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APPENDIX J

CM PUMP MOTOR

Typical nameplate data for the pump motor of a CM can be seen in Table J-1. The pump motor measured at both sections was a 116 kW induction motor with a full load current rating of 91 A.

Table J-1: Nameplate data of the pump motor on a CM.

CM Pump Motor					
Power	116	kW	Voltage	1000	V
Duty	S1		Current	91	A
Ins class	H		RPM	1477	
			pf	0.77	

Table J-2: Production figures for shifts that the pump motor was investigated.

Date	Sect 21		Sect 51	
	Morning	Afternoon	Morning	Afternoon
6-Jun-2005	2079	1485	-	-
7-Jun-2005	1925	1435	-	-
8-Jun-2005	1750	2240	-	-
23-Jun-2005	-	-	1856	1566
28-Jun-2005	-	-	2204	1740

J.1 LOAD PROFILE

The next section focuses on the load profiles of the pump motor. Each graph shows the line voltage and the voltage limits, the load current and full load current capacity of the pump motor. The morning shifts and afternoon shifts are separated as well as the measurements made at the different sections.

J.1.1 SECTION 21

J.1.1.1 Morning shifts

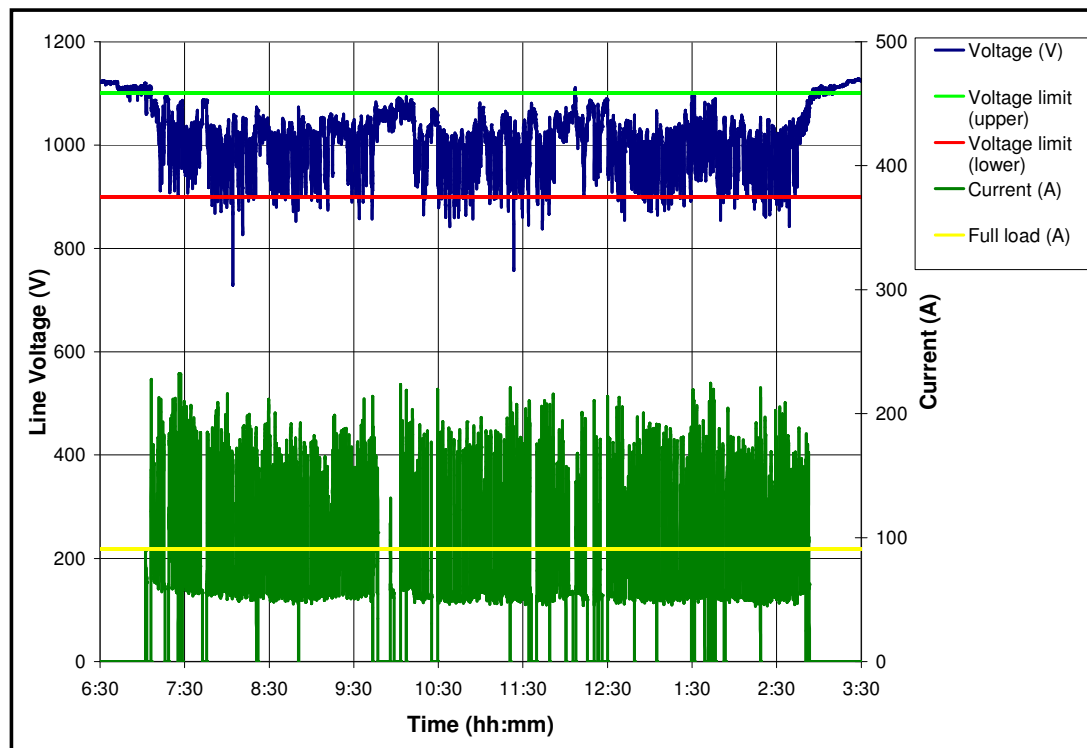
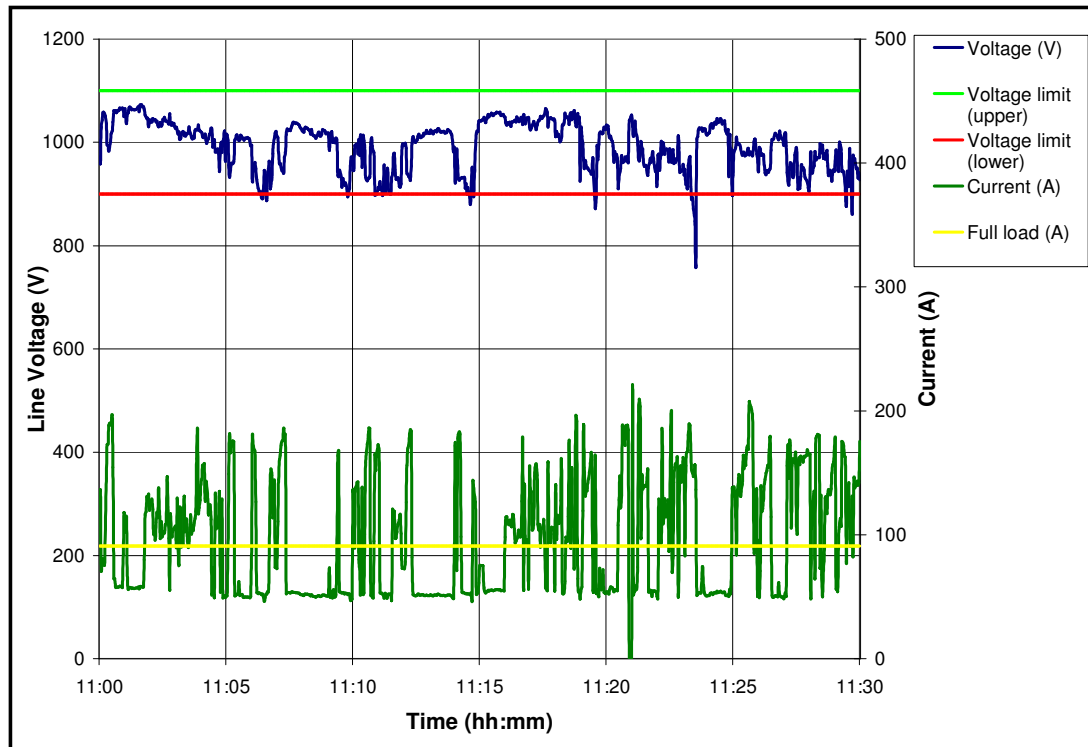


Figure J.1-1: Load current and voltage for a pump motor – 6 June 2005.



**Figure J.1-2: Load current and voltage for a pump motor – 6 June 2005
(30 minute period).**

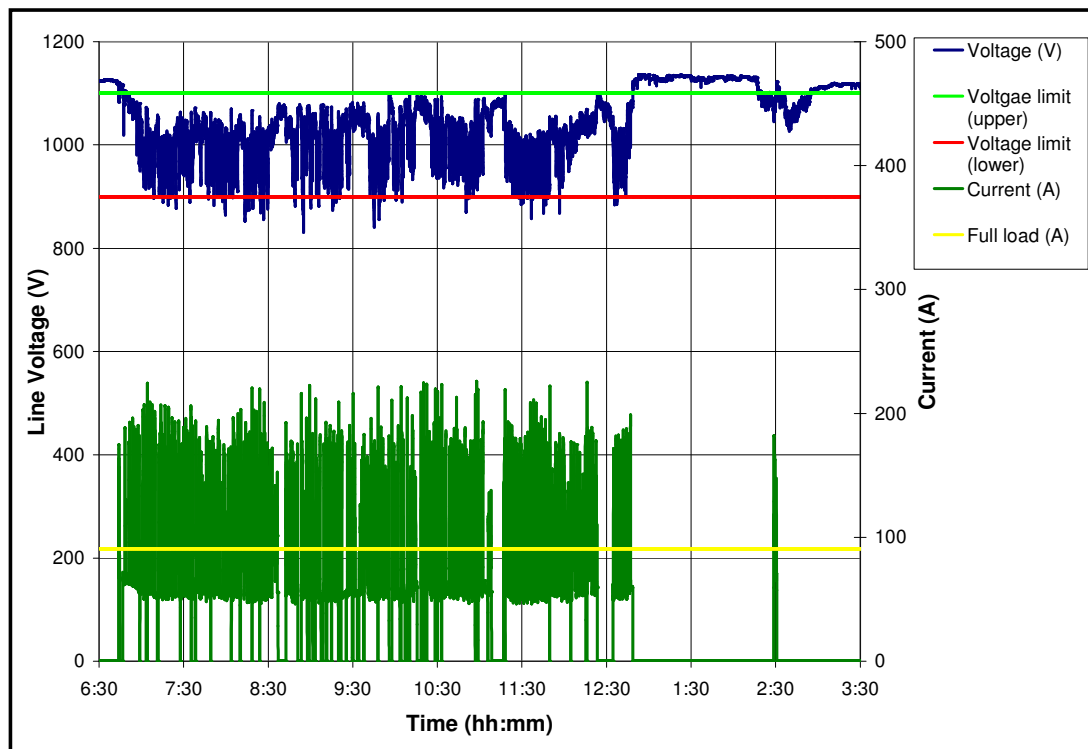
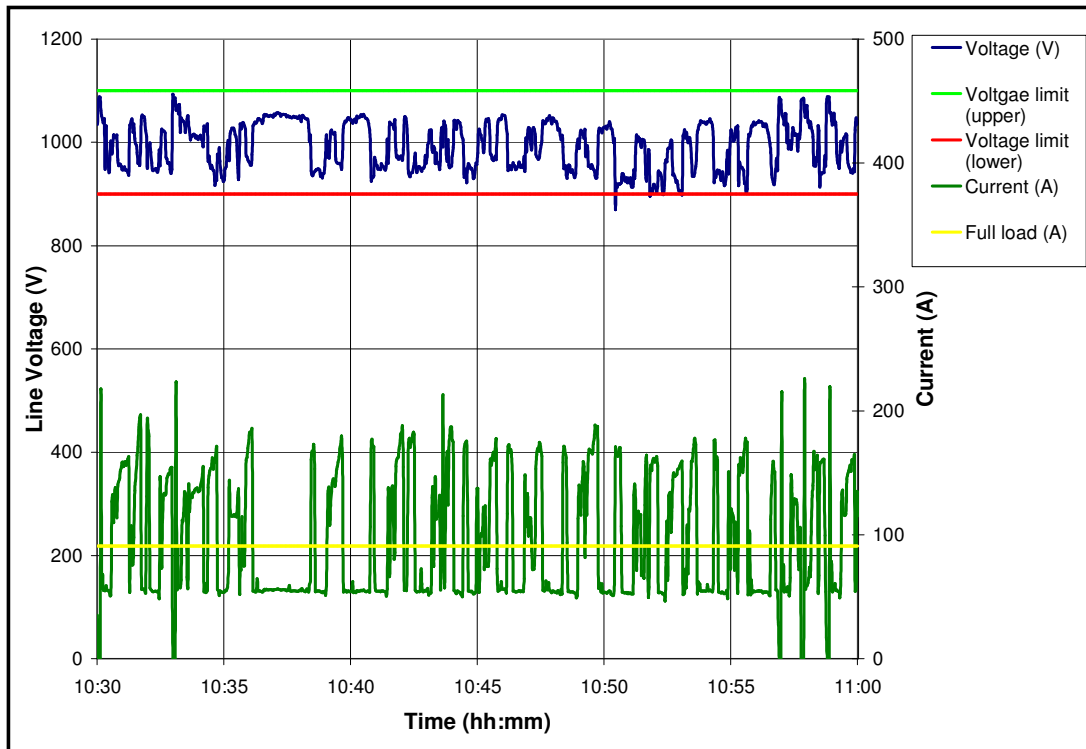


Figure J.1-3: Load current and voltage for a pump motor – 7 June 2005.



