

“Green Machine”

Each decade has been remembered for a significant event that influenced the course of history, and being environmentally conscious seems to be the focus of the current age. From the youngest PC and Mac users to the older, more experienced computer experts, developing a greener attitude is everyone's responsibility. Whether using a single desktop model at home, or managing a multi-million dollar computer company, it is easy for consumers to make changes to be environmentally responsible with today's technology. Through our research, we have discovered ways that everyone can improve to make computers greener.

Many consumers aren't aware that computers can cause harm to the environment. Those who are may have the misconception that computers are only detrimental to the earth after their disposal. In truth, computers can be dangerous to the environment in almost all stages of their manufacture, use, and disposal.

When computers are made, whether by Apple, Dell, HP, or any of the other computer companies in existence, they are manufactured using other machines. This is an industry where most of the human resources involved in the production process are engineers or technical workers that keep the robotics in the manufacturing process in working order. Others are involved in creating innovative ways to drive the industry forward. The production process requires copious amounts of energy, not all of which may come from a particularly “green” source. In fact, according to a study done by Lawrence Berkeley Labs it takes about a pound of coal to “create, store, package, and move” between 10 and 20 megabytes of data. According to research done by Jeremy Faludi at worldchanging.com, one computer takes several thousand gallons of water and over 6000 megajoules of energy to manufacture. To quote Faludi's source, the book Stuff: The Secret Lives of Everyday Things by the Northwest Environment Watch, published in 1997, “In all, the factories making my 55-pound computer generated 139 pounds of waste and used 7,300 gallons of water and 2,300 kilowatt-hours of energy (about one-fourth the energy the computer would use over its four-year lifetime). State-of-the-art factories could have made the same

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computer with half to two-thirds less waste. And different computers—with flat-panel displays like those in laptop computers instead of today’s big vacuum tube monitors, for example—could have been made with even less waste.”

Though this is an optimistic and somewhat outdated outlook, one must realize that the efficiency in computer production has not come to a place where it can be a completely green process. In fact, chip fabrication is an area of computer production that where some of the fewest advances have been made in order to make manufacturing more eco-friendly.

When a consumer brings their shiny new computer home from the store, it is unlikely that they know about the ecological impact that the creation of their new tool has already had. However, still more adverse effects are caused by that computer once it is online in the consumer’s home. Much of the energy wasted by computers is burned when they aren’t even in use. Though it is convenient, leaving a computer in “sleep” mode wastes copious amounts of energy—far more than is used if the computer is shut down properly. This is harmful to the environment for the same reason that it’s helpful to the consumer. While a computer is in “sleep” mode, it is idling and always ready to be turned on and used. The central processing unit (CPU) uses small amounts of energy constantly. As long as the computer is on, the CPU is running. When the computer is shut off, all energy flow to the computer is shut off, preserving energy. According to Fox News, the typical desktop computer system uses between 90 and 280 watts, in addition to about 35 to 90 for the monitor. A laptop may use as few as 80 watts.

After two to three years, the average lifespan of an American computer, its owner will undoubtedly try to get rid of it. Around 50 million computers become obsolete each year, according to an article by Fox News. There are several ways to dispose of a computer. Unfortunately, the most popular and dangerous method used is to throw the computer away. According to Greenpeace, approximately 4.6 million tons of consumer electronics waste is thrown away in the U.S. alone. Worldwide, electronics comprise about 70% of all hazardous waste, according to worldchanging.com. There are several

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companies whose job it is to take computers, as well as the hazardous waste some of them contain, off the owner's hands, and move them to another facility. Here, if they are not properly disposed of, any or all of several things may happen: dangerous chemicals could leak into the surrounding soil and water, contaminating these resources for those who live there. In addition some computers could be stripped apart for some of the more valuable parts, including wiring, salvageable production materials, and the hard drive that can contain easily recovered personal information. This salvage of computer parts is one of the most dangerous “professions”, left only for those who are unlucky enough to do it. Computer dumps are dangerous, chemical-laden places. Many computers contain chemicals that can cause long-term or chronic damage to the lungs and other organs. In fact, most computers contain carcinogens including cadmium and mercury, in addition to other elements such as chromium, which can cause blood, liver, and neural issues in many animals. They also contain flame-retardant materials, which serve to prevent the computer from catching fire in case of overheating.

