

The Potential for Transformation:

A comparison of power usage for PC's and Ecoware in a school classroom

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Purpose of this study

Our company aim is to market a solution that incorporates an innovative piece of software and significantly reduce the carbon footprint produced by IT within the UK. It is estimated that information technology equipment alone provides 3% of the UK's carbon footprint and that figure continues to rise, and that approximately 85% of the carbon footprint of a typical office is due to IT use. This system called Ecoware has the capacity to revolutionize the computer industry and provide a solution that will reduce the UK's carbon footprint.

Over the course of this last year energy costs have been rising - not just here in the UK, but across the world. Some small businesses are seeing prices in excess of 22p per kilowatt hour (kwh). Resulting in noticeably higher energy bills. Given this situation, it's natural to wonder whether using different technology could reduce power bills and, if so, by how much. There is a serious lack of hard data readily available to back up the volume of opinions that circulate, mostly because hardware power ratings do not reflect actual power usage.

In this paper we present a unique practical study which introduces laboratory style test equipment into a working production IT system. Using real world measurements of PC's.

Since we intended this to be a really practical study, we decided to use an actual operating school to ensure that our readings would reflect real world usage patterns. We measured computers in combinations which reflect the way that these devices are normally used.

The cost of electricity varies from supplier to supplier and region to region and prices vary from 9p kwh to 22p kwh and there are a variety of methods of calculating power usage. So we have decided to use the same figures as the "Greening ICT with JISC" study which is robust and can be replicated. We have chosen to use the same power watt meter that was used in the JISC study at Sheffield University. This is considered an extremely reliable product and is rated highly in product reviews.

This methodology will make the study valid for readers seeking to reproduce these tests in their own establishments.

Test Environment

A primary school situated in Central London was selected as the ideal test environment as it was geographically central for observers to travel to it. Duncombe Primary School is a progressive LEA school with an enthusiastic approach to IT and the environment.

The school has an ICT suite which currently has a number of stand alone desktops with 15inch integrated TFT screens and one Ecoware six user system which uses six 19inch TFT Hanns G HP 191 screens. This environment allows for simultaneous testing of the traditional desktop PC's and the Ecoware system while they are engaged in the same tasks in the same lesson. The children will be performing a set task as assigned by the class teacher.

Research Questions

Our primary questions were simple:

- What is the difference in power use for a single user sharing an Ecoware system to a single user performing the same task on a conventional desktop PC?
- What are the actual cost savings gained?
- What is the difference in the carbon savings between the Ecoware system and the conventional desktop PC?

Test Equipment

Plug in power and energy monitor Model 2000MU

Ecoware six user was connected to 6 19inch TFT screens.

Three RM 2400-256 Part Number YH790(SDX) with 15inch integrated TFT screens.

Extension lead to join the stand alone desktops & attach energy monitor

The systems were configured so that the Ecoware computer with its six independent workstations had a power meter attached.

Three of the school's stand alone computers were joined together by the use of an electrical extension lead and this was plugged into a matched power meter.

The readings will then be divided by 6 for the Ecoware solution and 3 for the stand alone systems giving a reading per workstation.

Methodology

The six Ecoware workstations were all connected to a single mains socket With a watt meter attached. Three of the schools stand alone PC were similarly connected together using an identical watt meter.

The power consumption of these units were then measured when turned off, switched on with network login screens, at idle, during normal school use and finally all running the same full screen videos.

Normal school use in this instance was a year 5 class all working on an identical science project. See project sheet in appendix.