**Figure J.1-4: Lo Load current and voltage for a pump motor – 7 June 2005
(30 minute period).**

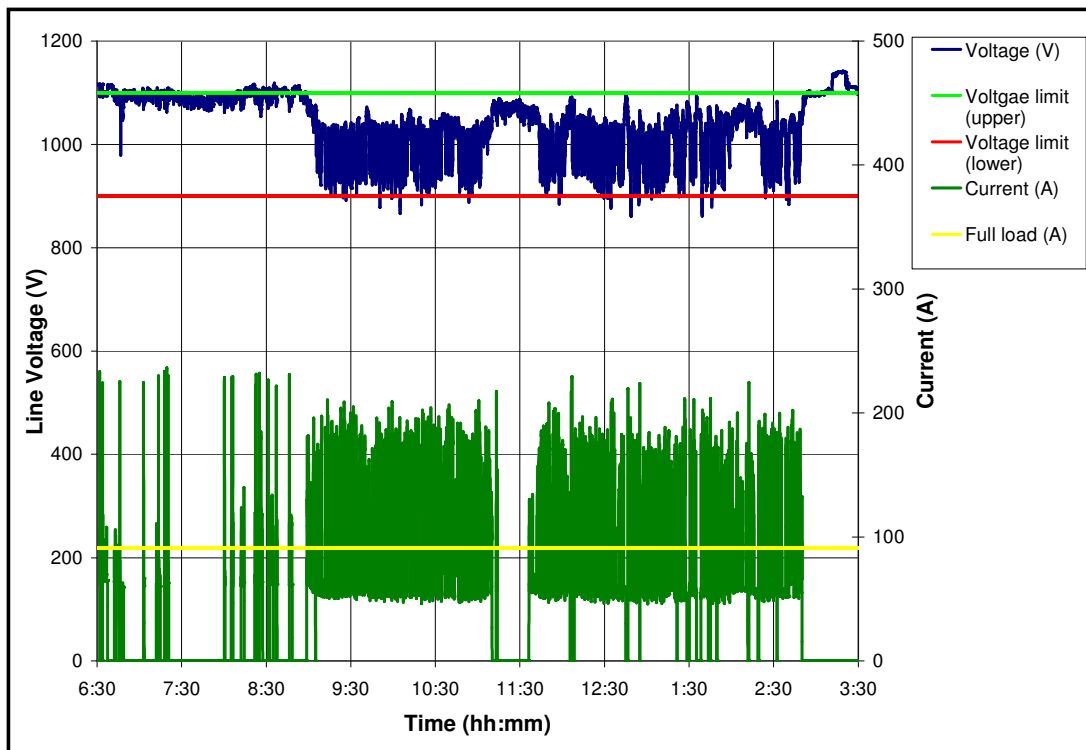
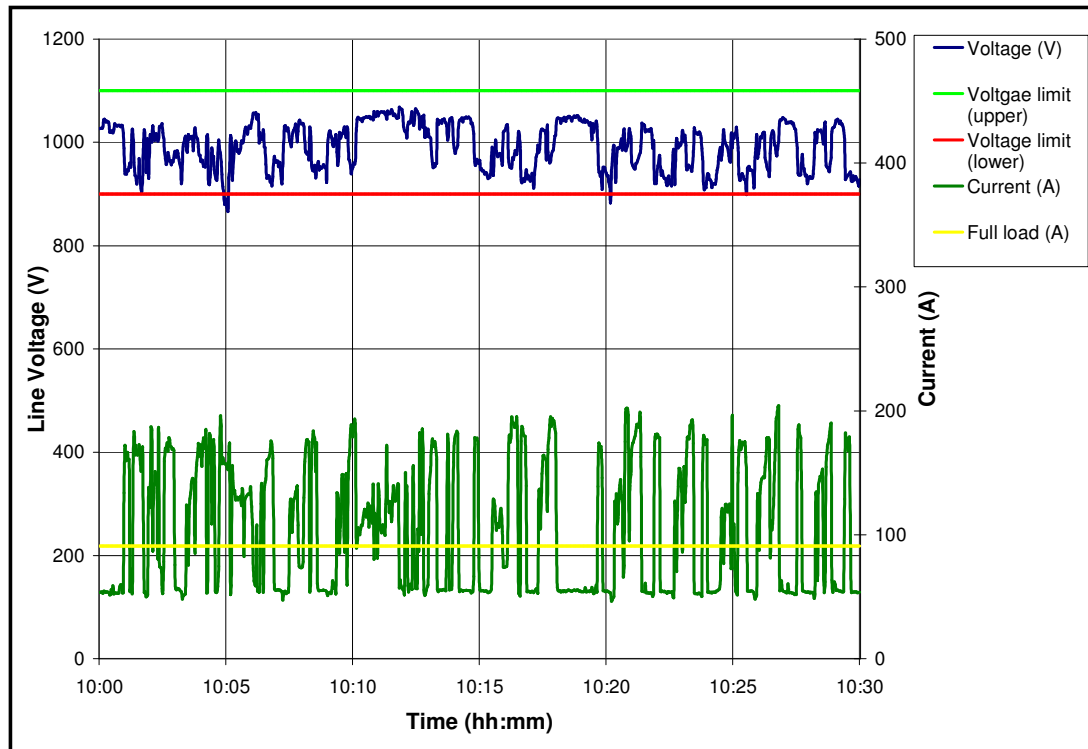


Figure J.1-5: Load current and voltage for a pump motor – 8 June 2005.



**Figure J.1-6: Load current and voltage for a pump motor – 8 June 2005
(30 minute period).**

J.1.1.2 Afternoon shifts

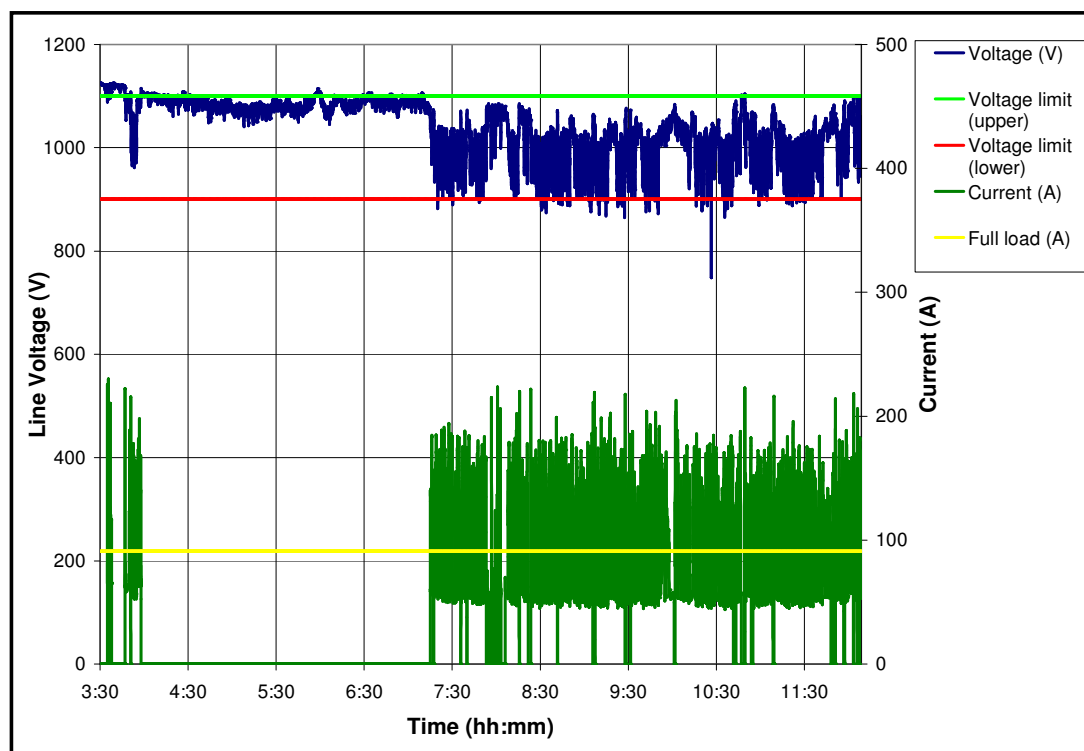
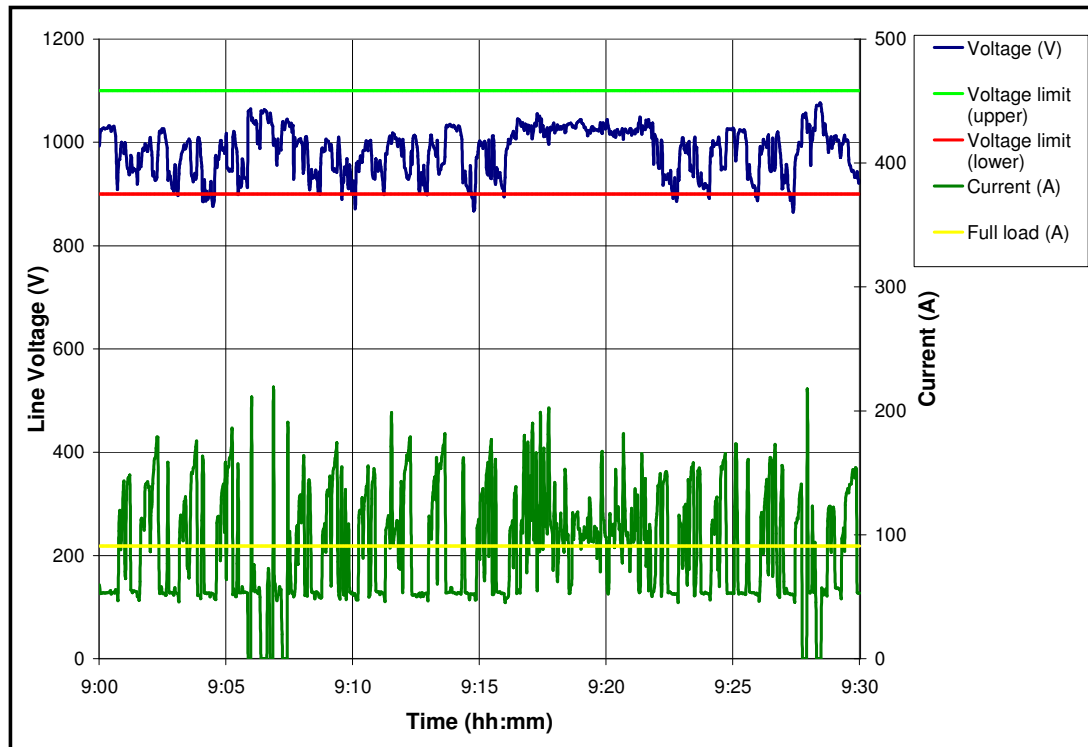


Figure J.1-7: Load current and voltage for a pump motor – 6 June 2005



**Figure J.1-8: Load current and voltage for a pump motor – 6 June 2005
(30 minute period).**

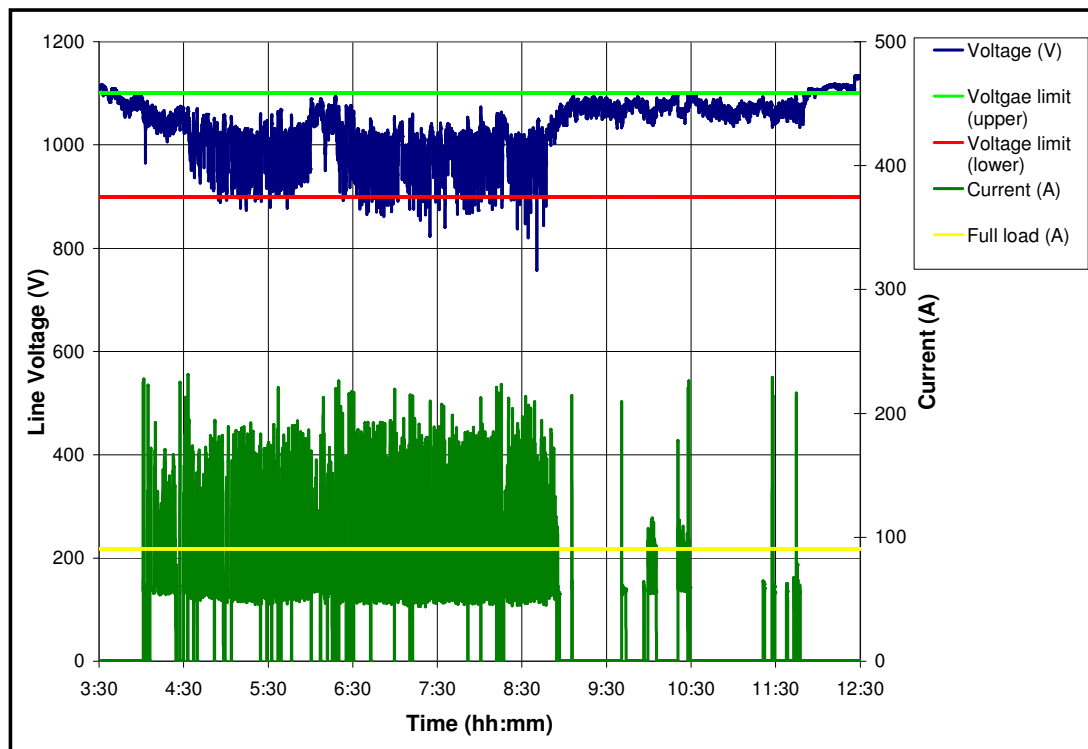
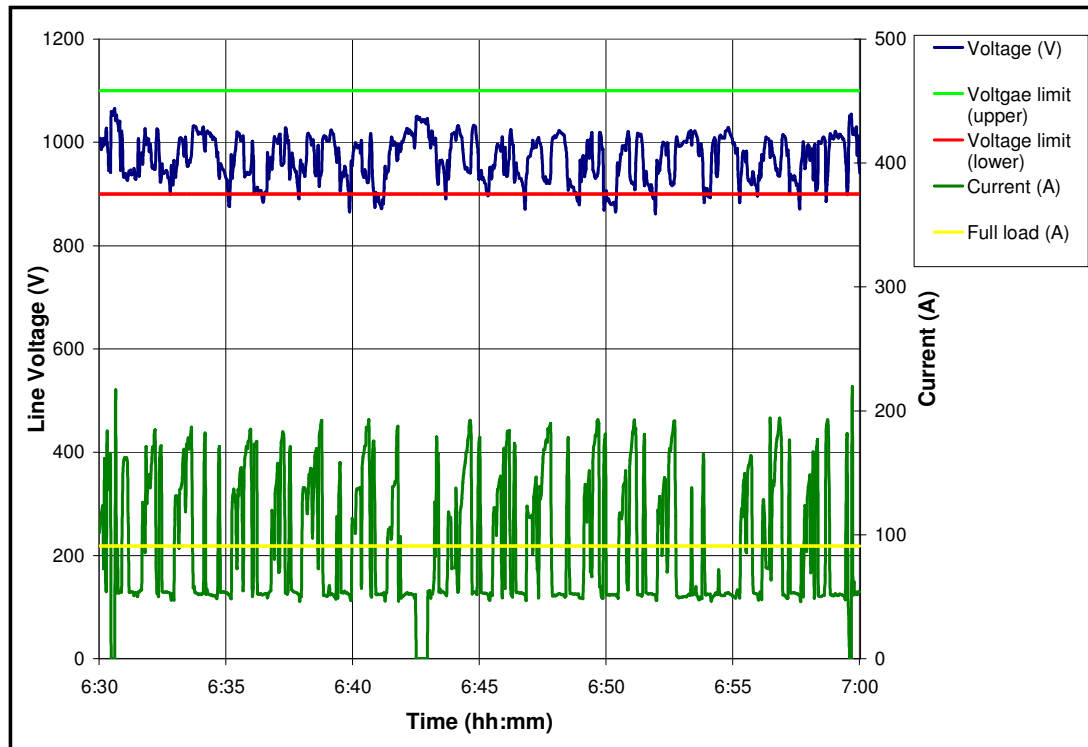


Figure J.1-9: Load current and voltage for a pump motor – 7 June 2005.



