

Power Consumption

The Hidden Costs of Copiers and Printers



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Executive Summary

Did you know that office equipment is one of the fastest growing electricity uses in commercial buildings in North America? Office equipment consumes approximately 7% of commercial electricity or \$1.8 billion in costs to businesses.

Although many organizations are adopting greener business practices, energy consumption due to office equipment and related energy systems, including air conditioning to displace the heat generated from such equipment, is expected to rise. Reducing the amount of this electricity has important environmental and economic benefits. By choosing energy-efficient equipment, purchasers can save a substantial amount on electricity costs, as much as 95% for products such as monitors and printers.

For organizations seeking to purchase printing equipment, understanding power consumption and the role it plays in the environment is critical to maintaining a green workplace — and can have a positive impact on the bottom line. Although many printer manufacturers' are listening to buyers and beginning to launch products that use less energy, buyers need to understand how energy consumption works to be able to purchase a model that is best suited for their organizational needs and printing output volume. This white paper will explain how to accurately read printer and copier specification labels so that potential users can calculate the energy consumption the organization will use. It will also provide tips on saving energy and other ways of going green in your business environment.





Why Organizations Need to Care About Power Consumption

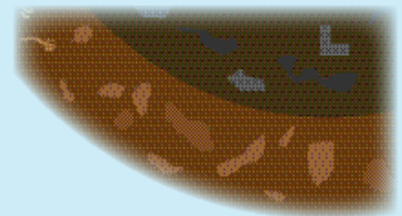
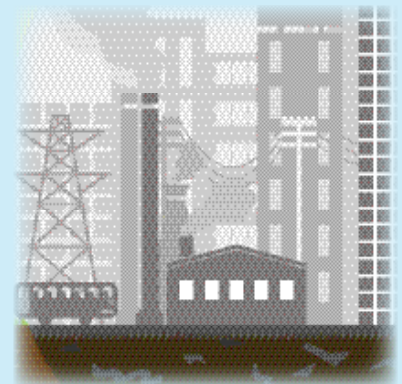
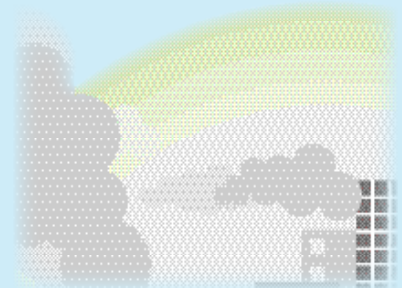
Many organizations have a growing concern for the environment. Businesses play a critical role in developing and/or utilizing environmentally sound products and processes. Being aware of the impact that office equipment has on the environment and ways to reduce negative effects will enable buyers to make educated decisions on the office equipment they purchase.

There are several general reasons why organization should establish “green” business practices. Purchasing green equipment, designing and building green solutions, paying attention to energy consumption, and conscientiously disposing of and recycling hardware helps organizations:

- Reduce energy costs
- Comply with government regulations
- Meet increasing customer demands for cleaner, more eco-friendly products
- Appeal to customers and partners who want to patronize and associate with green companies
- Protect the environment

Watt for Thought

- Copiers use more energy per unit than any other piece of office equipment.
- Every ton of recycled office paper saves 380 gallons of oil.
- Office equipment consumes approximately 7% of commercial electricity or \$1.8 billion in costs to businesses.
- 1kWh of electricity generated at a coal-fired power station releases about 1 G (2.2 lbs) of carbon-dioxide (CO₂) into the atmosphere. In 2007, 48.6 percent of the electricity generated in the United States was from coal.





Power Consumption: The Hidden Costs of Copiers and Printers

In order to determine how much electricity costs, it's important to understand how it is measured.

Power, measured in watts, is the real-time measurement of the electrical energy being consumed by a device. To determine the number of watts consumed if a device lists amps, multiply the amps (electrical current) by the voltage (electrical pressure). One thousand watts equals 1 kilowatt.

20 amps x 120 volts = 2,400 watts or 2.4 kilowatts (kW)

The exact *voltage* coming out of an electrical socket can vary, so electrical devices are designed to accept a range of voltages between 110-120 volts. Printing devices may be labeled as 110, 115, or 120 volts. Some larger copiers and printers require 240 volts and require special wiring and receptacles; 240 volts will actually double the power in the example above.

Power consumption refers to the electrical energy supplied over time to operate an electrical device. Electricity is charged by the kilowatt-hour (kWh). Using 1000 watts for 1 hour equals 1 kilowatt-hour. For example, if the printer in the example above is running at its maximum power for one full hour, the power consumption would be:

2.4 kW x 1 hour = 2.4 kilowatt-hours (kWh)

Now that we understand how to calculate power consumption while a printer is running, we need to figure out the monthly power consumption. This is made difficult as most office printing devices have several power consumption modes including On, Off, Standby, and Sleep. The challenge is finding the energy consumed in these modes as few manufactures publish this type of data.

