Life Cycle Assessment and Public Policy Development for the Automotive Industry

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Although engineers have looked at energy use and waste generation for well over a century, initially because of their obvious impact on a company's bottom line, it wasn't until the 1960s that many companies began analyzing whole industrial systems. Modeling exercises such as the 1969 National Academy of Science's "Resources and Man" and the 1972 Club of Rome's "A Blueprint for Survival" fostered concerns about world population growth and the possibility of the exhaustion of fossil fuels, mineral resources and growing environmental problems. Although some of the predictions were somewhat extreme (for example, one Club of Rome study predicted that the earth's fossil fuels would be depleted by 1992), they did spark interest in describing the behavior of extended industrial systems to learn more about their environmental impact.

My intent today is to give you a brief overview of how this practice of analyzing life cycle impacts evolved; to identify evolving environmental policy initiatives, both domestic and international, affecting the automotive industry; and to comment on the role of life cycle analysis as an approach to public policy development.

Over the last 20 years, environmental pressures from governments and public opinion led to the evolution of measuring an industrial system's environmental impact. Initially, interest focused on the use of energy and was often referred to as energy analysis, requiring calculations to describe processes that naturally included the consumption of raw materials and solid waste generation.

In addition to the concern over energy consumption, there had been a long-standing recognition of environmental implications. Environmental issues such as global warming and ozone depletion added to the need to consider potential emissions to both air and water. Since the methodology for evaluating the global release of emissions is similar to that used for calculating energy consumption, energy analysis was expanded to encompass their computation. As a result, the term "energy analysis" evolved into Life Cycle Analysis or Assessment (LCA). Since the oil crisis of the 1970s, regulators in North America, Europe and Asia have conducted various types of LCA studies and private companies have conducted internal LCAs as well.

In the mid-1970s, LCA began to play a more prominent role in the development of public policy. For example, at the same time that energy awareness was growing, the environmental lobby began focusing on the packaging industry, especially beverage packaging, where the introduction of single use packaging was seen as wasteful. In the United States, pressure grew to promote returnable containers and resulted in the 1972 pioneering bottle bill in Oregon that has since been replicated elsewhere. In Europe, the European Commission directive on beverage packaging was passed in 1985. The data used to promote this legislation were based on results of energy and resource analysis.

Today, LCA is an emerging tool worldwide in the development of public policy and in design decisions. It analyzes multiple attributes of a product or system from cradle to grave. It also has the unique ability to create a quantitative inventory listing of all process inputs and

outputs (including environmental emissions and energy resources) from which tradeoff analyses can be made before making public policy decisions or investing in significant products, changes or research.

A recent (1994) survey conducted by the Swedish Waste Research Council indicated a number of motivations for conducting LCAs by policy makers. The data indicates that the most common reasons for performing an LCA are to improve the environmental performance of products and to make informed long-term policy decisions. Specifically, the survey results indicated the following relative ranking of recommendations:

- Help develop long-term national environmental policies,
- Supply information needed for legislation or regulatory policy,
- Gather environmental information, and
- Evaluate claims by manufacturers.

This awakening of the public's consciousness towards energy conservation and environmental issues, in addition to LCA's emergence as a measurement tool in a world with an increasingly global economy, gave rise to a push for the global harmonization of LCA standards.

The International Organization for Standardization (ISO) brought LCA to the forefront in the early 1990s through ISO environmental management standards activities. Today, experts from 29 countries are entering their fourth year in the development of the ISO 14000 standards for environmental management systems.

Some believe ISO 14000 could lead to greater LCA acceptance and increase the viability of its expanded use in developing regulations by establishing tradeoffs. Others hope ISO 14000 will clarify the inherent limitations of LCA as a policy development tool.

In this regard, I believe we must be cautious in the use of LCI or LCA as decisional tools in setting public policy. There are a range of inherent limitations that others can speak to, but let me mention a few. First, data that may hold environmental significance in one region is often not significant in another region, and this holds true across the globe. In addition, the economic drivers in individual countries and regions are not currently taken into account by typical LCA.

For example, landfill and incineration costs make the end of the life segment of a product life cycle a much different issue in Japan than in the United States, where landfill costs are much lower. As seen in this slide, the economic drivers for diverting material away from solid waste varies significantly from country to country, depending on the relative availability of landfills--supply and demand at work. In addition, the subjectivity involved in evaluating the human health and environmental effects of process inputs and outputs limits LCA's use, particularly across cultures where values and needs may differ. For these reasons, LCA while useful to inform any policy debate should not be seen as a dispositive decision making tool for development of global environmental policy.

