

Analysis of Electricity Usage

The results from the Dent Smart Loggers are as follows:

Dent Smart Logger Number	Placed on Welding Machine Number	On-time (hours)
2	FCAW #7	9.2
3	SMAW #9	2.0
4	FCAW #5	n/a

Table 8 - Dent Smart Logger On-Time Chart

Dent Smart Logger #4 had an error and did not record any electricity usage. The data received from the loggers was analyzed with Alex Hebert.

The variance in the on-time hours of Dent Smart Logger 2 and 3 (as shown in the above table) is significant and given the estimates by Dave Helman, it was decided that the higher on-time of 9.2 hours is a more accurate representation. The on-time of 9.2 hours was used in analyzing electricity usage.

Using the information provided by Lincoln Electric (as shown in Appendix G), an estimate of energy consumption was calculated using the following formulas.

$$\text{Total kilowatts} = \frac{\text{voltage} \times \text{amps}}{1000}$$

$$\text{Time used} = \frac{\text{on time hours}}{\text{logged weekdays} \times \text{hrs per day}} * \text{weekdays per year} * \text{work hrs per day}$$

$$\text{Total kilowatt hours in 1 year} = \text{total kilowatts} \times \text{time used}$$

Analyses using the Dent Smart loggers' on-time of 9.2 hours (5.3% of the total available time) and one using the 35% usage rate estimated by Dave Helman were conducted and then compared.

The total kilowatt hours in one year was calculated for both high draw and phantom draw. Each figure was then multiplied by \$0.068 (price/kWh) and added together. The total cost was multiplied by 16 students, yielding a yearly cost range of between \$3,481.92 and \$16,942.20.

The following chart outlines the results from both analyses:

	Energy cost estimate using 5.3%	Energy cost estimate using 35% Usage
High Draw kWh/yr.	2314	14,963
Phantom Draw kWh/yr.	887	609
Cost/Machine/Year	\$217.62	\$1,058.89
Total Cost of 16 Students	\$3,481.92	\$16,942.20

Table 9 - Analysis of Total Electricity Consumption

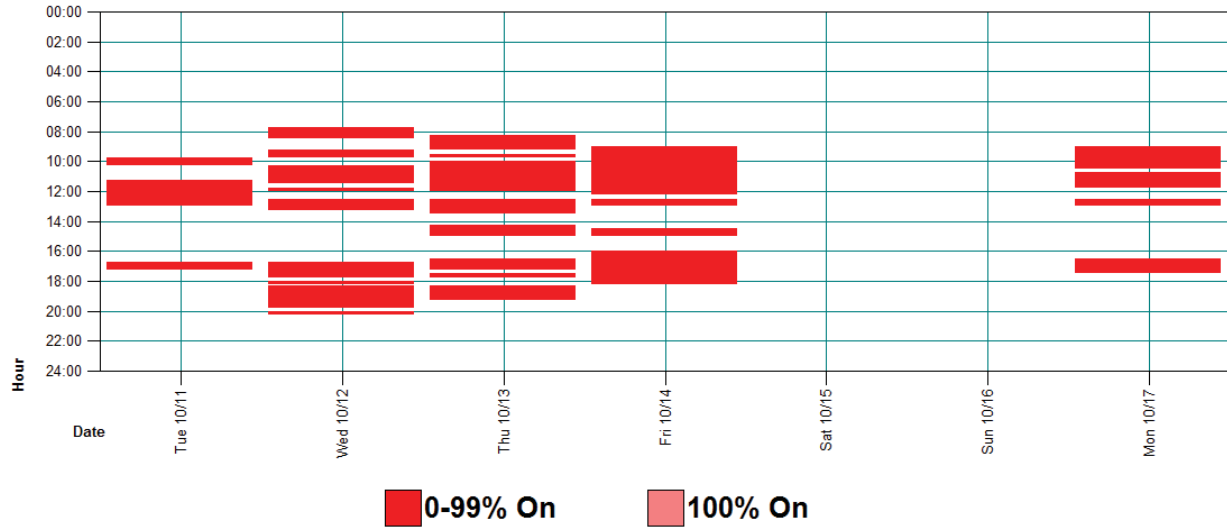
Appendix R – Dent Smart Logger Summaries and On-Time Graphs