**Figure J.1-10: L Load current and voltage for a pump motor – 7 June 2005
(30 minute period).**

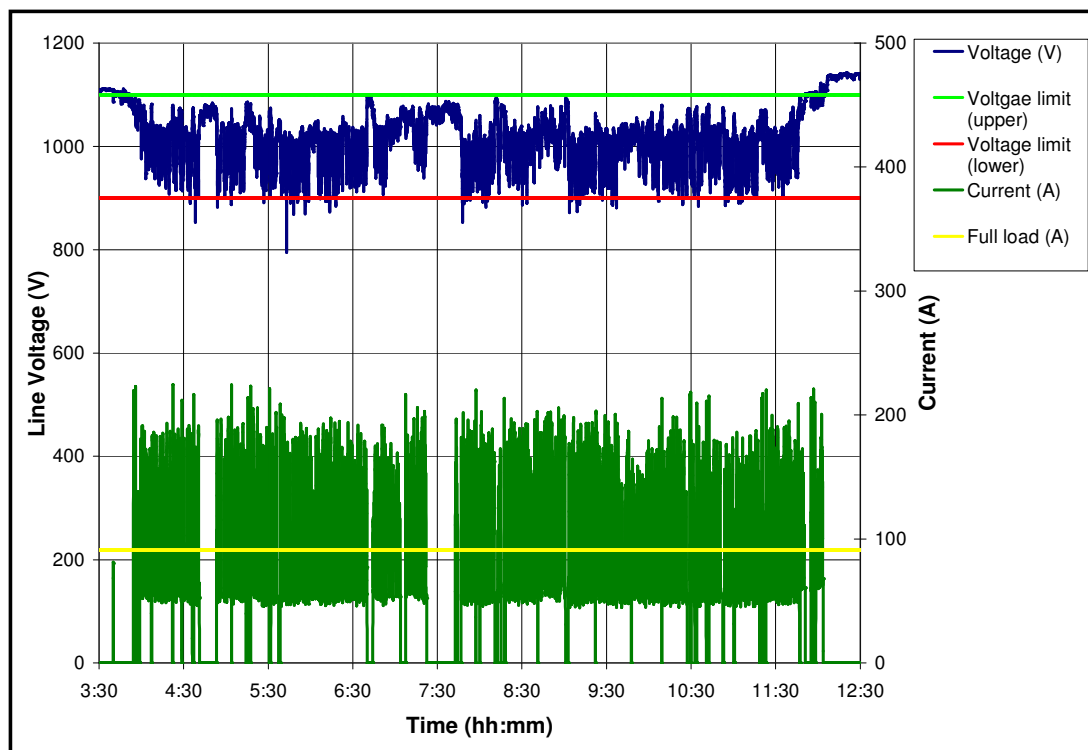
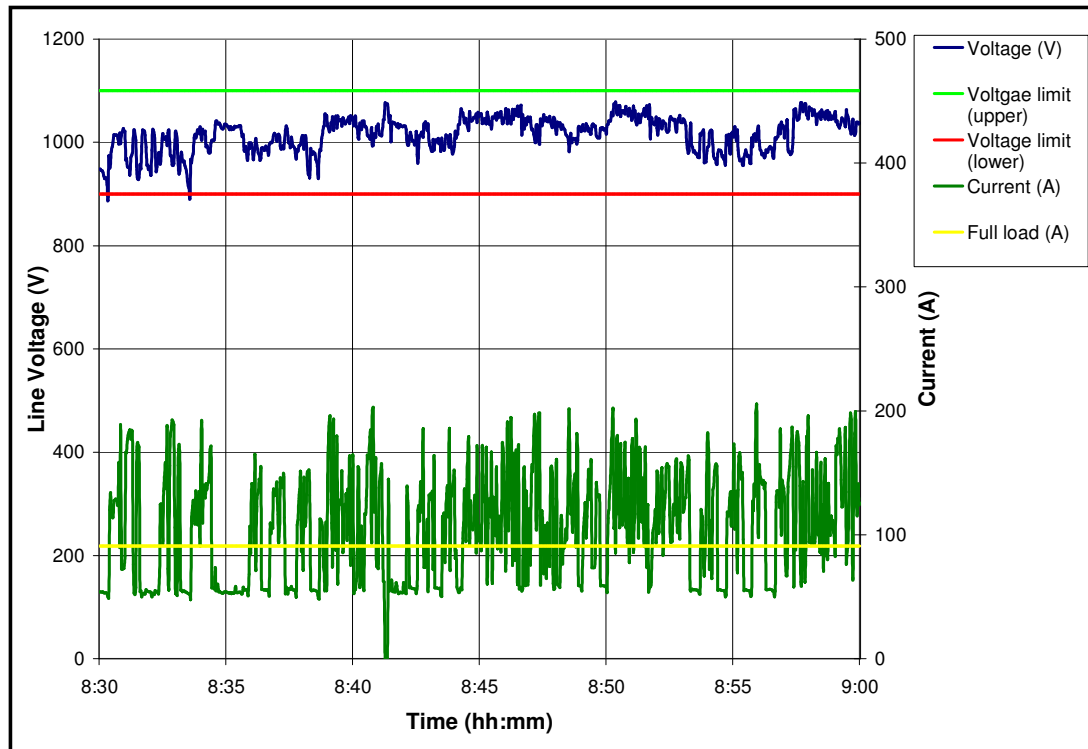


Figure J.1-11: Load current and voltage for a pump motor – 8 June 2005.



**Figure J.1-12: Load current and voltage for a pump motor – 8 June 2005
(30 minute period).**

J.1.2 SECTION 51

J.1.2.1 Morning shifts

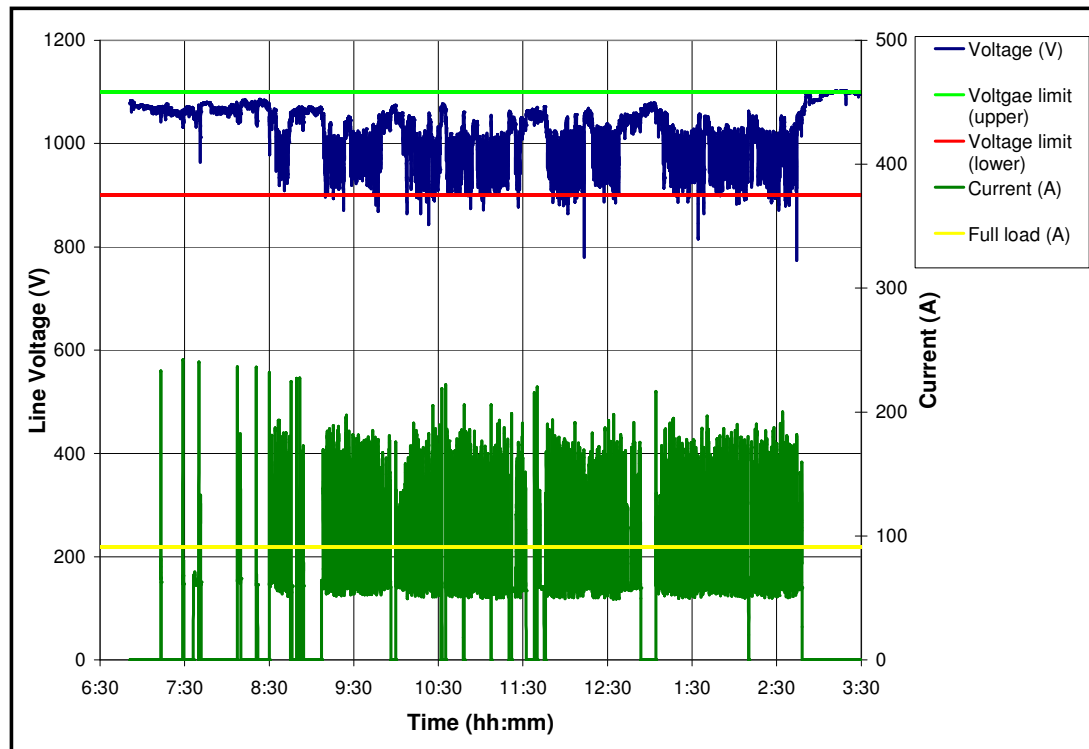
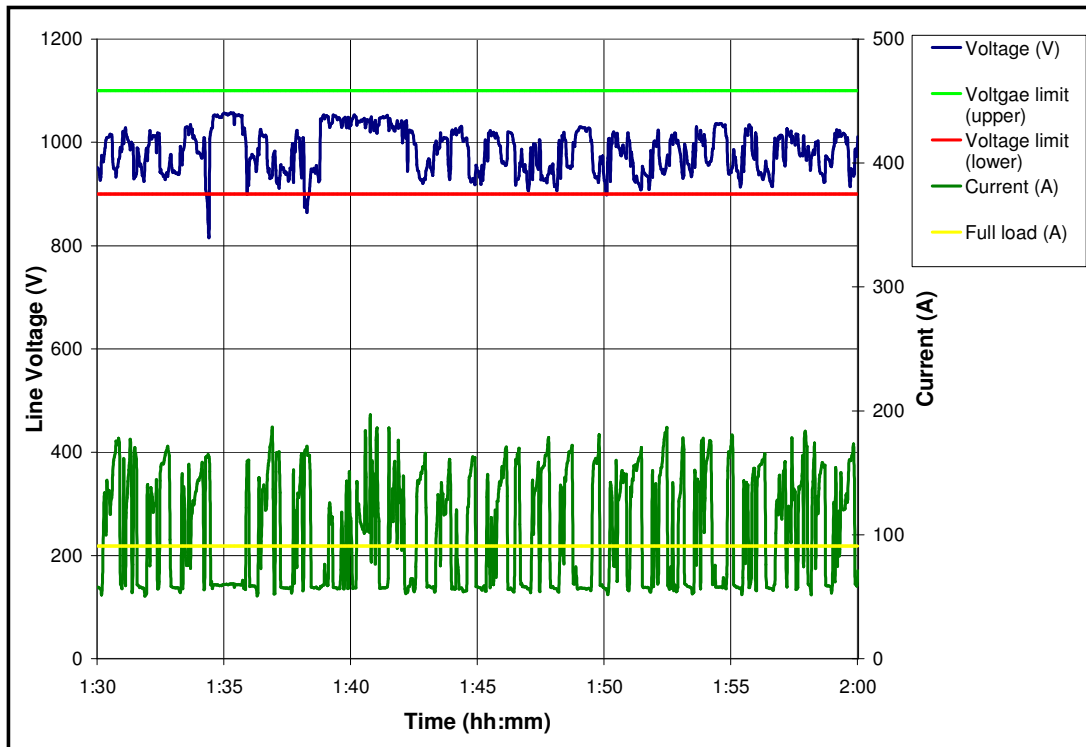


