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## Question 9:

# What can computer display manufacturers do to reduce environmental impacts?

The final step of an LCA is an "improvement assessment" or "interpretation of results." An improvement assessment is the systematic evaluation of opportunities for reducing the environmental impacts of a product, process, or activity. In this LCA, the improvement assessment is left to individual computer display manufacturers.

The improvement assessment can be done at various levels of effort, beginning with looking at the overall results as presented in the CDP report by life-cycle stage, or looking at individual material contributions to impacts. Using the LCIA data reported in the CDP, one would first apply individual subjective importance weights to each impact category to help determine where to focus improvements. This can be done at the life-cycle stage level, the process or process group level, or individual material level. All the data presented in the CDP report should allow for this type of assessment, with the exception of the subjective importance weights. The importance weights simply mean looking at which impact categories have greater importance to the decision-maker and weighing those impacts accordingly. This will assist in making decisions about where the greatest impacts of particular interest to a company are and where one would choose to target improvements.

If more analyses are desired about a certain process, a company may perform the analysis internally with additional data they have collected or they may contact the University of Tennessee to determine if additional analyses can be done and still protect confidentiality of data. Additional analyses by the University of Tennessee beyond those presented in the final report would be done for a fee as negotiated with the University of Tennessee.

The LCA results do identify several areas manufacturers should consider as part of their improvement assessment. Regardless of whether a manufacturer is conducting a complete improvement assessment, the LCA methodology itself provides a systematic process for considering the environmental and health impacts of the computer display's life. Specifically, manufacturers should consider the following when conducting an improvement assessment or evaluating potential process improvements:

**Of the various life-cycle stages, the actual manufacturing process presents the most opportunities for improvement.** Opportunities for improvement in CRT manufacture could include improved energy efficiency during glass manufacturing and reductions in lead content. Opportunities for improvement in manufacturing LCDs could also include improved energy efficiency. Certain materials, such as sulfur hexafluoride, are of concern due to their contribution to global warming, and should be an area of focus in an improvement assessment.

**Consider the impacts of manufacturing changes on other stages of the product's life cycle.**

Computer display manufacturers will likely have the most control over the manufacturing life-cycle stage, but they should also recognize the influences on the other stages on total environmental impacts. Any improvement assessment should consider how changes in one life-cycle stage will affect impacts in other stages. For example, the mercury inputs and outputs from the intentional use of mercury in an LCD backlight are less (by mass) than the mercury emissions from the CRT use stage, due to the relative energy inefficiency of the CRT and the emissions of mercury from electricity generation. This example illustrates that on a pure mass basis, a product's energy efficiency is a key consideration, and any changes in manufacturing should be examined to determine whether they will increase energy use. In general, life-cycle trade-offs must be considered in any improvement assessment.

**Identify opportunities by evaluating the relative environmental impacts of different process steps and components.**

The LCA provides an accounting of the relative, potential environmental and health impacts of various components of the computer displays. This information can help computer display manufacturers identify opportunities for product improvements to reduce potential adverse environmental impacts and costs. Identification of impacts from the computer display technologies can also help manufacturers determine where their best opportunities lie for implementing pollution prevention options.

**Manufacturers can use this study as a basis to evaluate company-specific processes.**

One of the objectives of this study was to provide a model for future analyses. Companies that have more current data for the CRT or LCD can apply them to the study's model. For example, changes in an individual process can be identified and incorporated into the results. The other processes that are not expected to change significantly can be left unchanged, and only limited data would need to be altered. This method would reduce the time and resources that would normally be required for a complete analysis. Companies may examine their processes internally or contact the University of Tennessee to discuss opportunities to conduct additional analyses.

**Manufacturers can weigh criteria to reflect site-specific factors.**

Those interested in comparing the results of the two computer display technologies can apply their own set of importance weights to each impact category to make their site-specific decision. For example, if energy impacts are considered to be much more important than aesthetics, energy can be weighed more heavily in concluding which monitor may have fewer environmental impacts. When applying the study results, it is also important to keep in mind the data limitations and uncertainties, as well as cost and performance considerations.