tarif	0.1000
Rate 2:	
Start time	00:00
Tarif	0.0000
Rate 3:	
Start time	00:00
Tarif	0.0000
Rate 4:	
Start time	00:00
Tarif	0.0000

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