What is driving environmental policy today in the automotive arena? The emphasis has been on the last stage of the vehicle's life cycle -- end-of-life (EOL) vehicles. In some European nations, public policy initiatives are directing responsibility to the automotive manufacturers for EOL vehicles.

The initiative with the most widespread implications is the European Commission's "Draft Directive on EOL Vehicles." Proposed in 1995, the draft directive combines the principles of the "Directive of Packaging and Packaging Waste" and the recommendations of the priority waste streams group. Proposals for the directive, which the commission hopes to finalize this year, must then be approved by the European Parliament and Council of Ministers. The target implementation date is 2002.

Approval of the proposed directive is by no means assured. The United Kingdom is generally opposed to the idea of European legislation, and the European automotive industry has questioned the need, because EOL vehicles account for less than 1 percent of European Union waste, and that, in any case, the industry is already implementing the strategy on a voluntary basis.

Additionally, several European countries have set, or are in the process of developing guidelines for EOL vehicles.

For example, France established a system of shared responsibility in 1993. Vehicle equipment manufacturers, dismantlers, recoverers and recyclers, together with material producers, signed an agreement with the government on the management of EOL vehicle waste. The agreement said that waste for ultimate disposal would amount to no more than 15 percent of the total weight of the vehicle by 2002, and no more than 5 percent by 2015. The importers of foreign vehicles also have endorsed this agreement. This type of voluntary system is generally preferred by the auto industry when compared to the proposals of the European Commission.

Germany approved an ordinance adopting a voluntary EOL recycling scheme proposed by the German auto industry. Beginning in 1997, auto makers must take back used domestic and foreign cars no older than 12 years, at no cost to the owner. This will only apply to cars registered for the first time after the decree takes effect. The ordinance calls on the automotive industry to establish a nationwide recovery and recycling infrastructure within two years, and to increase a car's recyclable content from the current 75 percent per unit weight to 85 percent by 2002 and 95 percent by 2015.

Sweden's Environmental Protection Agency wants producer responsibility to cover both old and new automobiles: a recycling fee would be charged, but the Agency believes that it is more important to dispose of hazardous substances safely and design them out of new autos than to increase the proportion of material recycled. Swedish auto manufacturers and wholesalers proposed a voluntary system under which they would assume the main responsibility for collecting and disposing of EOL vehicles, but only those registered after fall 1997.

The United Kingdom has no legal requirement for vehicle recycling, but a "Certificate of Destruction" has been introduced to ensure the proper disposal of EOL vehicles. The Automotive Consortium on Recycling and Disposal (ACORD) was set up in 1992. Responding to a government challenge, it submitted an outline for a voluntary "producer responsibility" plan in 1993 based on the priority waste stream's project group's proposals.

The Netherlands has had a recycling subsidy program since 1994 in which auto buyers must pay approximately $150 toward an automobile's dismantling and disposal on each new car registered.

In Denmark, the automotive sector is one of seven where the Environment Minister has

opened negotiations with industry sectors on take-back arrangements.

In Japan, a lack of landfill space will make it increasingly costly to dispose of automobiles (and other durable goods). Automobile and electronics manufacturers expect that they will eventually be held directly responsible for their end-of-life plastics. Recently, the Ministry of International Trade and Industry (MITI) established numerical automotive recycling targets for cars with engines between 1.5 and 2 liters in size.

In the United States, where landfill space is actually increasing, the EPA is in an information gathering posture, and is looking at possible policy recommendations. EPA representatives keep a close eye towards international initiatives, but does not appear to be proceeding on any specific agenda presently.

The Agency is becoming more active in the area of Life Cycle Management (LCM), which examines the environmental impact of products through the full life cycle of products.

The Automotive Sector of EPA's Common Sense Initiative believes that LCM:

- Leads to a decrease in the use of environmentally damaging materials;
- Leads to process designs that encourage recycling; and\
- Minimizes environmental burdens across the life cycle of parts.

Furthermore, the sector offered the following recommendations:

- Industry, states and the EPA should develop methods of assessing life cycle requirements;
- States and industry should consolidate and simplify environmental reporting requirements to provide more useful data for LCM initiatives;
- Manufacturers should collect data related to life cycle impacts;
- Manufacturers and their suppliers should develop common methods of data collection to support LCM; and
- Recycled content and recyclability definitions should be harmonized across industry, state and federal arenas and, where possible, across the international community.