Summary for Logger 2 - Removed November 2, 2011

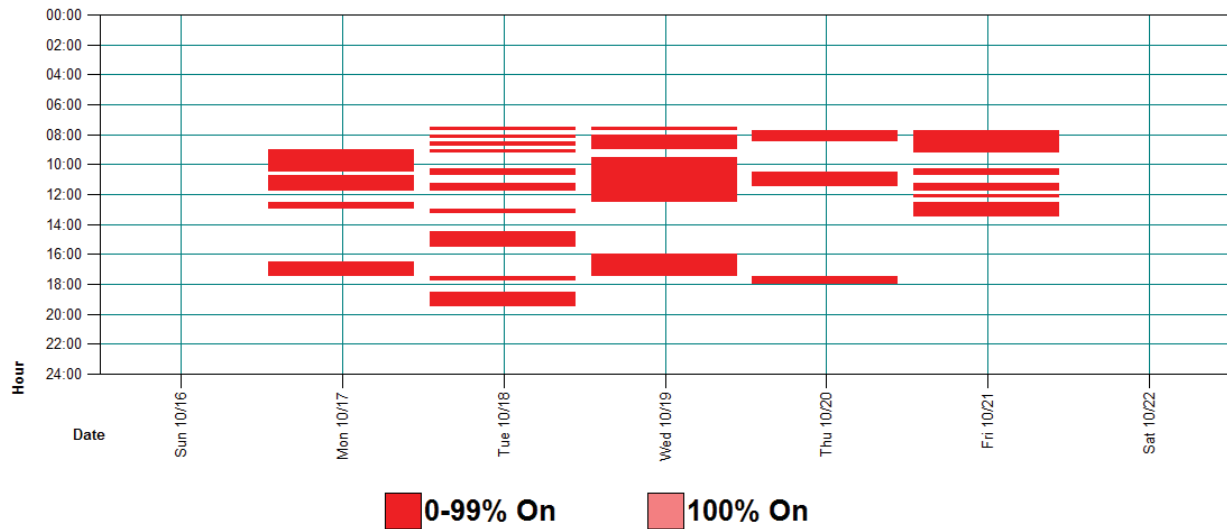
Data File Name:	Logger 2 Nov 4 2011.log
Logger Serial Number:	ML10070023
Description:	DENT SMART LOGGER
Logger Reset:	10/11/2011 9:12:23 AM
Elapsed Time Since Reset:	578.97 hrs
On-Time Since Reset:	9.20 hrs
Percent On Since Reset:	1.59%
Connected Load:	No Load Define
Energy Cost:	Unknown
Data Starts:	10/11/2011 9:12:23 AM
Data Ends:	11/4/2011 12:10:54 PM
Data Elapsed Time:	578.98 hrs
Estimated Annual Hours O	140 hrs
Number of Turn Ons:	3216
Percent On:	1.59 %
Data On-Time:	9.22 hrs
Average On-Time:	0.00 hrs
Longest On-Time:	0.07 hrs
Shortest On-Time:	< 0.01 hrs
Number of Turn Offs:	3217
Percent Off:	98.41 %
Data Off-Time:	569.75 hrs
Average Off-Time:	0.18 hrs
Longest Off-Time:	66.44 hrs
Shortest Off-Time:	< 0.01 hrs

