False Assumptions and Faulty Logic Pervade New HP Environmental Report

Hewlett-Packard (HP) commissioned a company, First Environment, to "study" the environmental impact of HP OEM toner cartridges that are recycled compared to single-use remanufactured cartridges. The study concludes that the two are equal in environmental impact.

A close examination of this report, the assumptions upon which it was based and the scientific methodology used to determine its findings are important, because the report's conclusions are being used by at least one OEM to diminish the importance to the environment of remanufactured cartridges.

If such information is allowed to stand without a response from the remanufacturing industry, the report's conclusions will affect consumer perceptions. Remanufacturers must be aware of the claims made by this report and be able to explain to customers the false assumptions, faulty logic and outdated information used in the report.

First Things First

First Environment is a company that creates studies which appeal to large companies. It is an environmental consulting company. Many of its articles and presentations are about how to profit the most from environmental issues. A visit to its website at

Lester Cornelius, president and technical director of **Optical Technologies Corporation**, is chairman of the Int'l ITC, chairman of the Standardized Test Methods Committee, president of the Remanufacturing Industries Council and sub-committee chairman for ASTM F 05.01. He developed the first coating for remanufacturing PCR rollers. Lester can be reached at lestercorn@aol.com.

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www.firstenvironment.com will indicate the types of reports and presentations the company produces.

First Environment relies upon ISO 14040-1997 to provide credibility for this study. To quote the standard: "…life cycle assessment can assist in identifying opportunities to improve the environmental aspects of products at various points in their life cycle; decision-making in industry, government or non-government organizations (e.g. strategic planning, priority setting, product or process design or redesign); selection of relevant indicators of environmental performance, including measurement techniques; and marketing (e.g. an environmental claim, ecolabeling scheme, or environmental product declaration)." It is the last one, marketing, that the First Environment report appears to address foremost.

According to the First Environment report, "While the goal of this study is to evaluate the comparative environmental profiles of HP and remanufactured cartridges, its use is not limited to environmental reporting." The report, in fact, is currently being used as a marketing piece by HP. ISO 14040, a standard for life cycle assessment, allows this study to be used for marketing. The commercial aspect being written into the standard raises red flags about credibility because so much money is at stake.

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Not a Test Method: Life Cycle Assessment

It also is important to understand that life cycle assessment is not a well-developed science. Quoting ISO 14040, "The International Standard recognizes that life cycle assessment is still at an early stage of development. Some phases of the life cycle assessment technique, such as impact assessment, are still in relative infancy."

The standard simply does not give a means to run calculations, or even examples of a life cycle assessment. Instead, it provides a structure to report a study on life cycle assessment. It is a reporting, or formatting, standard and not a test method.

This distinction is very important to keep in mind, because how a life cycle assessment is conducted is entirely up to the company or organization running the study. There are no specific instructions on how to conduct a life cycle assessment. It is puzzling why this ISO standard exists at all. It is a compilation of generalities.

False Assumption: Page Yield

The First Environment report makes its environmental comparisons in several ways. The most important is, "…the cartridge comparison is being made in terms of function of printing pages, so that it is fairly based on the service that the cartridge provides, not on a physical cartridge to cartridge comparison."

This statement proposes a strange environmental comparison. It is not the environmental impact that concerns this study, except through the unfocused lens of page yield. That assumption and stated goal is the key to finding one's own level of acceptance of this report. Is environmental impact truly a function of the number of pages a toner cartridge can produce?

The First Environment report relies mostly on a previous report by Quality Logic. That report was based on one cartridge model and compared yield between new HP cartridges and remanufactured cartridges. The First Environment report says: "It should be noted that the page yield presented by Quality Logic is an average yield, which [is] affected by non-functioning cartridges. In other words, as cartridge failures for the sample of a given brand went up, the brand's average yield decreased. This is the only way that cartridge failures are accounted for in this study." The concept of replacement of either OEM or remanufactured cartridges is nonexistent in this study, although it exists for both cases in the real world.