In the area of procurement, a 1993 Clinton Administration Executive Order requires the EPA to "issue guidance that recommends principles that executive agencies should use in making determinations for the preference and purchase of environmentally preferable products." Development of these guidelines, which suggest the use of "life cycle considerations" to determine environmental preferability, is still underway.

Many U.S. states followed suit by establishing procurement guidelines with requirements that "life cycle analysis" be considered in purchasing decisions. Some states have made recycled content a guideline for automotive fleet purchases and other products.

In a broader context, the President's Council on Sustainable Development has been investigating the concept of "extended product responsibility." Under this concept, all participants up and down a product's life cycle chain have a proper role to play in addressing the product's environmental impacts. The

American Chemistry Council's staff has been working with the U.S. EPA and is examining case studies of products and services where the concept has been employed. EPA is looking at potential public-private actions that could be taken to foster expanded application of the concept, although the ultimate outcome and timing of the staff's activity is not clear.

The situation in the U.S. is a microcosm of the world scene. Each state has a different economic situation, and environmental issues vary just as they vary regionally or nationally. While international bodies basically agree on Life Cycle Inventory (LCI) methodology, they do not agree on how to assess the impacts of the data from those inventories. Indeed, LCA results cannot and should not be reduced to a single score that applies to a variety of regions across the board. Therefore, it should be used cautiously in making public policy decisions and as a tool to improve environmental performance of various materials.

In addition, public policy discussions in the automotive arena have been too focused on the back end of the automobile's life cycle. We all know that up to 90 percent of the energy used, therefore the environmental impact, in the car's life cycle occurs during the use of the automobile. More attention should focus on that area, instead of only the EOL aspects of a car's life cycle. At a 75 percent recycling rate, the car is one of the most recycled products in the world today. With respect to the 25 percent that is currently not being recovered, great strides have been made in developing new recovery technologies. For example, the plastics and automotive industries are investing in new ways to design plastics for greater recyclability, to improve plastics identification technology to expedite recovery, and to develop new applications for recycled plastics. APC recently unveiled a 50,000 square-foot facility in Richmond, California, used to conduct research on automotive recycling. It also holds a plastics identification laboratory that tests new technologies from around the world.

Several initiatives in the United States are right on target. One program in particular addresses the entire life cycle of an automobile. The United States Consortium on Automotive Recycling (USCAR) has been collecting Life Cycle Inventory (LCI) data on a generic 3,200 pound vehicle in order to generate a suitable set of metrics to benchmark its environmental performance. This benchmark will serve as a basis of comparison for the environmental performance estimates of new and future vehicles.

Additionally, the U.S. government's Partnership for a New Generation of Vehicles (PNGV) program is working to develop a light weight vehicle that will achieve 80 miles per gallon while maintaining the performance and comfort of a mid-size sedan. These efforts will help to address the higher environmental impact "use" phase of an automobile's life cycle.

Let's place the development of LCA as a useful tool in perspective. Today, the three major components of LCA, inventory, impact and improvement, are in very different stages of development and understanding. Inventory is the most developed of the three defined stages. Though a lot of time and effort have gone into moving into the next stages of "impact" and "improvement," both of these LCA components are far behind "inventory" in terms of standardization and understanding, and importantly, in the practice of the science and art of LCA.

The conclusion we reach is that LCA is not advanced enough to be used for making public policy decisions.

Finally, we need to keep in perspective what it really takes to bring about real change--it requires time, pain and insight. To my knowledge, anyone involved in LCA has experienced all three. The question is, has enough of each of these occurred to assure that we are indeed ready for sound fundamental change based on LCA? From what we have heard at this conference this week, I believe that all of us agree that much more needs to be done before enough insight has been gained.

The final quote, I believe, is very appropriate for any LCA and public policy discussion. From a lesser known Greek king, Agesilaus, "It is circumstances and proper timing that give an action its character and make it either good or bad."

We in the plastics industry are proud of the contributions plastics have made to reducing the car's mass, thereby using less of the earth's resources. APC believes public policy must be based on the continuing

improvement in overall quality and environmental performance of products and services that has occurred and continues. LCA is only one tool to help us achieve that goal.

Thank you.