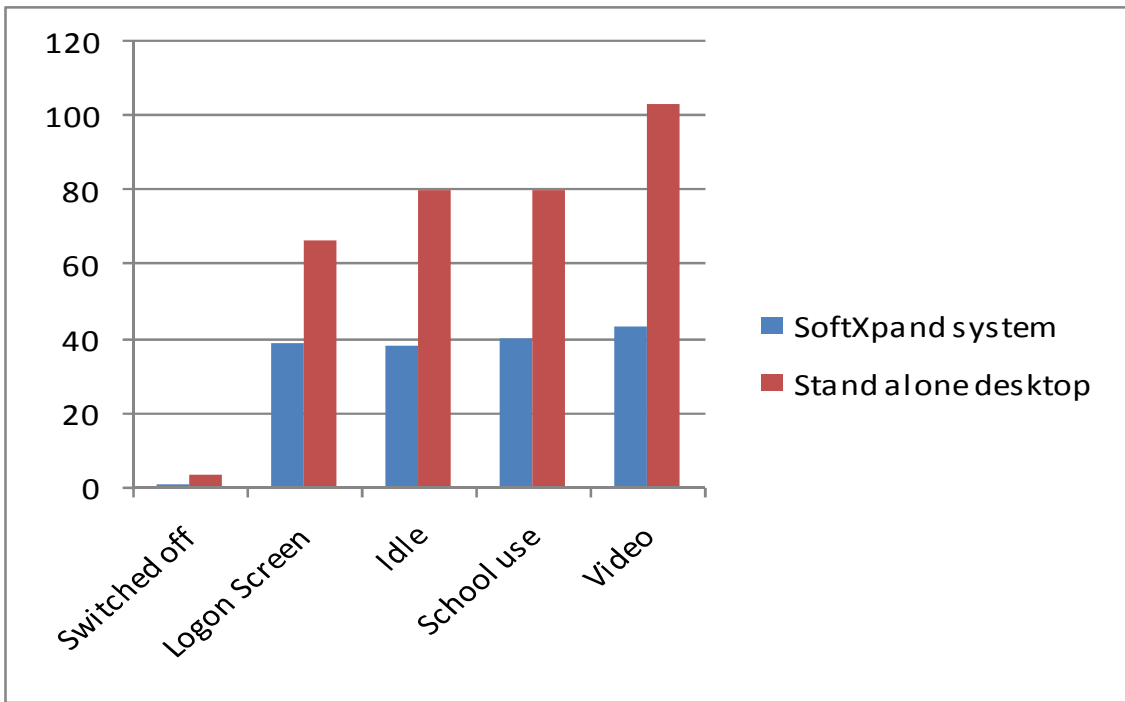
Two people were assigned the task of pressing the watt meter kwh button simultaneously and recording the results.

The results were then recorded on a table so the data could be analysed.

Results

The results are shown in the table below.

| Wednesday 26 th January 2011 | | | | | |
|-----------------------------------------------------------------------------------------------|------------|----------|----------------------|------------------|-------------------------------|
| Task | Time taken | Ecoware | Conventional Desktop | Ecoware Per user | Conventional Desktop Per user |
| Year 5 Science. Required the use of a search engine for research. Exercise sheet in Appendix. | | | | | |
| Switched Off | Watts | 4.3 | 9.2 | 0.716 | 3.06 |
| Switched on. Logon Screen | Watts | 233 | 199 | 38.83 | 66.33 |
| Idle | Watts | 230 | 240 | 38.33 | 80.0 |
| Normal school use | Watts | 240 | 240 | 40 | 80 |
| Normal school use | 40mins | 0.21kwhr | 0.18kwhr | 0.035 | 0.06 |
| Full Screen video | Watts | 258 | 309 | 43 | 103 |



A Bar Chart to show Watts per user for each system

Both the observers noticed that the ventilation air emitted from the six user Ecoware system was colder than that emitted by each of the conventional desk top PC's.

The completed and signed data recording sheet is in the appendix.

Conclusion

The results do show that with approximately 50% saving in almost every tested area that there will be considerable cost savings from using Ecoware over conventional PC's, though due to the limitations of available hardware the actual savings could not be determined. These will depend upon a number of factors, including the number of hours per day the computers are in use, the cost of electricity to the particular end user and the exact equipment that is being replaced.

Apart from the savings in energy costs there will be a reduction in purchase costs, a reduction in maintenance costs, and a reduction in waste disposal. There will be further savings by not requiring air conditioning, as well as the savings from the reduction in the number of network ports, power points and Ethernet switches required.

Similarly the Carbon savings will depend on all of the above, but according to Gartner around 70% of the carbon footprint of desktop PC's is embedded in the manufacture. Ecoware by definition removes five out of every six conventional desktop PC's and therefore saves a genuine 83% of the carbon footprint of manufacture, packaging, transportation, heat output and landfill.

Recommendations

The Ecoware solution has been sold in the UK since 2007.

The results of this trial are so positive that it is recommended that an Ecoware computer is loaned to the most technically appropriate department of the Office of Government Commerce for two weeks for them to test the system further.

As the existing PC's in the schools ICT suite had integrated monitors we were unable to isolate the monitors from this experiment and the fact that the integrated monitors were 15inch compared to Ecoware 19inch will have given a skewed reading in favour of the stand alone PC's. A further study should include closer replication of monitor usage.

Understanding Power Levels

While our study focused mainly on active power, computer equipment may have several power modes, as stated in Koomey J.G; Cramer M.; Piette M.A., and Eto J.H, Efficiency Improvements in U.S. Office Equipment: Expected Policy Impacts and Uncertainties." Lawrence Berkeley National Laboratory, LBNL Publication 37383 December 1995.

Normal school use:

This is the power of the device when in operation. For PC CPU's, active power can vary somewhat when different peripherals are in operation. Monitor power can also vary depending on the image being shown.

Idle:

This Mode represents an intermediate state which attempts to conserve power with instant recovery. The system is idle. If the device has no standby mode, this power level is equivalent to that of the active mode.

Off Mode:

The power that is drawn when the device is switched off.

Logon Screen:

This is the power of the device when switched on and waiting for users to log on to a network connection.