There are some glaring mistakes in the First Environment report. For example, page yield on a 96A was listed as 2,960 for HP and 2,741 for remanufactured cartridges, according to the Quality Logic report. Quality Logic did not use a 5-percent coverage test target. That is hard to understand, since HP lists 5-percent coverage on its website and in its literature for yield determination.

The difference in unusable pages, as defined by Quality Logic, was not an apples-to-apples comparison. For HP, it was an average over 50 cartridges, and for remanufactured cartridges, it was an average over 30 cartridges. The more cartridges tested, the better the result. Why were 40 percent fewer remanufactured cartridges evaluated than OEM cartridges?

The difference in unusable pages between OEM and remanufactured was an average of 128 fewer pages for remanufactured cartridges, according to Quality Logic's own calculations. The cartridge model tested was rated at 5,000 pages at 5-percent coverage. This means that according to Quality Logic the difference is 2.6 percent, using 5-percent coverage.

Outdated Data: Second-Hand Sources

Here is a telling quote from a First Environment article, "The Top Ten Pitfalls of Environmental Audits and How to Avoid Them," that explains some of the shortcomings in this report: "Often the seller [substitute HP] has assessments that have been performed in the past or even assessments contracted for to support the marketing effort [substitute the Quality Logic report]. It can seem terribly attractive to use these, with perhaps an update performed by the original consultant. After all, why spend additional money on work that has already been done once?"

In the quote above, First Environment acknowledges the potential corruption of old data or the use of outdated information from previous consultants [the Quality Logic yield study] and old magazine articles.

First Environment's report relied for its input (called inventory by the ISO standard) entirely on second-hand information, and some of it is completely unsubstantiated. There is a requirement in ISO 14040 for quality data: "The nature of choices and assumptions made in life cycle assessment (e.g. system boundary setting, selection of data sources and impact categories) may be subjective."

As a matter of record, no investigation was made by First Environment. It relied on old data. The entire report is based on a yield test report from Quality Logic, some mostly unrelated evidence and quotes from a few older trade magazine articles.

Outdated Data: Single-Cycle Remanufacturing

The study relies in part on information it gleaned from an article written in 2002 in *Imaging Spectrum*. The report quotes, "[In] 2000, at least 70 percent of the first remanufacturing cycle cores were abandoned."

The assumption is based on outdated information. HP's own market strategy of increasing the number of printer models it releases in as short a period of time as possible has changed how the industry works. Five years ago, 20 printer models encompassed 70 percent of the market. As of 2003, according to information from Lyra Research, Inc., that same 70 percent is comprised of 76 printer models.

The increase in printer models has several consequences. First, it makes finding particular empty cartridges more difficult and

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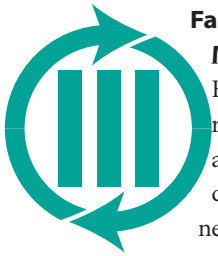
expensive. Second, it raises inventory requirements not only for remanufacturers, but also for HP dealers. The increase in cost to remanufacturers has forced the industry to reuse as much as possible. The increased scarcity of empties has created higher residual value that has made reuse of a remanufacturer's own cartridges good economic sense. This has changed the whole premise that the HP study is based on. It is based on single-reuse arguments that simply are not the case today due, in large part, to HP's own strategy.

There are still some remanufacturers who follow the single-reuse concept, but they are rapidly learning that it simply is not economical to turn away their own remanufactured cartridges. No one has hard numbers on how many times a remanufactured toner cartridge is reused. However, some of the largest toner cartridge remanufacturing companies in the world apparently are recapturing as much as 40 percent of their own empties. That is a number approximately equal to what HP claims to recapture. Both Staples and Office Depot have huge, global, empty cartridge recapturing programs so that they can supply their cartridge remanufacturers.