On-Time Graph for Logger 2 - Removed November 2, 2011

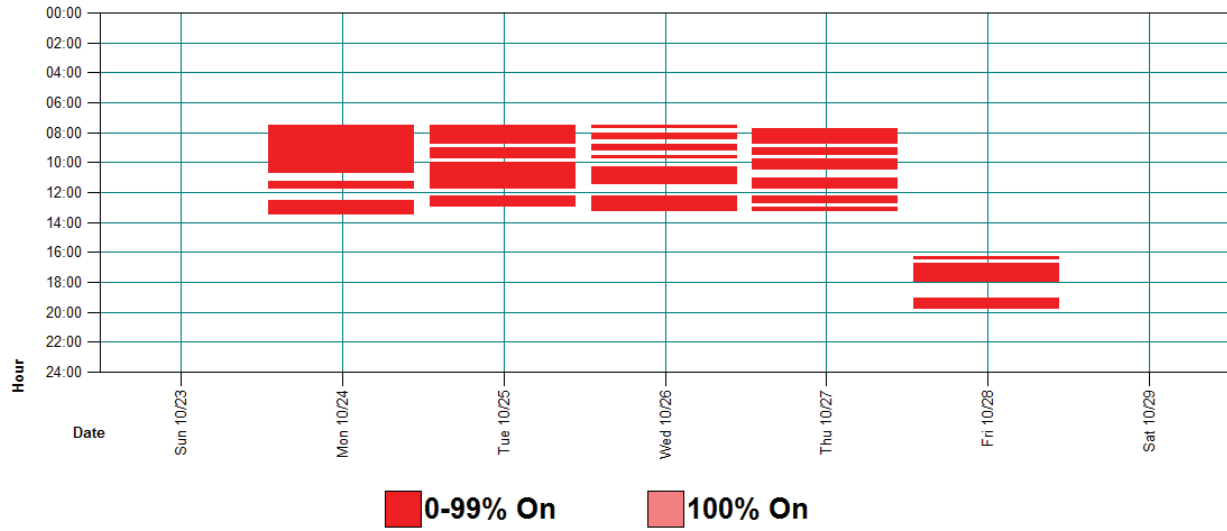
On-Time Graph - DENT SMART LOGGER: 10/11/2011 - 10/17/2011



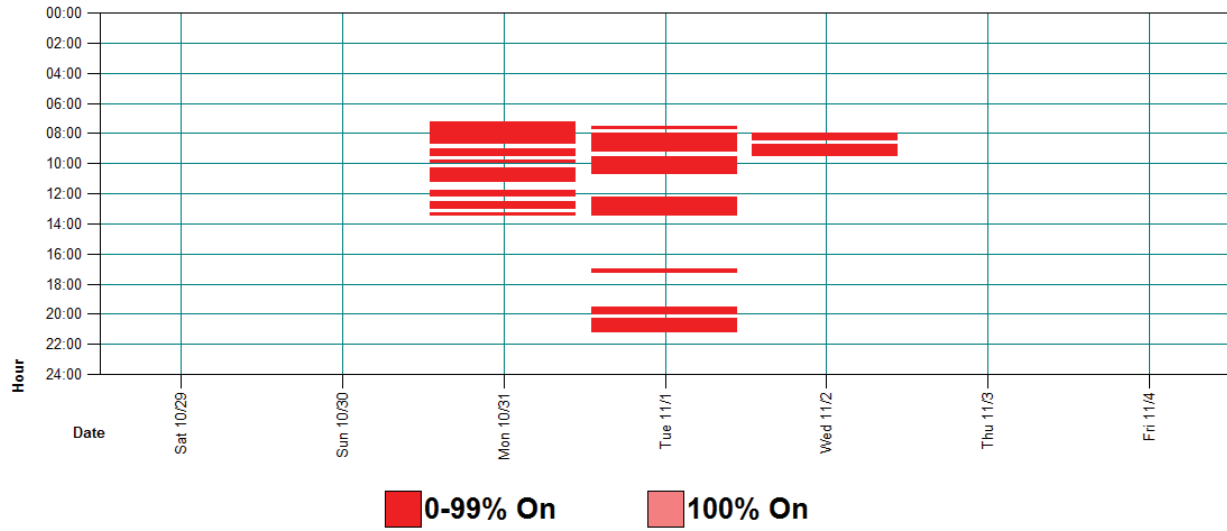
On-Time Graph - DENT SMART LOGGER: 10/16/2011 - 10/22/2011