Figure J.1-13: Load current and voltage for a pump motor – 23 June 2005



**Figure J.1-14: Load current and voltage for a pump motor – 23 June 2005
(30 minute period).**

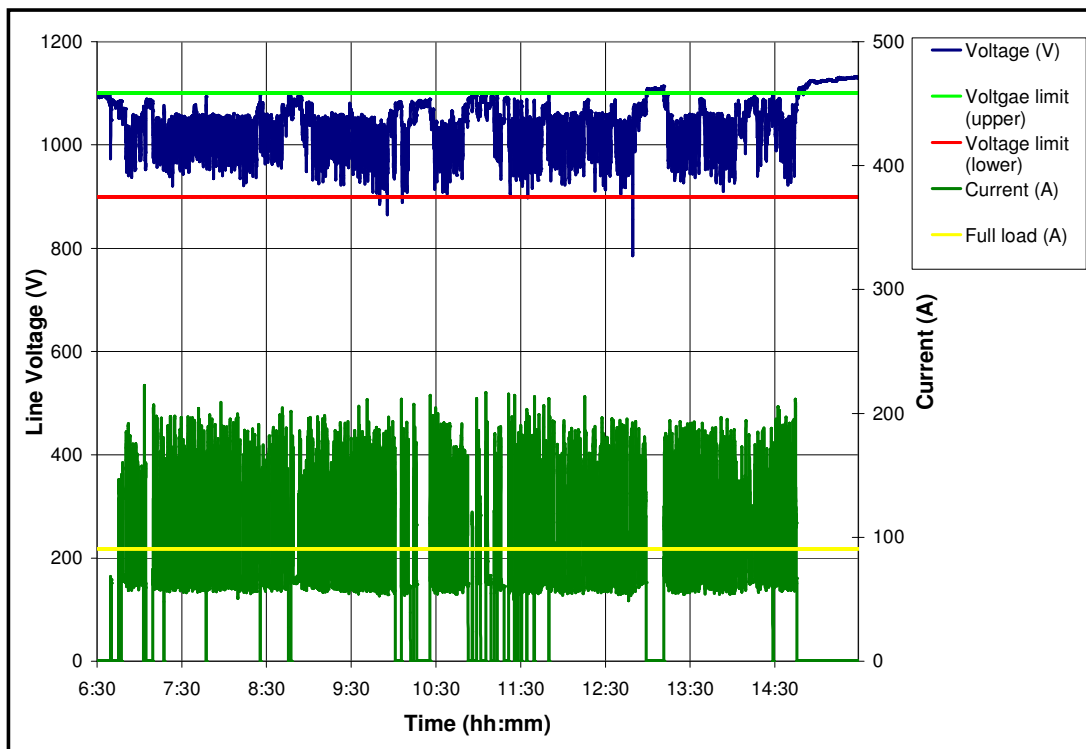
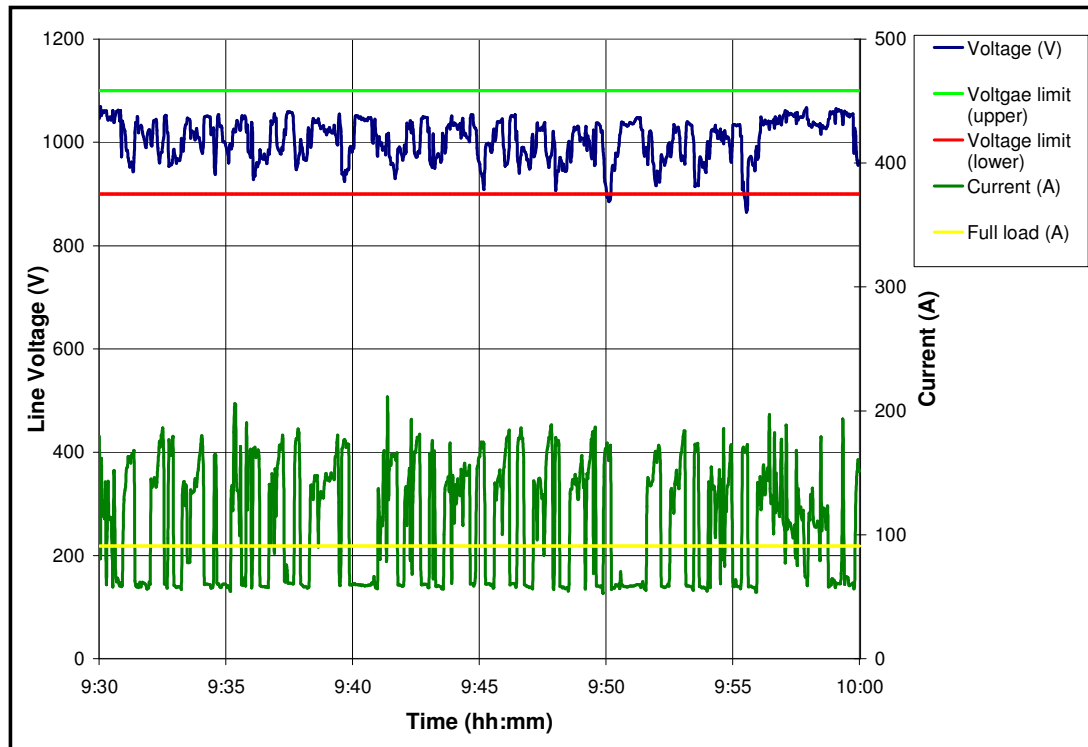


Figure J.1-15: Load current and voltage for a pump motor – 28 June 2005.



**Figure J.1-16: Lo Load current and voltage for a pump motor – 28 June 2005
(30 minute period).**

J.1.2.2 Afternoon shifts

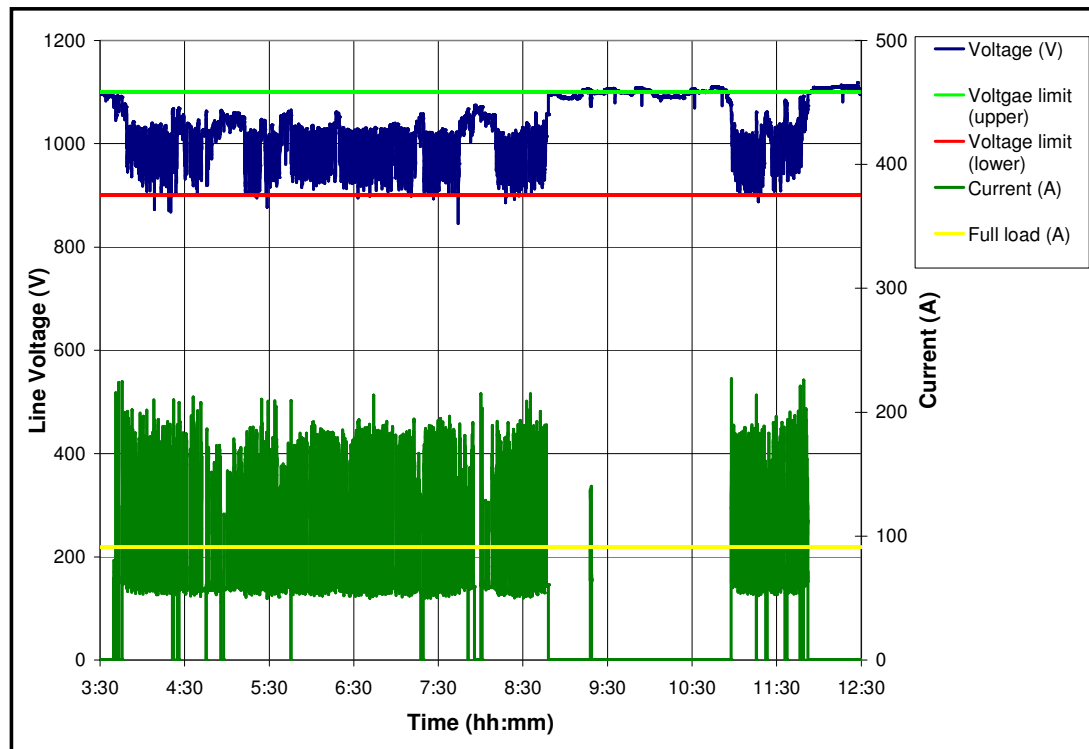
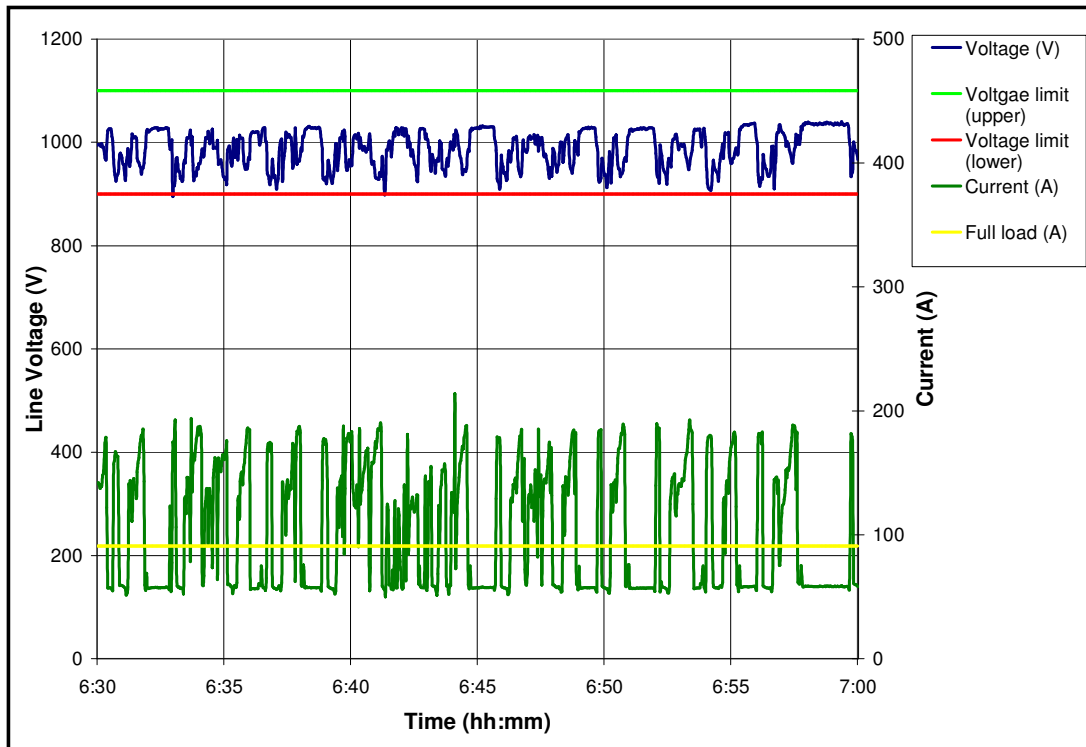


Figure J.1-17: Load current and voltage for a pump motor – 23 June 2005.



**Figure J.1-18: Load current and voltage for a pump motor – 23 June 2005
(30 minute period).**

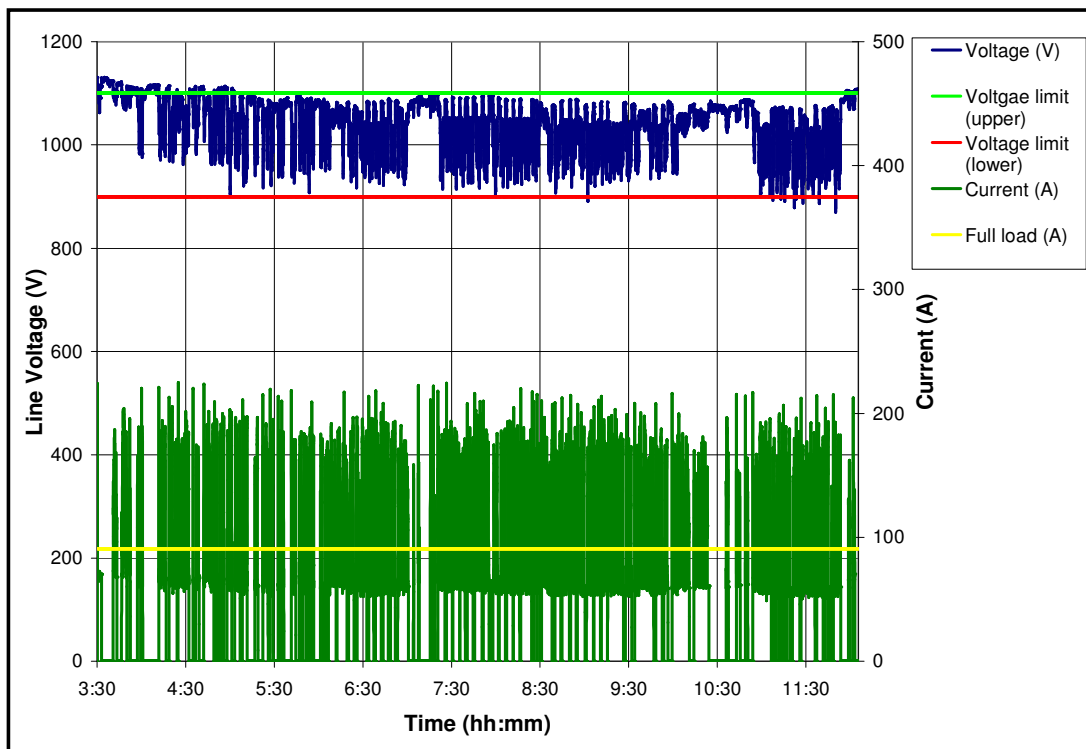
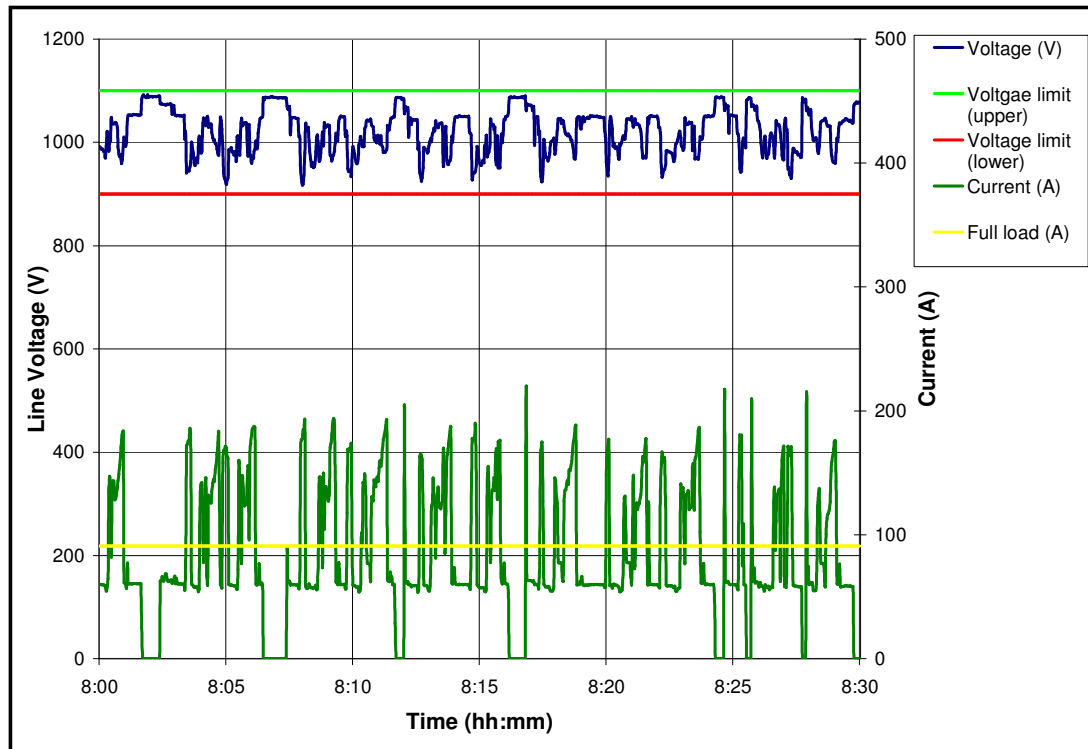