Many think that they can't do anything to make their computer greener. This is a common misconception. In truth, there are numerous ways to be environmentally conscious when using a personal computer. Most techniques require little money, if they cost anything at all. Methods for increasing energy efficiency include the use of power-strips, changing personal settings, refurbishing old computers, buying a more energy efficient model, and recycling an old computer.

Power-strips have been around for quite some time. They stop electric appliances from drawing idle power when not in use. They help to stop “Vampire Electronics”: devices that appear to be turned off but continue to use electricity in their idle state. Wall chargers are some of the most infamous offenders in this respect. They continue to draw energy from the wall socket, even after peripheral devices have been unplugged. Power-strips stop this sucking of power by automatically shutting off the devices plugged in to them. Some can detect when a certain device gets turned off, and then automatically turn off the other devices that are plugged in. This is possible because they sense when the voltage going to a device gets

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too low, indicating that the device has turned off. For example, if a computer were the main device, the peripherals plugged into the strip, such as a printer or speaker system, would turn off if the computer were shut down. Another benefit of power strips is their built-in surge protector, which provides a layer of protection against spikes of energy coming into your home from power providers. Power-strips are useful devices that can be relatively inexpensive and some cost as little as \$20. Using power strips make it easy to make computer use a little “greener”.

Keeping a computer healthy is one of the best ways to be green. It’s simple to avoid having to buy a new computer every 5 years by keeping the current machine from failing. In most cases, it is cheaper to fix a problem than it is to buy an entire new unit. Repairing computers or building new ones using recycled materials may also be a feasible option, depending upon the availability of materials and know-how. At other times, purchasing a new unit may be the only option. Today’s models are much more energy efficient and easier to recycle thanks to decreased amounts of harmful chemicals. When buying a new computer, it is best to look for one that will last for many years to come. By buying a computer that can accommodate technological advances, it is possible to avoid having to purchase a new computer every couple of years. If buying new equipment is necessary, purchasing only the parts that are outdated or unusable, rather than a whole system, makes the purchase more eco-friendly. For example, because monitors use more energy than towers, one might be able to purchase a monitor and use the tower for several more years. Instead of buying a new desktop computer, consider looking into a laptop. They use much less energy and there’s less material to recycle. Having a computer that works and is green is easy to do. Consumers have the options of keeping their original machine alive or purchasing a new, more energy efficient one. Either way, these are easy ways to keep a greener focus.

Recycling old electronics is the best way to get rid of them and be a conscious consumer. Many companies today even have recycling programs for their own products. Consumers can even get a discount if they buy that company’s brand after recycling an old piece of equipment. Recycling

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computers is sometimes tricky because of the way a computer is put together. Unfortunately, this has led to a lot of electronic waste, or e-waste. More than 75% of all computers end up in a closet somewhere because people don't know what to do with them after they break. Another large percentage of waste is shipped to developing countries where it is processed in less than ideal conditions.

When recycling, it is important that you give your old electronics to organizations that will act responsibly with the waste. There are many of these companies and you can look online to find a recycling location near you.

Typically, computers are still usable when we get rid of them. Instead of throwing it out, donating a computer to a local organization that needs is an option that serves the dual purpose of being both. Many of these places cannot afford the cost of a new computer and would appreciate the kindness. Recycling is a responsible way to help out the planet and be a little greener.

There are also a few things that consumers can do while on their computers to help it become more energy efficient. One excellent example is changing the settings on their computers. Some computers have energy saving options that can be changed. These include the screen brightness and the amount of time the computer idles before going into sleep mode. Simply turning the computer off when it's not in use is one of the simplest things that consumers can do. If it's not on, it's not using as much power. Also, a computer that is running a complicated program like a video game is using more power than one that isn't. Energy consumption can be reduced by playing games less often or buying one of the current home consoles instead. A common misconception is that the screen saver saves electricity. It doesn't. They use the same amount of energy as the operating screen. Screen savers were actually created to prevent damage to the phosphorescent coating inside monochrome monitors. These monitors aren't used that much anymore, however, but the screen saver remains. These suggestions utilize the existing parts of your computer and shouldn't cost a thing. It takes only seconds to decrease energy consumption in these ways.