Faulty Logic:
Multi-Cycling Too Complex

First Environment reported that "Multi-cycle remanufacturing as a scenario was considered at the onset of the study." However, it was deemed too complex, and they did not see the need to investigate this.

First Environment seems to use the "too complex" justification not to proceed down any avenues of investigation that might lead away from the apparent marketing goals of this report. Instead, the study states its assumptions "transparently" as defined in ISO 14040. If one states one's assumptions transparently, according to ISO 14040, one will get acceptance of the outcome.

Faulty Logic:
First Manufacture Environmental Impact Too Complex

First Environment omits the environmental impact of the original manufacturing steps used to make new HP toner cartridges, including component manufacturing. The report could not establish the environmental impact of first manufacture, stating it was too complex. So, how is it possible to make a comparison to remanufacturing without this information?

The First Environment report states: "There was insufficient data available to completely model processing into individual cartridge parts and the actual cartridge assembly process." HP certainly has this information. Omitting this information greatly shifts the balance of the environmental impact. It is hard to imagine a life cycle assessment that is considered viable without the complete impact of first manufacture.

The study eliminated the environmental impact of any metal components, "But the remaining 60 percent by mass—for example, impacts associated with the forming of the individual parts from metal—were not to be included."

Remanufacturers generally reuse the metal components in toner cartridges. The First Environment report chose to ignore this fact. As long as this case of selective inclusion is stated "transparently," according to ISO 14040, this omission is acceptable.

False Assumption: Drill and Fill

First Environment's calculations include significant reliance upon drill-and-fill operations. The removal of the drill-and-fill portion of the comparison tips the environmental balance greatly in favor of remanufacturing based upon First Environment's own calculations and conclusions. "Drill and fill" is a term used by OEMs as a negative marketing ploy, spreading the impression that such remanufacturing methods still exist.

Drill and fill was the earliest, crudest technique used by refillers who were afraid to dismantle the cartridge. A hole was drilled in the toner hopper, toner was added to the empty hopper and the hole was plugged. Nothing else was done to the cartridge. There are no remanufacturing operations that use this technique in North America, Europe, Japan or Australia. However, there are about 30 websites on the Internet that offer drill-and-fill kits for sale.

It is clear that First Environment is using a false assumption to perpetuate an OEM myth that drill and fill still exists as a viable business model. The report compares recycled HP toner cartridges with both remanufactured toner cartridges and drill and fill. Including references to drill and fill reduces the environmentally-friendly aspect of remanufacturing according to First Environment's calculations.

Faulty Methods:
Data Quality Review by Harvard Academics

Some unnamed persons from "academia at Harvard" looked at the First Environment report and placed their stamp of approval on the study, apparently also failing to test the quality of the data and assumptions. The academic review is not explained.

It is unlikely that the accuracy of the data was considered. ISO 14040 requires that the data quality be evaluated independently. That was not done properly. It would be illuminating to question the "academia at Harvard" about what it was that they did. Were they paid for an endorsement or to do an objective evaluation as required by ISO 14040?

At no point was any reliable remanufacturing source, such as the International Imaging Technology Council, contacted for a test of the data included in this report.

ISO 14040, section 5.1.2.3 clearly states: "Data quality requirements shall be defined to enable the goals and scope of the life cycle assessment study to be met. The data quality requirements should address: time related coverage, geographical coverage, technology coverage, precision, completeness and representativeness of the data, consistency and reproducibility of the methods used throughout the life cycle assessment, sources of the data and their representativeness; uncertainty of the information." The First Environment report consistently fails in both precision and representativeness.

ISO 14040 states in section 5.1.2.5, Critical Review considerations: "A critical review shall be conducted for life cycle assessment studies used to make a comparative assertion that is disclosed to the public and shall employ the critical review process outlined in 7.3.3."

ISO 7.3.3 Review by interested parties states: "An external independent expert is selected by the original study commissioner to act as chairperson of a review panel. Based on the goal, scope and budget available for review, the chairperson selects other independent reviewers. This panel may include other interested parties affected by the conclusions drawn from the life cycle assessment study, such as government agencies, non governmental groups, or competitors."