Figure J.1-19: Load current and voltage for a pump motor – 28 June 2005.



**Figure J.1-20: Load current and voltage for a pump motor – 28 June 2005
(30 minute period).**

J.2 HISTOGRAM

The next section focuses on the frequency with which a CMs pump motor consumed a certain load power and current. The graphs show the number of times a certain power or current has been consumed. The tables give data about the tonnes produced during the shift and the percentage time of the shift that the motors were producing. The time that the motors have been over loaded or loaded within the full load rating of the motor is given as a percentage of the actual producing time. The morning shifts and afternoon shifts are separated as well as the measurements made at the different sections.

J.2.1 SECTION 21

J.2.1.1 Morning shifts

Table J-3: Data for the total consumption of a pump motor in section 21.

	6-Jun-05	7-Jun-05	8-Jun-05
Tonnes/CM/Shift	2079	1925	1750
% Time of shift producing	78.14%	58.06%	63.24%
% of Production time underloaded	51.83%	52.29%	54.57%
% of Production time overloaded	48.17%	47.71%	45.43%

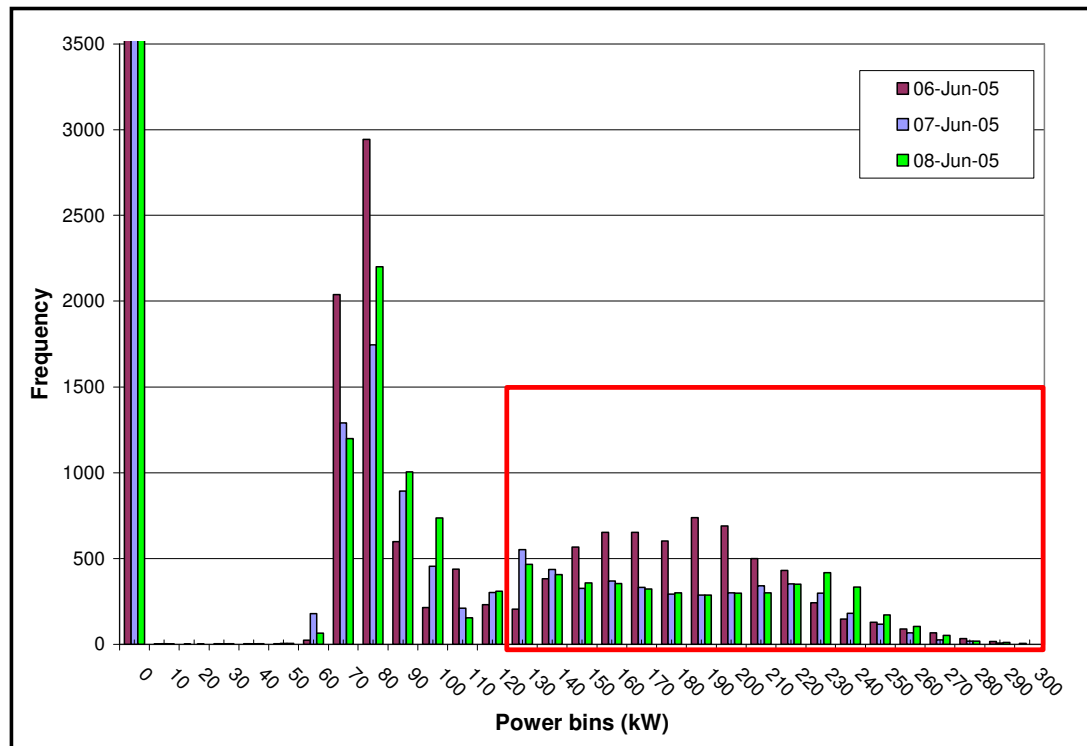


Figure J.2-1: Histogram for power consumed by a pump motor.

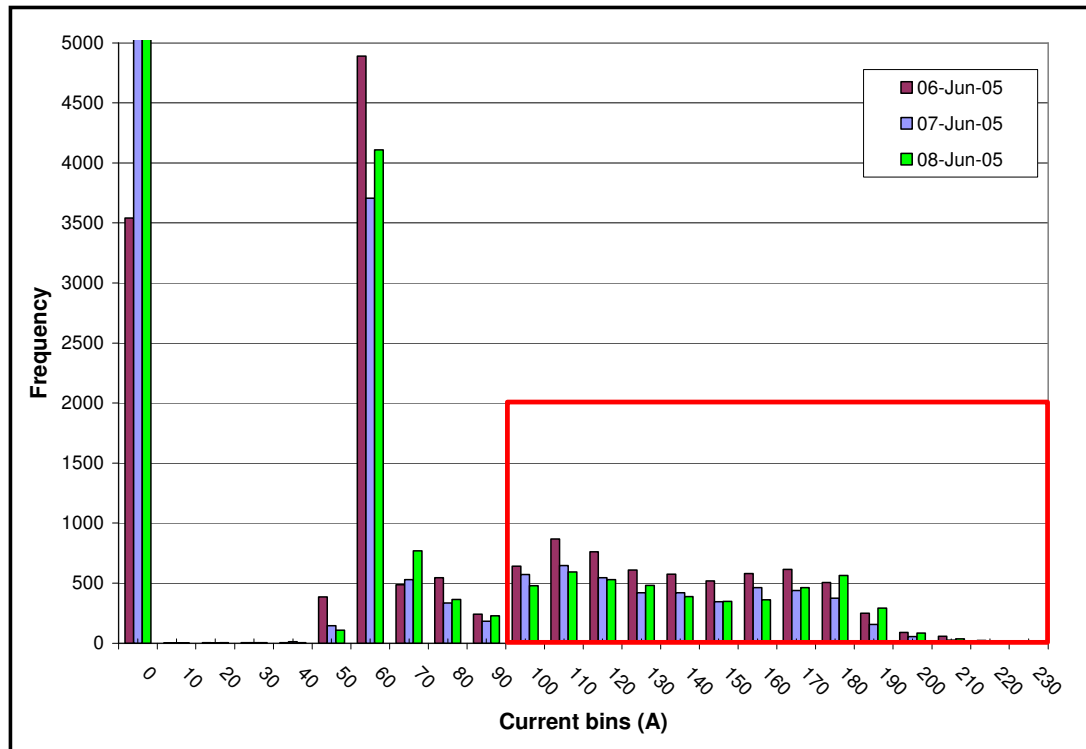


Figure J.2-2: Histogram for current consumed by a pump motor.

J.2.1.2 Afternoon shifts

Table J-4: Data for the total consumption of a pump motor in section 21.

	6-Jun-05	7-Jun-05	8-Jun-05
Tonnes/CM/Shift	1485	1435	2240
% Time of shift producing	54.83%	55.67%	77.40%
% of Production time underloaded	51.34%	55.38%	52.49%
% of Production time overloaded	48.66%	44.62%	47.51%

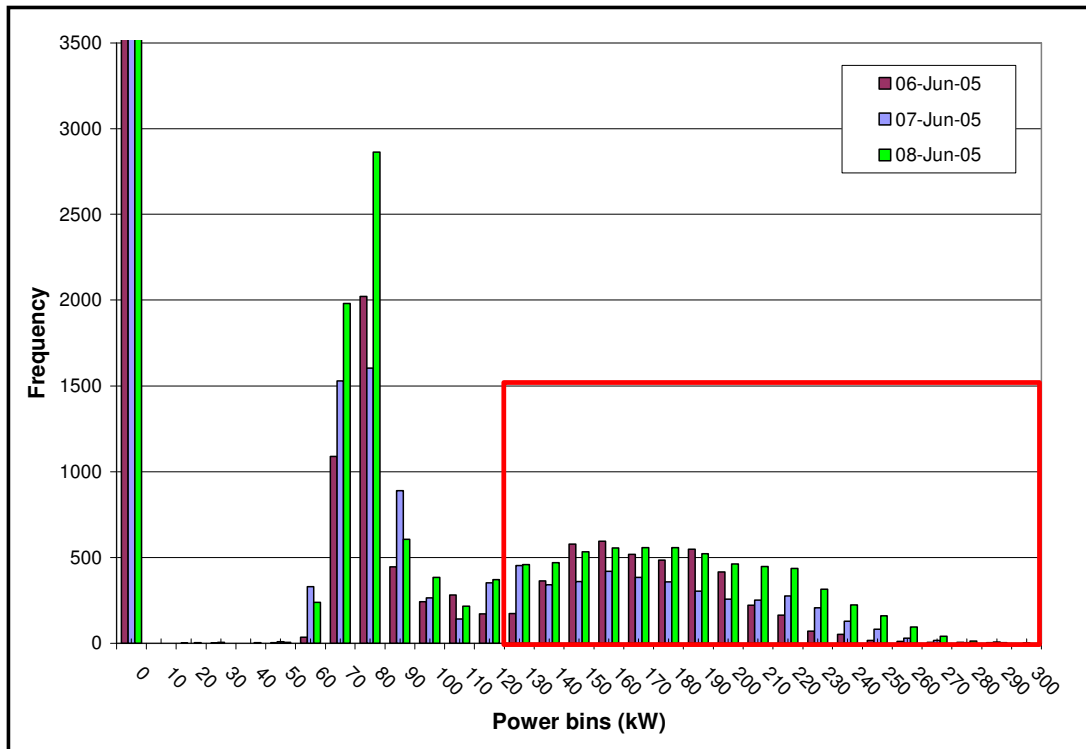


Figure J.2-3: Histogram for power consumed by a pump motor.

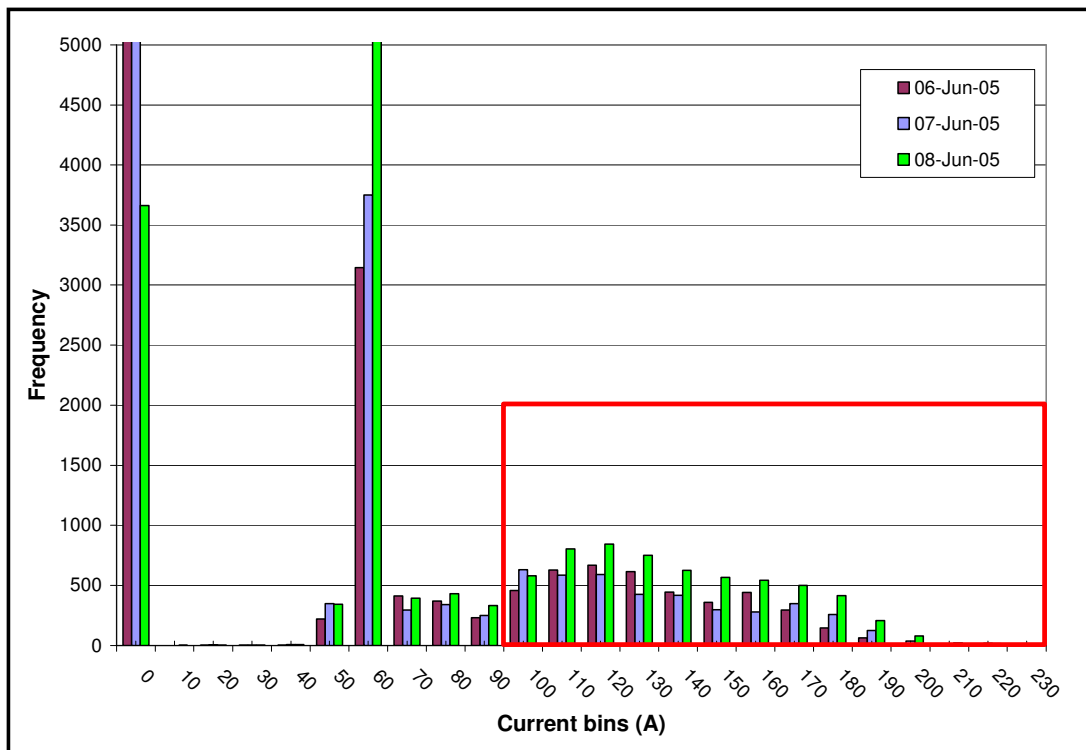


Figure J.2-4: Histogram for current consumed by a pump motor.