On mode refers to equipment that is performing its primary function, such as printing documents, processing significant data, and playing sound or video.

Standby mode refers to a power mode for printers that use less energy than the "on" mode. In copiers and laser printers this usually means that the fuser is being kept warm. Standby energy is the total energy consumed over a period of time (measured in kWh). Standby energy equals standby power multiplied by time spent in standby mode.

Sleep mode refers to a low power mode for printers. In copiers and printers, this means that the fuser is not being kept warm and that a "warm-up" period will be required before the device is ready to print. This mode saves significant electrical consumption compared to leaving a device fully on and idle but allows the user to avoid having to reset programming codes or wait for a machine to reboot. Sleep energy is the total energy consumed over a period of time (measured in kWh). Sleep energy equals sleep power multiplied by time spent in sleep mode.

Knowing how long a device is actually printing is needed to figure out the total monthly power consumption for a particular printing device. To calculate:

- Take the monthly volume or the prints/copies per month and the speed of the device.
- Determine how much time the printer or copier would actually be printing and how much time it would be on, standby, sleep, and off modes.
- Then multiply the hours per month for each mode by the power used by each mode.

An example follows on the next page...



Power Consumption: The Hidden Costs of Copiers and Printers

<i>Printing</i>	<i>2.4 kW</i>
<i>Standby</i>	<i>310 watts or .31 kW</i>
<i>Sleep mode</i>	<i>200 watts or .2 kW</i>
<i>Speed (PPM)</i>	<i>75 (4,500/hour)</i>
<i>Monthly Volume</i>	<i>100,000 pages</i>

Using our example and the Massachusetts costs noted above we calculated the cost of 20 printers:

Cost of electricity = 238 kWh x 17.17¢ = \$40.86 per month x 20 printers = \$9,807.60 annually

Hours per month (30 days x 24 hours) = 720

Hours printing = 100,000 copies / 4,500 copies per hour = 22 hours

Hours standby = (720-22) x 60% (approx.) = 418 hours

Hours standby = (720-22) x 40% (approx.) = 279 hours

Monthly power consumption = kWh printing + kWh in standby + kWh in sleep = (22 x 2.4kW) + (418 x .31kW) + (279 X .2kW) = 238 kWh

Once the total monthly power consumption has been calculated in kWh, multiply that by the cost of electricity. The cost of electricity varies by region. In 2008, the price ranged from 6.7¢ per kWh in Idaho to 30¢ per kWh Hawaii. When calculating electricity costs take into account fees for delivery/ transmission, distribution and renewable energy that most providers charge. A recent invoice in Massachusetts stated the cost of electricity at 11.79¢ per kWh but with the added charges the actual cost was 17.17¢ per kWh—that’s 46% above the basic cost of electricity.

20 RISO printers would only cost \$309 annually. Compared to most comparable models that is a 97% savings. Also, RISO printers would stop 127,704 pounds of carbon-dioxide (CO₂) being released into the atmosphere.

It is interesting to note that most printing devices consume more power while in standby and sleep modes than they do the whole time they are actually printing. This is due to the number of hours that they remain idle during the day or overnight. In our example, the cost of printing 100,000 pages in a month would be \$107.88 per year but the cost of electricity use in idle and sleep mode would be \$382.50. To save energy unplug the device or turn the power bar off at night.

It is very confusing to have to manually calculate energy consumption. That is why RISO created a simple **energy savings calculator**. Enter a few variable and the calculator instantly calculates the monthly and annual power consumption and electricity cost. It then compares each alternative device to your choice of RISO printers.

Visit our website for more information.





How to Read Labels

The power requirements or power consumption information can be found on the specification sheet or on the serial number plate of the printer/ copier. There are several things to remember when considering the power consumption of a printing device:

- The amount of electricity listed on the label is the maximum amount that the printer will use. For example, a 2000-watt copier will only run at 2000 watts when printing at full speed. Knowing how much maximum electricity a device uses does not tell you how much it will use in a month.
- If the power is stated in amps (A) and volts (V), multiply the two to get the power in watts or kilowatts. Power (watts) = Voltage x Amps.

Power your RISO with a bicycle!

Because the RISO digital duplicator uses very little electricity PB Copy in Surrey, British Columbia is able to power the machine with a solar panel and bicycle; they offer “off-the-grid” printing.

“When we use the RISO digital duplicator, we are a zero carbon footprint. Add to that the power saving and the fact that we use only recycled paper and we are very environmentally friendly.”

-Kevin LaHay, Owner/Operator

To read more on PB Copy visit the **testimonials section under “about us”** on our Website.





Comparing Printing Technologies

When evaluating office printers, it's important to understand the different technologies available.