On-Time Graph - DENT SMART LOGGER: 10/23/2011 - 10/29/2011



On-Time Graph - DENT SMART LOGGER: 10/29/2011 - 11/4/2011

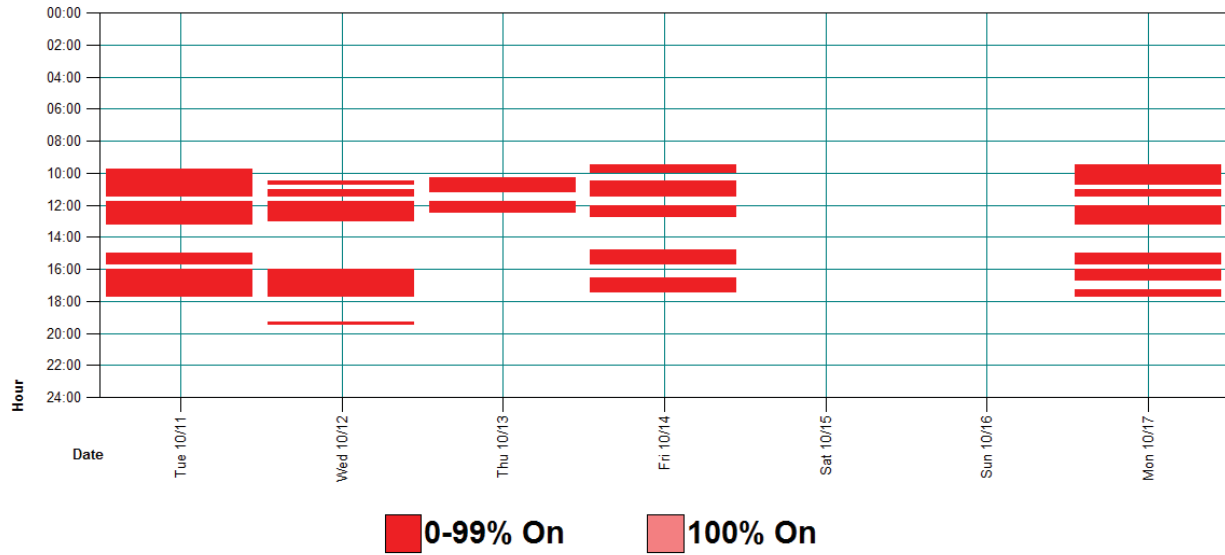


Summary for Logger 3 - Removed November 2, 2011

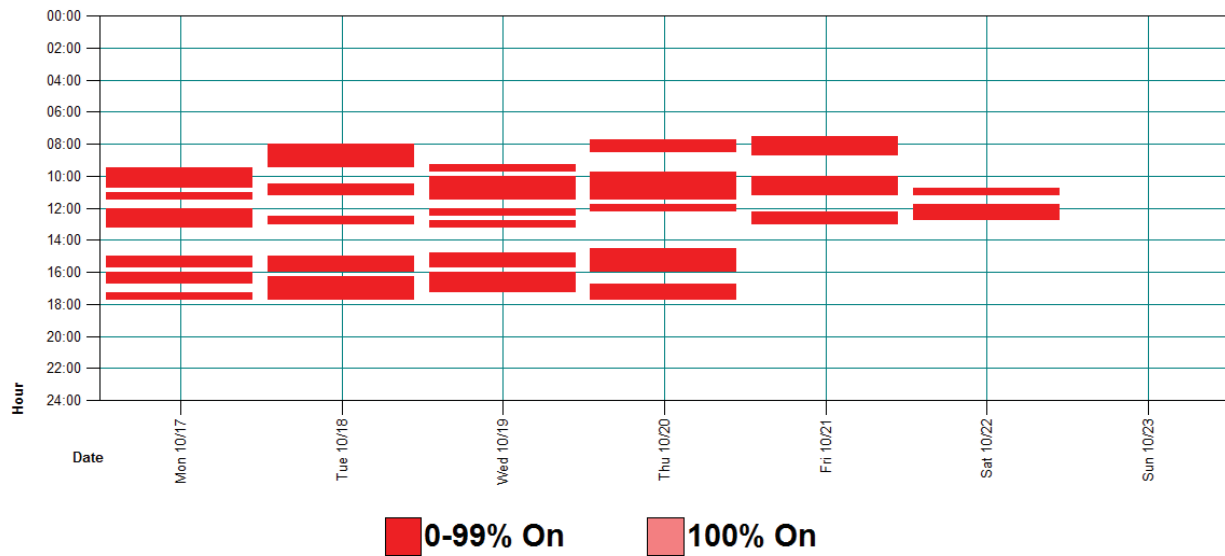
Data File Name:	Logger 3 Nov 4 2011.log
Logger Serial Number:	ML10070019
Description:	DENT SMART LOGGER
Logger Reset:	10/11/2011 9:10:53 AM
Elapsed Time Since Reset:	578.92 hrs
On-Time Since Reset:	2.00 hrs
Percent On Since Reset:	0.35%
Connected Load:	No Load Define
Energy Cost:	Unknown
Data Starts:	10/11/2011 9:10:53 AM
Data Ends:	11/4/2011 12:06:31 PM
Data Elapsed Time:	578.93 hrs
Estimated Annual Hours O	32 hrs
Number of Turn Ons:	1572
Percent On:	0.36 %
Data On-Time:	2.10 hrs
Average On-Time:	0.00 hrs
Longest On-Time:	0.04 hrs
Shortest On-Time:	< 0.01 hrs
Number of Turn Offs:	1573
Percent Off:	99.64 %
Data Off-Time:	576.83 hrs
Average Off-Time:	0.37 hrs
Longest Off-Time:	68.73 hrs
Shortest Off-Time:	< 0.01 hrs