J.2.2 SECTION 51

J.2.2.1 Morning shifts

Table J-5: D Data for the total consumption of a pump motor in section 51.

	23-Jun-05	28-Jun-05
Tonnes/CM/Shift	1856	2204
% Time of shift producing	65.84%	79.22%
% of Production time underloaded	51.38%	49.05%
% of Production time overloaded	48.62%	50.95%

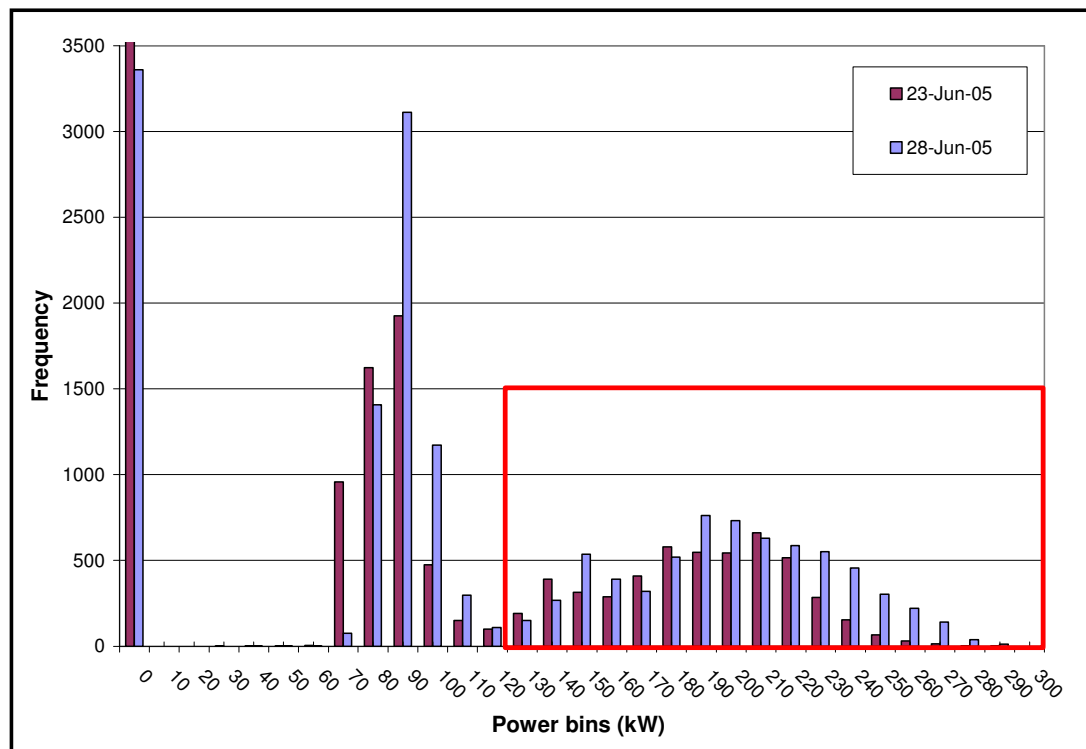


Figure J.2-5: Histogram for power consumed by a pump motor.

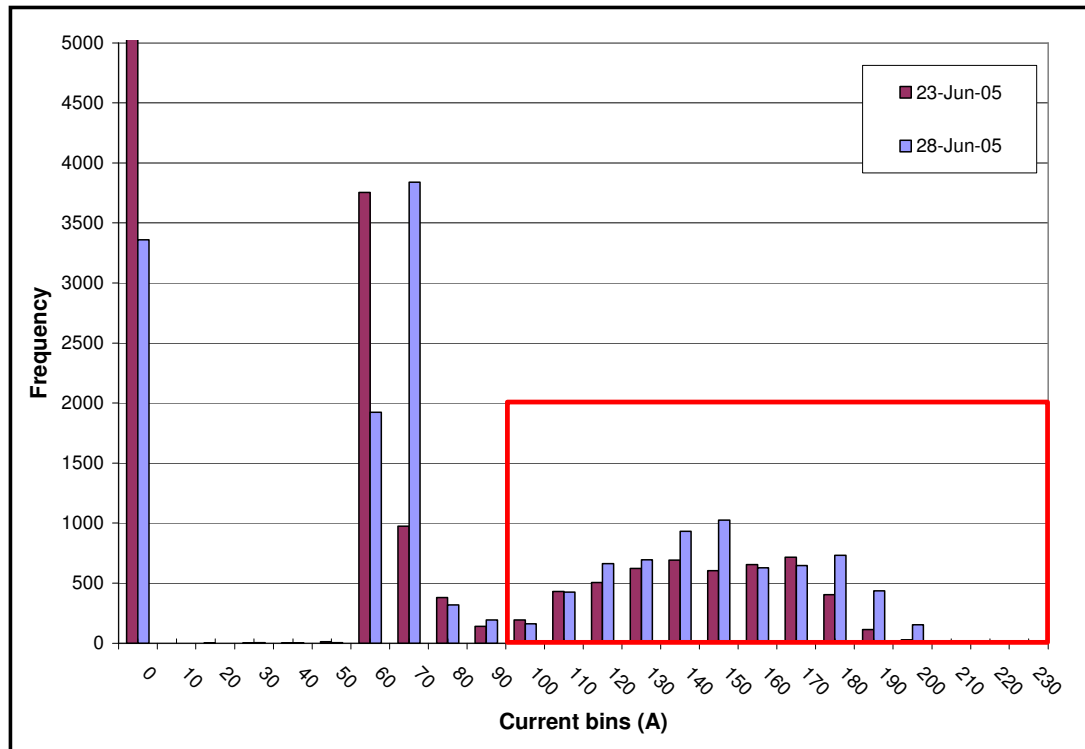


Figure J.2-6: Histogram for current consumed by a pump motor.

J.2.2.2 Afternoon shifts

Table J-6: Data for the total consumption of a pump motor in section 51.

	23-Jun-05	28-Jun-05
Tonnes/CM/Shift	1566	1740
% Time of shift producing	63.73%	64.96%
% of Production time underloaded	51.55%	51.63%
% of Production time overloaded	48.45%	48.37%

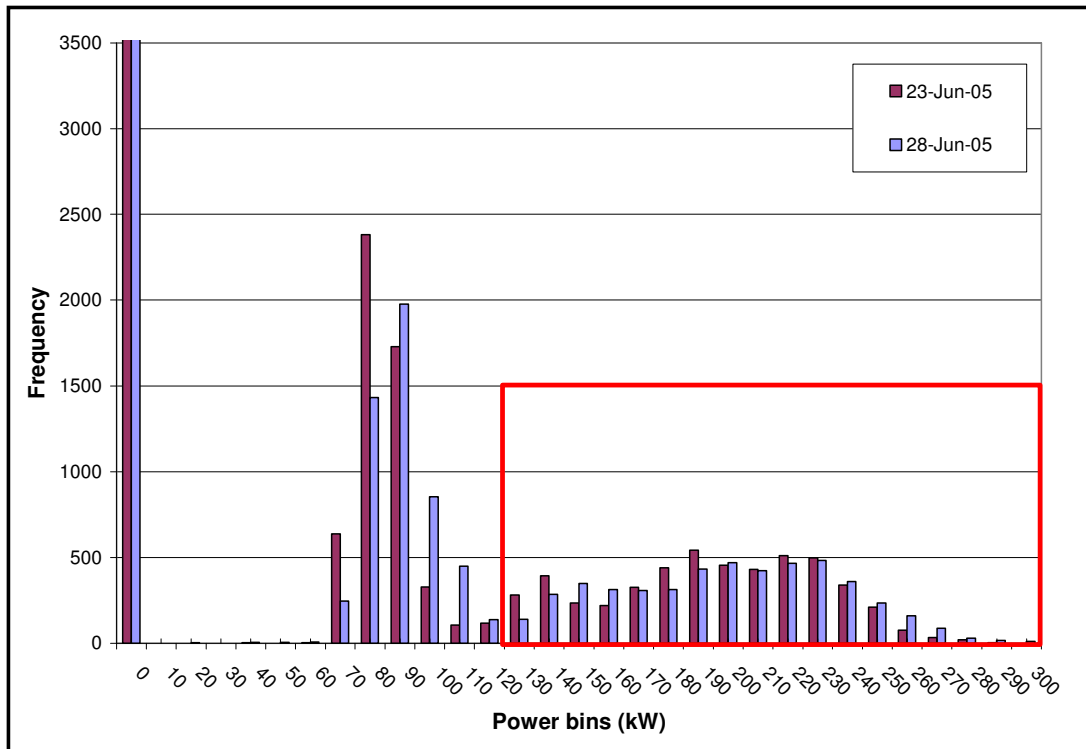


Figure J.2-7: Histogram for power consumed by a pump motor.

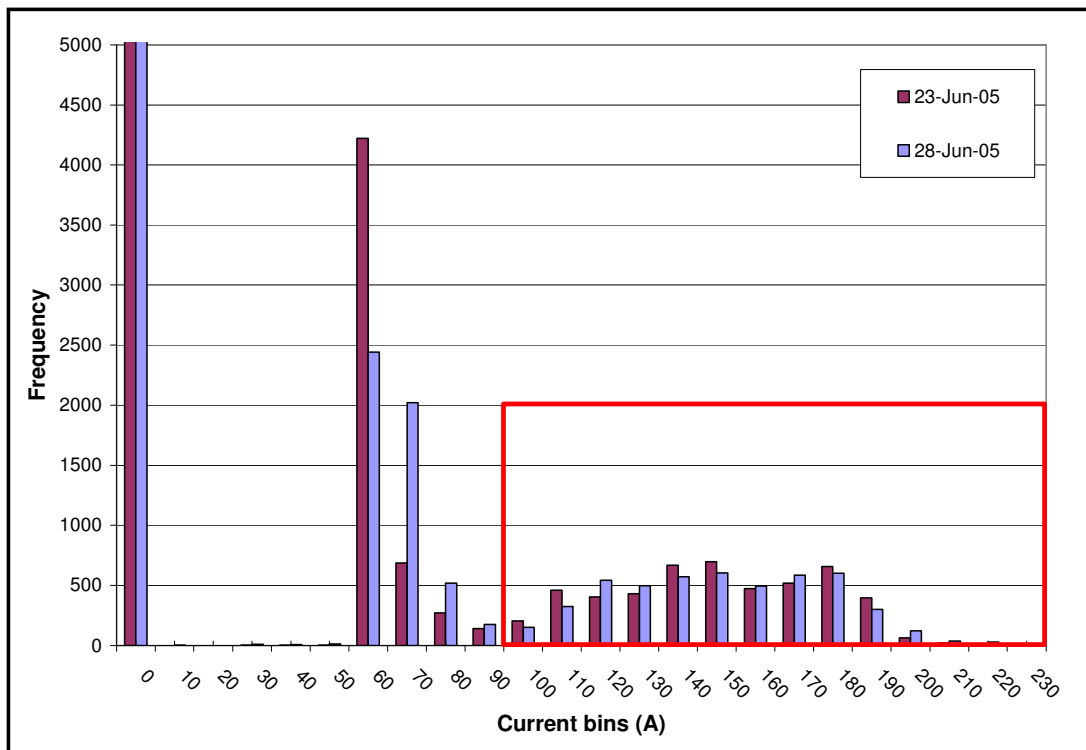


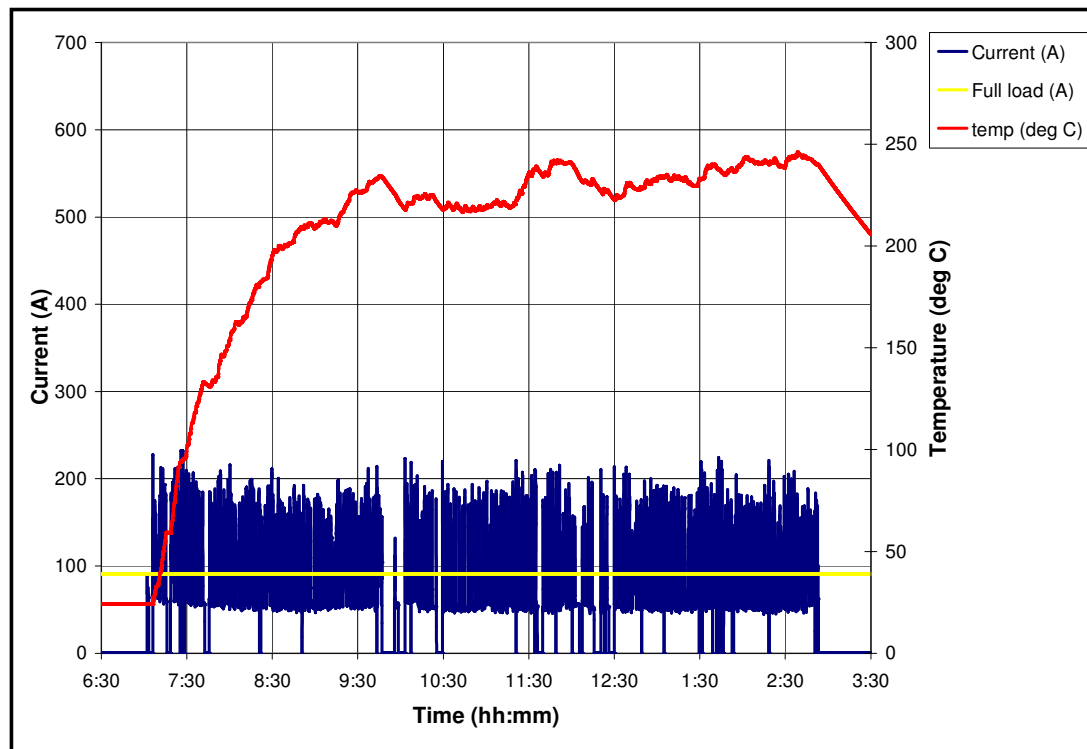
Figure J.2-8: Histogram for current consumed by a pump motor.