Harvard academics do not constitute other interested parties and certainly not competitors. The review process, according to ISO 14040, has been compromised by First Environment.

However, First Environment does have wiggle room in its report and could claim that HP did not give it a large enough budget for a thorough independent review, or it could refer to those other wiggle words, such as "may include" in 7.3.3. However, if First Environment were forthright, the independent review would have included other interested parties.

According to ISO 14040's directive: "The review statement and review panel report, as well as comments of the expert and any responses to recommendations made by the reviewer or by the panel, shall be included in the life cycle study report." None of this was in the detailed report released to the public by First Environment.

False Assumption: Transportation and Environmental Impact

The First Environment report also uses some false assumptions relating to transportation. It assumes that all cartridges had to be transported to St. Louis, Mo., for the purpose of calculating the environmental impact of shipping. The logic used is that the city is centrally located in the United States. Remanufacturing is decentralized, and there does not appear to be any significant portion of the industry that insists on shipping through Missouri to get to the other 49 states.

The report states that HP transports cartridges from Japan at a distance of 5,200 miles and then adds 1,400 miles from the West Coast to St. Louis. According to the report, remanufacturers, for the purposes of environmental impact calculations, truck cartridges 1,500 miles to St. Louis. Perhaps most remanufacturers start from offshore platforms 100 miles out to sea! The transport distance is used in calculating the environmental impact. East Coast remanufacturers have a much shorter distance to St. Louis.

A much more rational approach would have been the distance to large population centers, where it can reasonably be assumed that there are more laser printers and, therefore, more cartridge usage. That would have been more difficult for First Environment, but it certainly would have made more sense than the arbitrary selection of St. Louis.

Faulty Assumption: Environmental Impact of Broken Cartridges

The report refers to CAP Ventures as a source for the amount of unusable empty cartridges due to shipping damage. It quotes CAP Ventures as stating that 20 percent of the cartridges shipped to brokers were unusable.

The study makes that figure worse by assuming that the same number of cartridges failed in shipping to the remanufacturer's facility. According to the First Environment report, this equates to 36 percent of the empties being broken and defective. The underlying assumption is that shipping cartridges causes this high level of damage. At that rate, there would be no aftermarket.

Faulty Method: The Selection Process

There is no explanation of the process used for selecting remanufacturing companies as representatives for this study. The study acknowledges that it has no basis for selection; yet somehow a selection has been made. It might seem that the selection process would make the report appear biased, so it is more convenient to say that there is no basis for the selection of comparison companies.

False Assumption: Recovery Programs

The study makes yet another questionable assumption that does not in any way reflect reality. The report states: "… it was assumed that the user choosing HP cartridges would take advantage of the free return and recycling program after each use, if not providing the cartridge to a remanufacturer."

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This statement obviously is based on the assumption that a 100-percent recovery program is in place, which to this day has not happened. The reality is that no company accomplishes 100-percent recovery of its toner cartridges. Additionally, there is no reference made in the study to the energy required to recycle an HP cartridge.

A Conclusion Contradicting ISO 14040

First Environment comes up with percentages or scores for recycled HP cartridges compared to remanufactured single-cycle cartridges. Its conclusion is in direct contradiction to ISO 14040. According to ISO 14040, "There is no scientific basis for reducing life cycle assessment results to a single overall score or number, since trade-offs and complexities exist for the systems analysed [sic] at different stages of their life cycle."

Yet despite the ISO standard's directive, First Environment reduces the comparison to environmental equality between recycled HP cartridges and single-cycle remanufactured toner cartridges.

Overall, the assumptions made and the data input in the First Environment study reduce its value to a marketing piece with low credibility. Finally, it is irrational to say that a reused toner cartridge is the environmental equivalent of a new toner cartridge that subsequently is recycled.