Copiers/mFPs/Laser Printers:

These devices use the same basic technology to put an image on paper. Electronic signals representing an image (page) are sent to the printer, or manipulate the reflected light from the copied paper. During operation, these devices use this electronic signal to trigger a laser. The laser then shines on a rotating drum, creating a charge pattern that defines the image or text to be printed. Next, the charged portion of the drum rotates past the toner supply, attracting particles of toner to the charged areas of the drum. As the drum continues to rotate over the paper, a charged wire beneath the paper draws the toner from the drum and onto the paper. The key differentiator here compared to the technologies noted below is the last step. The paper travels into hot fuser rollers where the toner is fused to the paper. A massive amount of heat is required to print from laser technology.

Inkjet Printers:

Inkjet printers produce images by precisely moving an ink-cartridge with an array of holes across each sheet of paper. The cartridge ejects a high-frequency stream of tiny droplets from each hole on to the paper from a cartridge containing one or more colors of ink. Inkjets usually produce ink droplets either by rapidly deforming piezoelectric elements that release droplets from an ink pressure chamber, or by very rapid bursts of heat that locally cause the ink to expand and expel the ink from the cartridge. As the ink droplets impact the page, they spread and are absorbed into the paper with no need for heat or a fuser. Inkjet technology offers additional benefits, most notably the provision of color printing capability at low cost.

Digital Duplicators:

Files to be copied can be either scanned or sent from a computer. Duplicators digitally scan the original document/image and transfer that scanned image to a master via a thermal imaging process. The master is a paper plate with a polyester coating that is automatically placed around a print cylinder. Ink is microprocessor-controlled and vacuum-drawn from a cartridge to the surface of the master. Paper is fed straight through and contacts the print cylinder and a pressure roller. The ink is transferred to the paper with no need for heat or a fuser, and like the inkjet printer the ink is absorbed into the paper. Spot color printing is possible by changing the print cylinder.

The Fuser is Key:

Copiers/MFPs and laser printers consume more energy than inkjet printers and duplicators, primarily because the fuser rollers must remain at high temperatures to bond the toner to the paper. The fusing temperature can be as high as 400° F during printing, the laser printer actively supplies resistance heat to ensure effective bonding. In addition, copiers/MFPs and laser printers require perpetual heating in standby mode to avoid “heat-up” driven delays in response to a print request. Copiers use more energy per unit than any other piece of office equipment. Power consumption in office printing devices largely depends on the copier, laser printer, or MFP's print speed or copies per minute. Usually the faster the device, the more power is consumed. The power consumed in this fusing process accounts for about 60% of the total power consumption of copiers/MFPs and printers.





Tips to Reduce Power Consumption

There are simple, effective ways that organizations can save energy. We recommend the following energy saving tips:

Reduce

Where feasible, turn devices off at night or on weekends.

Re-use

Set printer's/copier's default to making two-sided copies.

Recycle

Choose recycled papers and soy-based inks.

Look to the future

Choose office equipment that has a proven record of reliability; replacement is required less often. This will also help reduce e-waste in landfills.

Sleep to save

Copiers and printers are on all day but only used for a small part of the day. Use the "stand-by" and "sleep" modes available on the device.

Save a tree

Save electricity and paper and read email and documents directly from the computer monitor. It takes ten times as much energy to create a piece of paper than to put an image on it.

Get the right size/type of device

A mid-volume (20 to 44 copies per minute) copier in a low-volume office can use 70% more energy per page than an efficient low-volume (under 20 copies per minute) copier. Duplicators and inkjet printers use up to 95% less energy than conventional printing devices.

Consider alternatives

Explore adding solar or wind power to generate electricity.

Stay cool

Office equipment generates heat in work spaces which then requires more power for cooling. Put printing devices in areas with natural ventilation and good airflow to reduce the need for air-conditioning. Consider duplicators or inkjet printers that do not produce heat.

Choose ENERGY STAR

Look for the ENERGY STAR logo when buying office equipment. The logo ensures that the device has automatic power-management features and uses energy more efficiently.





About RISO, Inc.

Riso, Inc., headquartered in Burlington, Massachusetts, is a wholly owned subsidiary of RISO Kagaku Corporation, Japan's leading manufacturer and distributor of production printers, digital duplicators and supplies. RISO is known for its digital duplicators and the world's fastest full-color cut-sheet inkjet, and just recently released its fourth generation of inkjet solutions, the X1 Series, as well as a variety of accessories for workgroup and commercial environments, including Perfect Bind and Print to Mail Solutions.

The company strives to create fundamentally unique new technologies through an approach that emphasizes productivity, cost containment, and versatility, delivering compact, high-volume duplicating and printing machines that perform many of the same jobs as much larger, more complex printing processes, outputting at rates of up to 180 ppm. RISO products are sold in 180 countries, and the company continues to set the world standard, developing machines with the fastest output, the smallest footprint, and the most cost-effective operation in the printing and duplicating industry.

For more information, visit our web site at <http://us.riso.com>, and don't forget to use the RISO energy savings calculator.





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