On-Time Graph for Logger 3 - Removed November 2, 2011

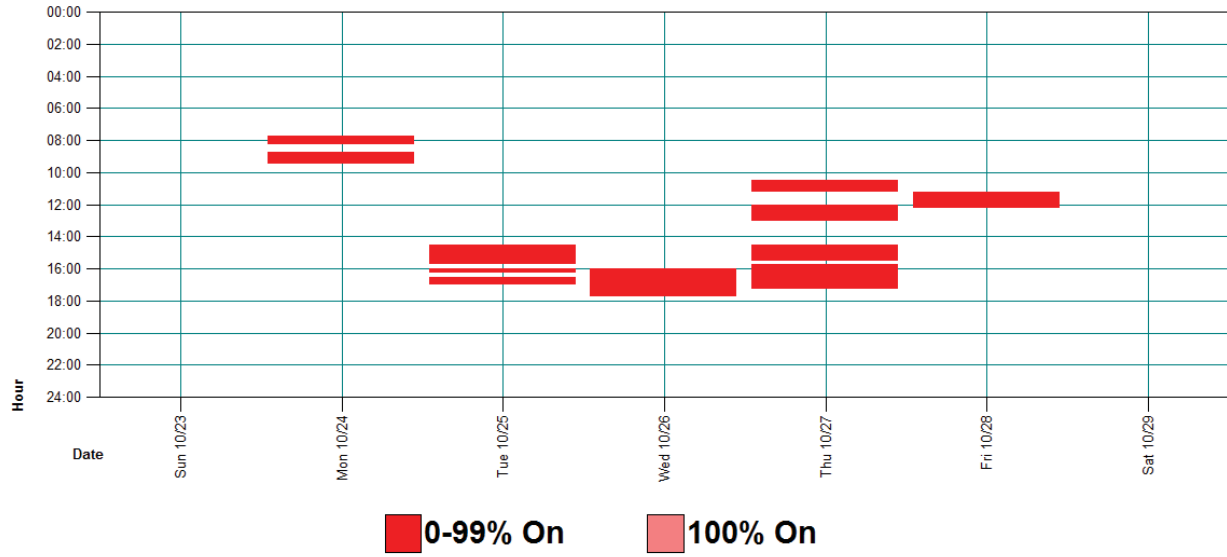
On-Time Graph - DENT SMART LOGGER: 10/11/2011 - 10/17/2011



On-Time Graph - DENT SMART LOGGER: 10/17/2011 - 10/23/2011



On-Time Graph - DENT SMART LOGGER: 10/23/2011 - 10/29/2011



On-Time Graph - DENT SMART LOGGER: 10/29/2011 - 11/4/2011