J.3 THERMAL CAPACITY

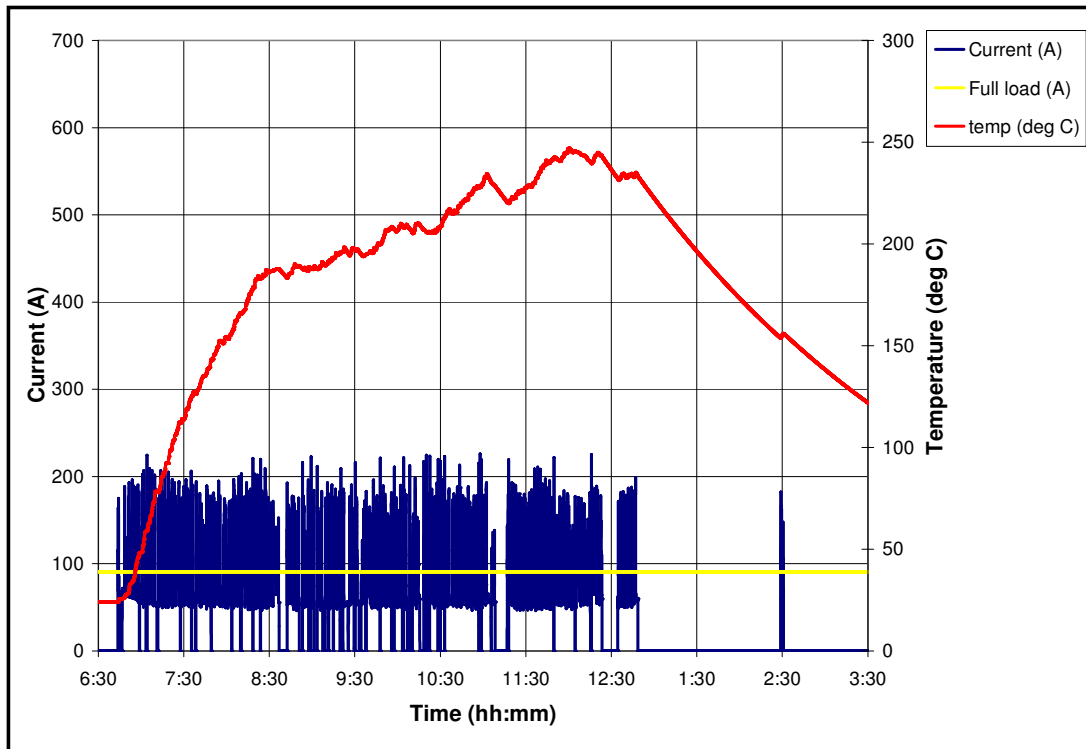
The next section focuses on the temperature of the windings of the pump motor. Each graph shows the temperature of the motor, the load current and rated full load current of the motor. The morning shifts and afternoon shifts are separated as well as the measurements made at the different sections. The thermal time constant is 60 minutes.

