

Adelante Development
A Division of



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“GREEN” Computers

A White Paper

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“GREEN” Computers – White Paper

Introduction

The “Green” movement is now over two decades old and is finally making inroads into computers. As computers have physically reduced in size and power consumption due to technological advances in chip miniaturization, there was never too great a pressure on the IT industry to go green. That is until recently, when people started to realize that there are hazardous substances in computers and waste disposal is not a trivial matter. Also, anybody who has been to a data center where hundreds or thousands of computers with screaming fans consume thousands of Watts, can testify that there is still scope for tremendous improvements.

What does “Green” mean?

Perhaps the early adopters of this concept felt that the ultimate goal was to go back to living off the land. But that cannot be a realistic objective. Nevertheless, the term has withstood the test of time and now has a firm footing in our vocabulary and attitudes.

In the context of computers we should view it more along this brief definition:

‘Throughout the lifetime of a computer it should have as little negative impact as possible.’

This is not an absolute statement and implies a constant striving towards reducing the negative impacts of computers.

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Life-cycle impacts

<i>Manufacturing</i>	<p>During the production of a computer use as few as possible or no toxic materials.</p> <p>Employ manufacturing processes that are not harmful to the workers.</p>
<i>Distribution</i>	<p>Use only as much energy and materials as necessary to ship the computer to the final user.</p>
<i>Use</i>	<p>Computer must not have any negative impact on users:</p> <ul style="list-style-type: none">- no radiation- no ergonomic injuries- no noise pollution <p>Use as little energy as possible.</p> <p>Low purchase and running costs.</p>
<i>Disposal</i>	<p>Disposal must not cause any pollution or danger to the environment.</p>

In detail

Manufacturing

The European Union has long recognized the importance of harmful substances and the need to regulate their use already at the point of manufacturing. This avoids a lot of problems down the road. It has stipulated through various directives also a reduction in electromagnetic emissions, etc. Most, if not all computer motherboard manufacturers adhere to these standards.

However, a computer system consists of various components and it's the sum total of all components and their combined characteristics (Electromagnetic emissions, vibration, noise (including ultrasound), heat, and even microwave radiation that may affect their users.

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Component examples:

Motherboard

A computer motherboard may have toxic materials embedded in various electronic components.

It also has its own EMF emissions, heat, and noise sources

Video Card

A video card has high-powered computer chips that have their own EMF, heat, noise, and vibration sources. Some computers have two video cards.

Memory

Computer memory chips emit heat and radiation

Disk drive

Disk drives produce heat, vibration and noise. The faster they spin, the greater the noise and vibration usually.

CD drive

CD-ROM and DVD drives may spin at high revs with much noise and vibration. Not many manufacturers have yet grasped that low-noise drives are important.

Networking

Bluetooth and wireless network interfaces. High-throughput wireless network cards emit low-power microwaves. Every wireless component in the home or office adds to this emission.

Distribution

Manufacturers have not found it too difficult to reduce packaging and distribution energy, because it cuts directly into their bottom line.

User - Radiation

Radiation is not the first thing a user will notice with computers, because radiation damage accumulates over years and will usually only show up after several years of exposure. It is clear that plastic cases offer less protection from radiation than metal cases. Even metal cases may be relatively ineffective once computers operate more and more in the GigaHerz range and thereby any potential emission will be as harder and harder microwaves.

Computer cases that were previously stored under or behind a desk are also becoming a thing of the past and processors are becoming more of a desktop item or are even integrated into the monitor. Radiation protection becomes even more important with those devices.

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User – Ergonomics

Flat-screen monitors now mostly come with height-adjustable stands, which is a great improvement over the old monitors. However, keyboard, mouse, and other input devices still can inflict repetitive strain injury and the design of those devices needs to improve further.

User – Noise pollution

Many users of computers are sitting in front of them for hours without break. The European Union has long recognized the danger such behavior represents and have mandated for businesses that responsible actions need to be taken in order to avoid long-term exposure. This includes frequent breaks, proper workstation design, distances, etc.

These regulations are pretty meaningless in a home environment, where their adherence can't be monitored or enforced.

It is therefore up to the manufacturer to design the computer equipment in such ways that it will cause as little harm as possible.

Noise is not a relative thing. Any long-term exposure to noise will result in permanent hearing damage. That's a known fact. Yet, humans start to ignore noise to which they are exposed for a long period of time. This does not mean that the danger has gone away.

A reduction in noise from all computer components is absolutely essential. Near-noiselessness should be the maxim. Fortunately, with advances in rotor blade technology it has now become possible to build near-silent fans.

Energy Consumption

It seems natural that work cannot be done without expending energy. However, through continuing miniaturization more and more work (in computing terms) can be done with less and less energy.

Energy spent often has a side-effect of heat waste. This heat needs to be dissipated and that in itself will require energy.

In a computer environment most of the work goes on in a very small area inside the computer chips. The resulting heat waste cannot easily be dissipated unless it is aided by fans. In turn, fans make noise.

Therefore, the more work can be done with less energy, the better.

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Costs

Finally, there is also a more subtle attribute of going 'green' with computers that may not easily be understood. The cheaper computers are to purchase and operate, the less effort it takes to earn the money to buy the computers. Each effort to earn money in turn has to do with work, which uses energy and creates heat itself. In other words, in a round-about way, the cheaper computers are, the 'greener' they are.

Disposal

Various characteristics of the computer play an important role during disposal:

Toxic materials Toxic materials are difficult and costly to extract. Inadequate or inappropriate disposal may poison the environment and can cause harm to living creatures.

Plastics Plastic cases and interior components are not as easy to recycle as metal, paper or bio-degradable products.

Outlook

Finally, 'Green' computers should never remain a categories of special equipment within the broad range of computers. All computers, computer manufacturers, users, and disposal agents must 'go green' for the sake of all of us and our future generations.

Feedback

If you have any comments, corrections, or additional information you are welcome to contact us at:

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