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Throughout the world, many countries and companies are attempting to reduce global warming, and they realize that computers and technology play a major role in the carbon emissions and other types of pollutants that are causing the global temperature to increase. The European Union, Google, IBM, Foxconn Technology, Asia, Dell and hundreds of countries around the globe are joining in the effort to save the world.

There are numerous examples of companies and governments changing in order to make computers and technology greener by reducing their carbon emissions. One example of this is the European Union placing many standards on the electronic products manufactured and sold in their country. This is called the Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment 2002/95/EC, otherwise known as RoHS. It was founded on July 1, 2006, and has placed restrictions on the amount of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame-retardants included in their products. Though all of the materials listed are allowed to be present in no more than 0.1%, mercury and lead have more specific standards.

The products covered include not only computers but also large and small household appliances, such as IT and telecommunications equipment, consumer equipment, lighting equipment, electrical and electronics tools, toys, leisure and sports equipment, and automatic dispensers. Obviously, these categories cover a wide variety of products, so a “decision tree” is used to determine which specific items can be covered. The decision tree is basically a table showing whether an item is covered by RoHS or not. Some of the items covered include radio sets, sewing machines, electric trains, and freezers.

Another movement, an organization called “Climate Savers Computing” is seeking to go green. The mission of the climate savers computing is to reduce the amount of carbon dioxide emissions of computers by 50%, or 54 million tons per year, by the year 2010. Google and Intel started it in 2007, and they intend to achieve their goal by promoting the use of power management software that improves

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the power consumption of computers when they are inactive. Desktop PCs, laptops, workstations, and servers are included in the initiative. It focuses mainly on climate change, and they believe that by focusing on this one problem, they can conquer it more effectively.

Yet another act supported by Google, called Blackle, is seeking to improve the efficiency of computer usage. Founded by Heap Media, Blackle is a search engine powered by Google. It works exactly like Google, which is very familiar to many people, but the entire screen is black and dark colors. The colors are darker, so there is less contrast and the computer doesn't need to use as much energy to produce the vivid colors shown on google.com. Blackle has saved 1,132,126.683 Watt hours of energy since its launch. Some people doubt the effectiveness of Blackle, but even if it does not work it can still be used to remind people of the need to save energy and go green every day.

The Kyoto Protocol, a treaty signed by over 160 countries around the world to reduce carbon emissions and global warming, is in favor of the GreenCert project. The GreenCert project was founded by IBM and Foxconn Technology, and is mainly effective in Asia. Companies producing GreenCert software are being founded in China, Taiwan, and across the Asia Pacific region. It is used to measure the amount of carbon emissions present in a single place or building, and is supposed to be used to assist companies in understanding what kind of changes they will have to make to improve their efficiency and reduce their emissions. IBM, Enterprise Information Management (EIM), and C-Lock Technology created the software, and the companies who are designing the software are aiming to set a good example by aiming to cut their emissions. IBM has cut many carbon emissions by allowing many employees to work from home, and promoting car-pooling and shuttle riding if people must leave the house.

Dell offers free recycling of computers, printers, and other technological products. Their company has reduced their carbon emissions significantly because of this program. They have changed packaging guidelines to save wood, and have produced laptop models that are 80% more efficient than

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older models. Dell introduced the Plant a Tree Program in 2007. This allows Dell customers to donate money to plant trees to balance out the amount of carbon emissions caused by their PC. Through these efforts, these companies and organizations are reducing carbon emissions one step at a time.

The conscious consumer looks for ways to reduce their carbon footprint on the earth. Changing production practices, modifying habits at home, being aware of how to recycle responsibly, and having information on updating computers can all have a positive influence on the environment. Computer technology is advancing at a rapid pace. We need to keep pace with the impact it has on consumers, producers, and our world, in order that we won't be left behind.