J.3.1 SECTION 21

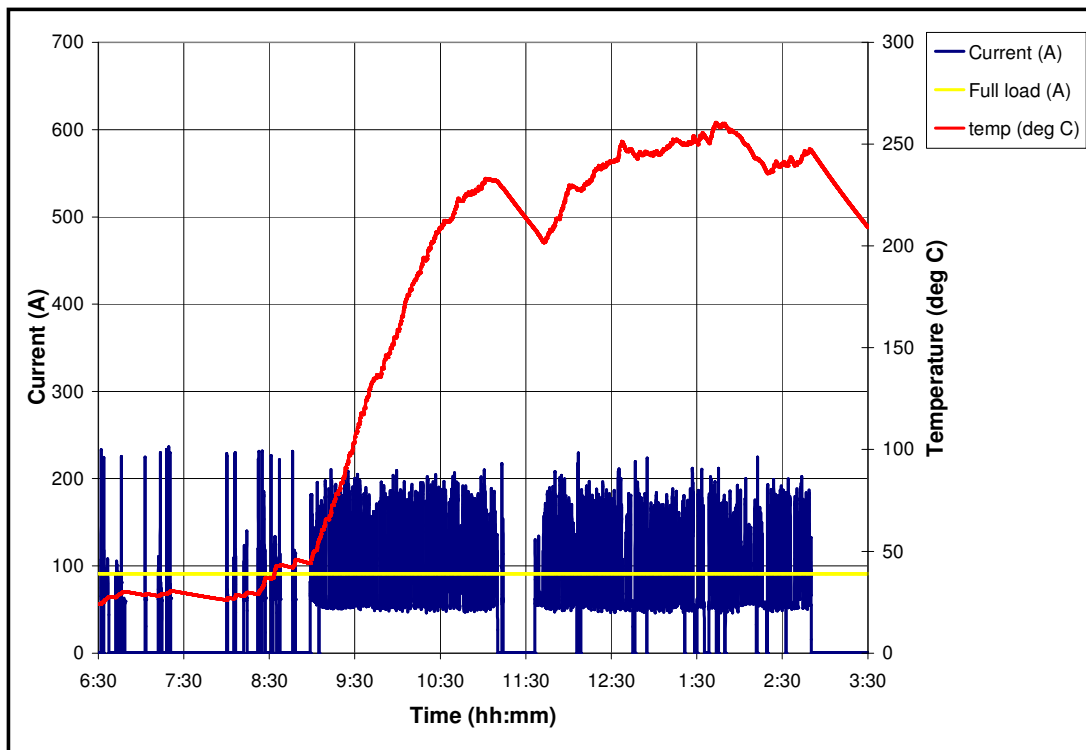
J.3.1.1 Morning shifts



**Figure J.3-1: Load current and motor temperature for a pump motor
– 6 June 2005.**

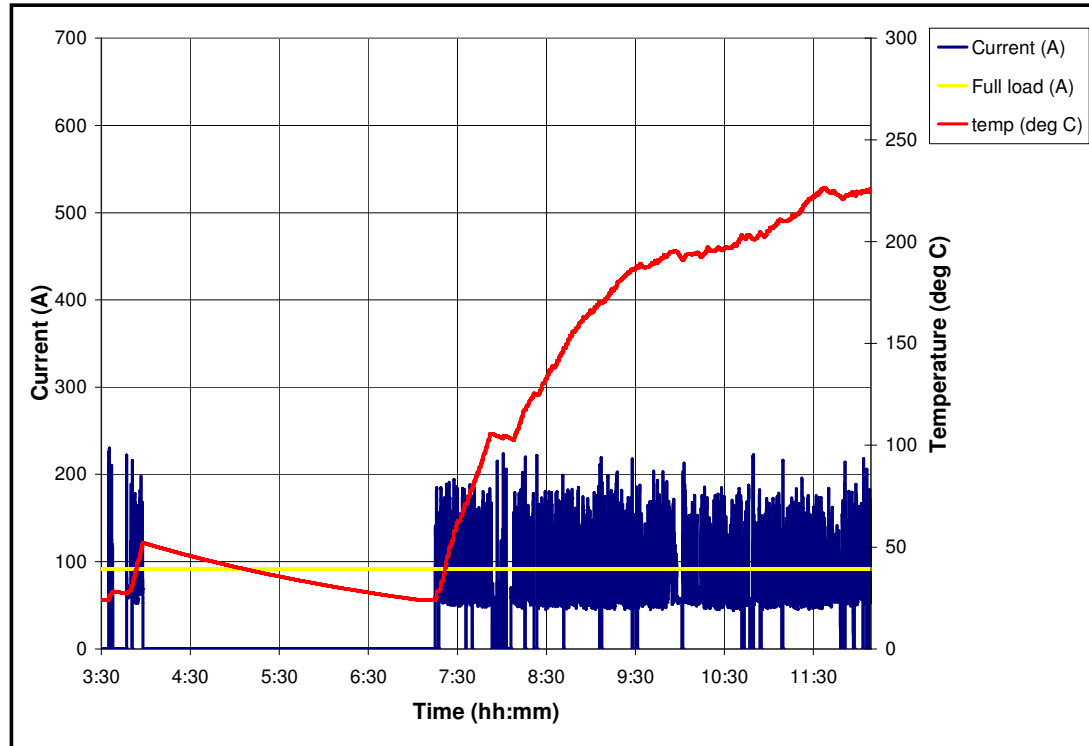


**Figure J.3-2: Load current and motor temperature for a pump motor
– 7 June 2005.**

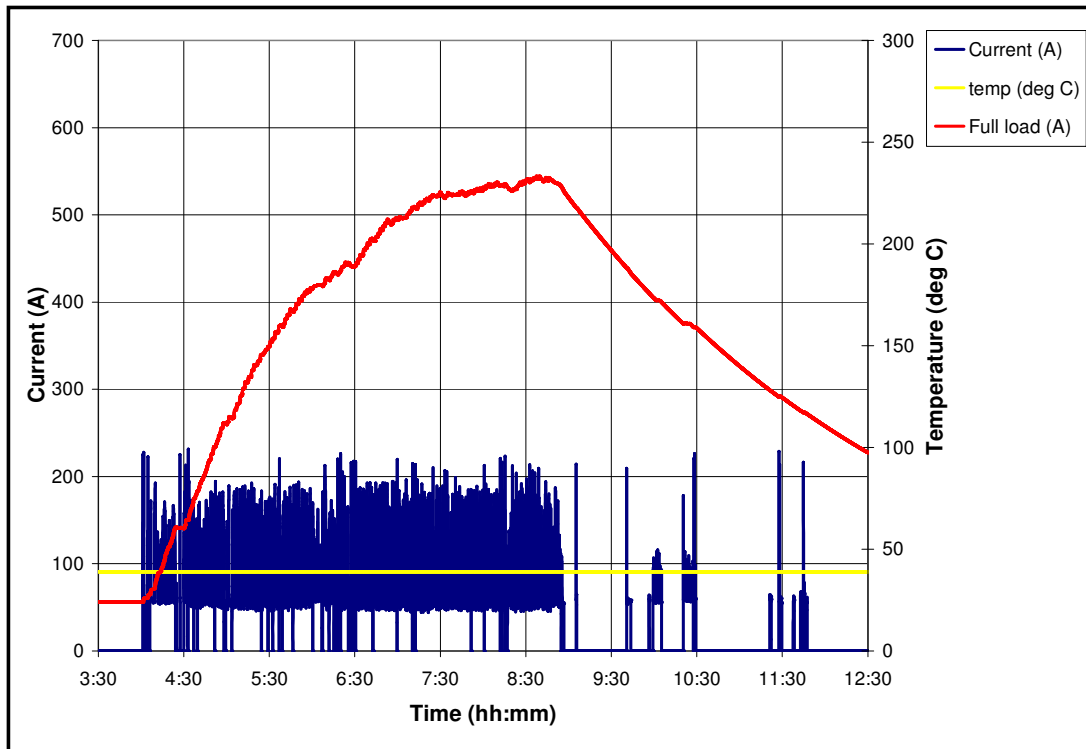


**Figure J.3-3: Load current and motor temperature for a pump motor
– 8 June 2005.**

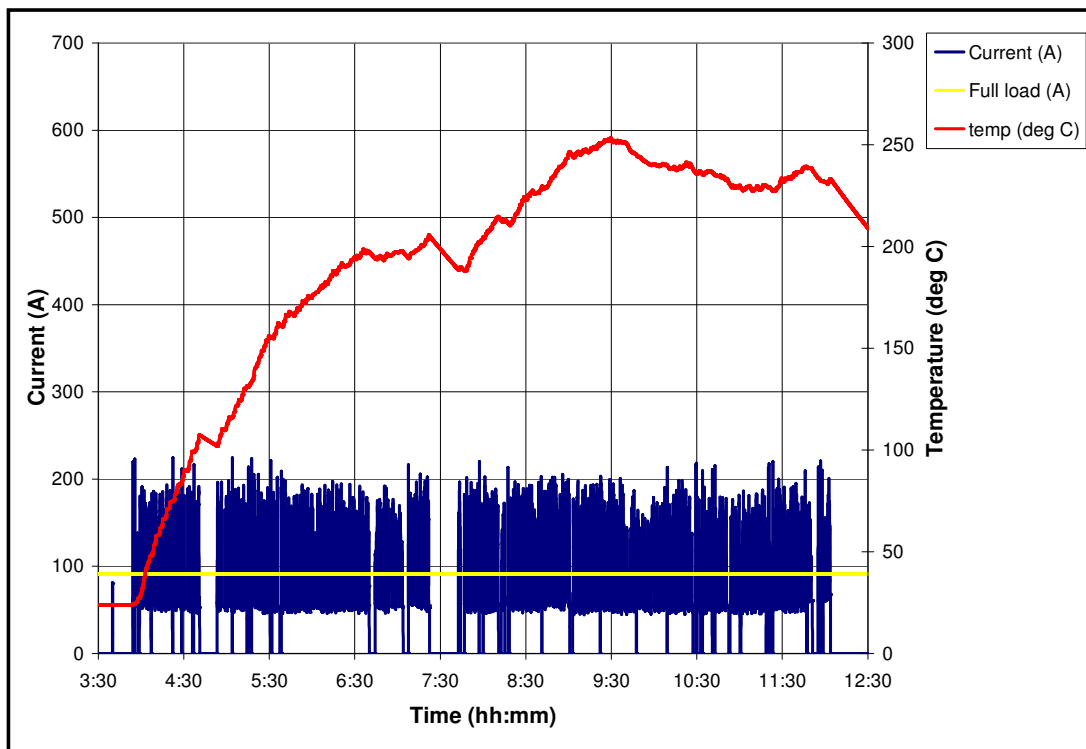
J.3.1.2 Afternoon shifts



**Figure J.3-4: Load current and motor temperature for a pump motor
– 6 June 2005.**



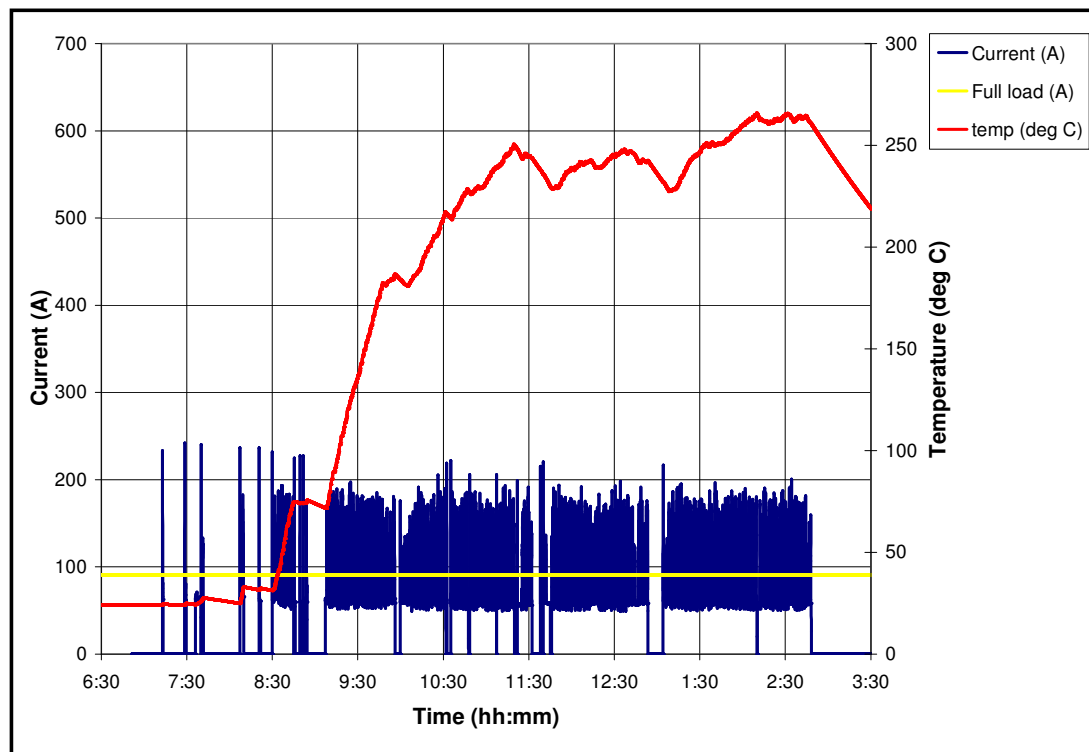
**Figure J.3-5: Load current and motor temperature for a pump motor
– 7 June 2005.**



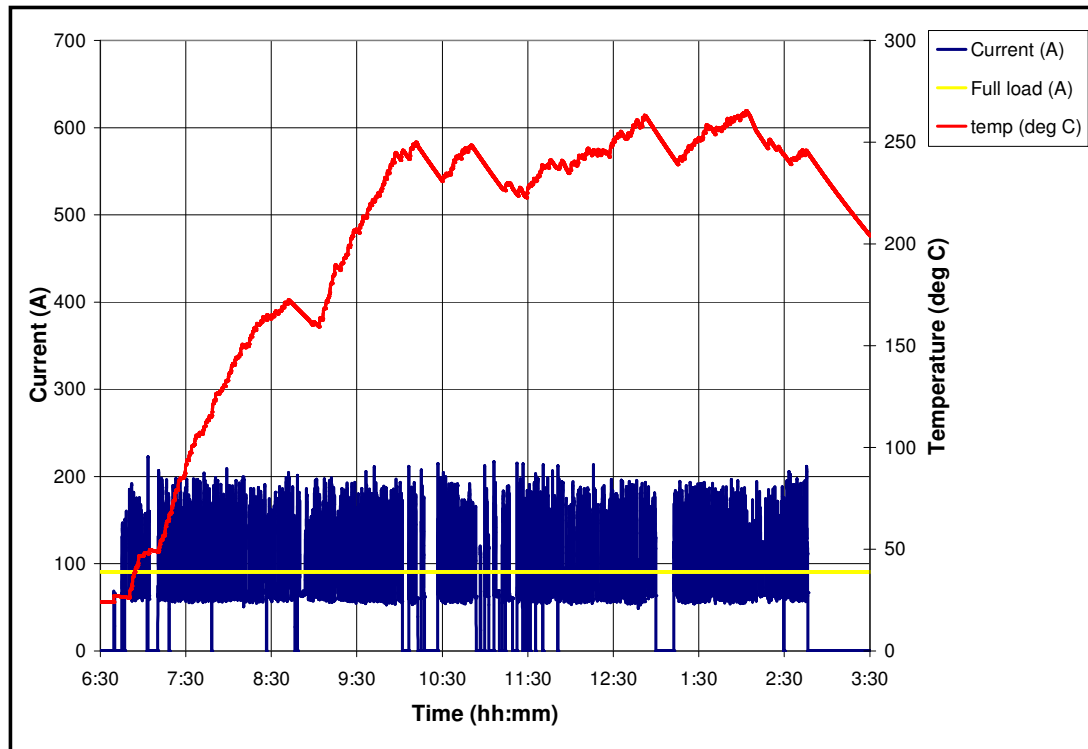
**Figure J.3-6: Load current and motor temperature for a pump motor
– 8 June 2005.**

J.3.2 SECTION 51

J.3.2.1 Morning shifts

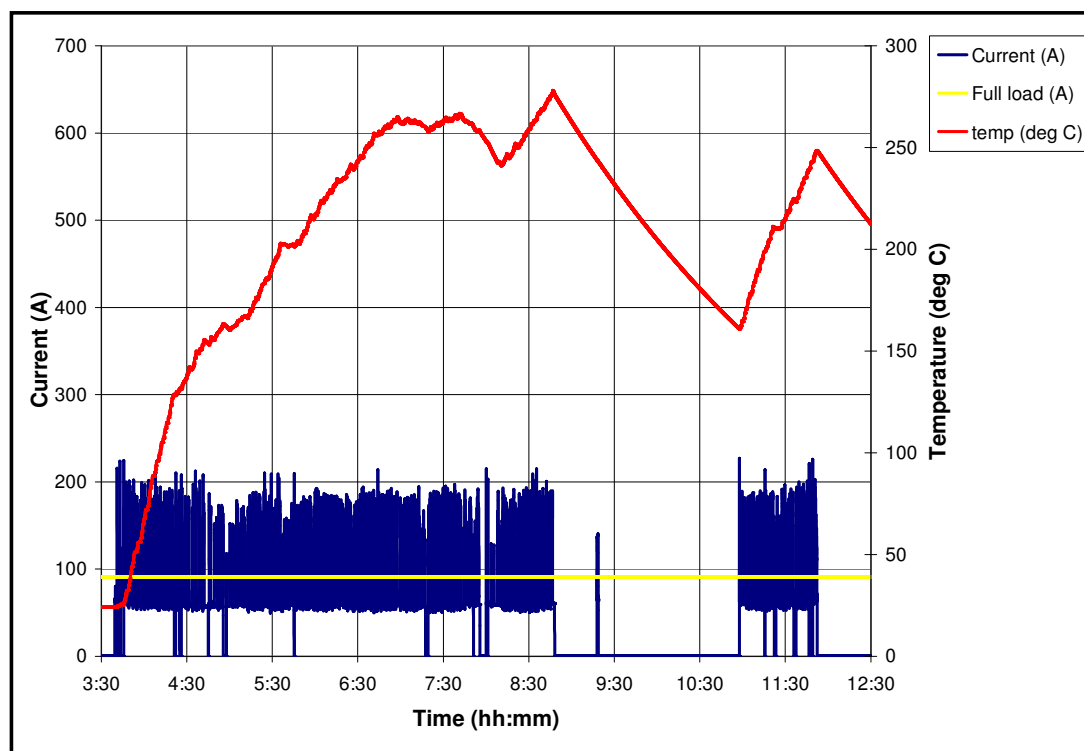


**Figure J.3-7: Load current and motor temperature for a pump motor
– 23 June 2005.**

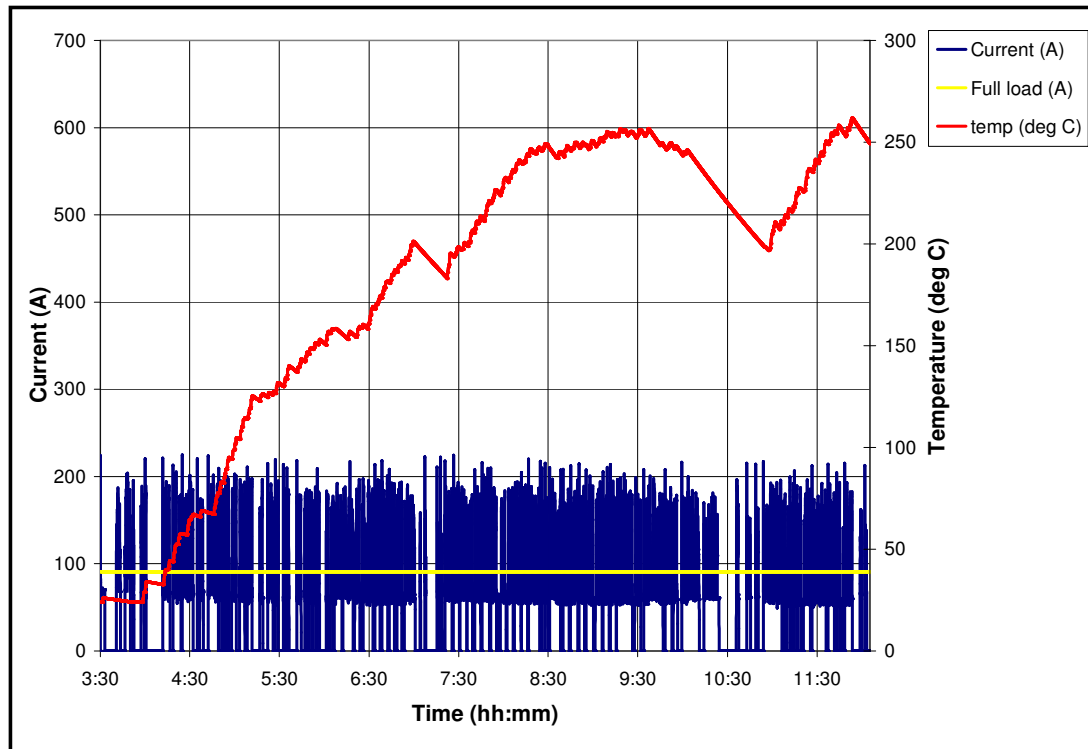


**Figure J.3-8: Load current and motor temperature for a pump motor
– 28 June 2005.**

J.3.2.2 Afternoon shifts



**Figure J.3-9: Load current and motor temperature for a pump motor
– 23 June 2005.**



**Figure J.3-10: Load current and motor temperature for a pump motor
– 28 June 2005.**