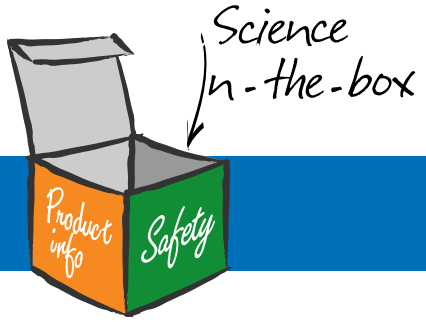

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Cutting Environmental Effect by half:

Compact detergents can do it!

Part I: The LCA Approach

Read also the 'Compact detergents have done it! Part II: Risk Assessment Approach" on **www.scienceinthebox.com**.

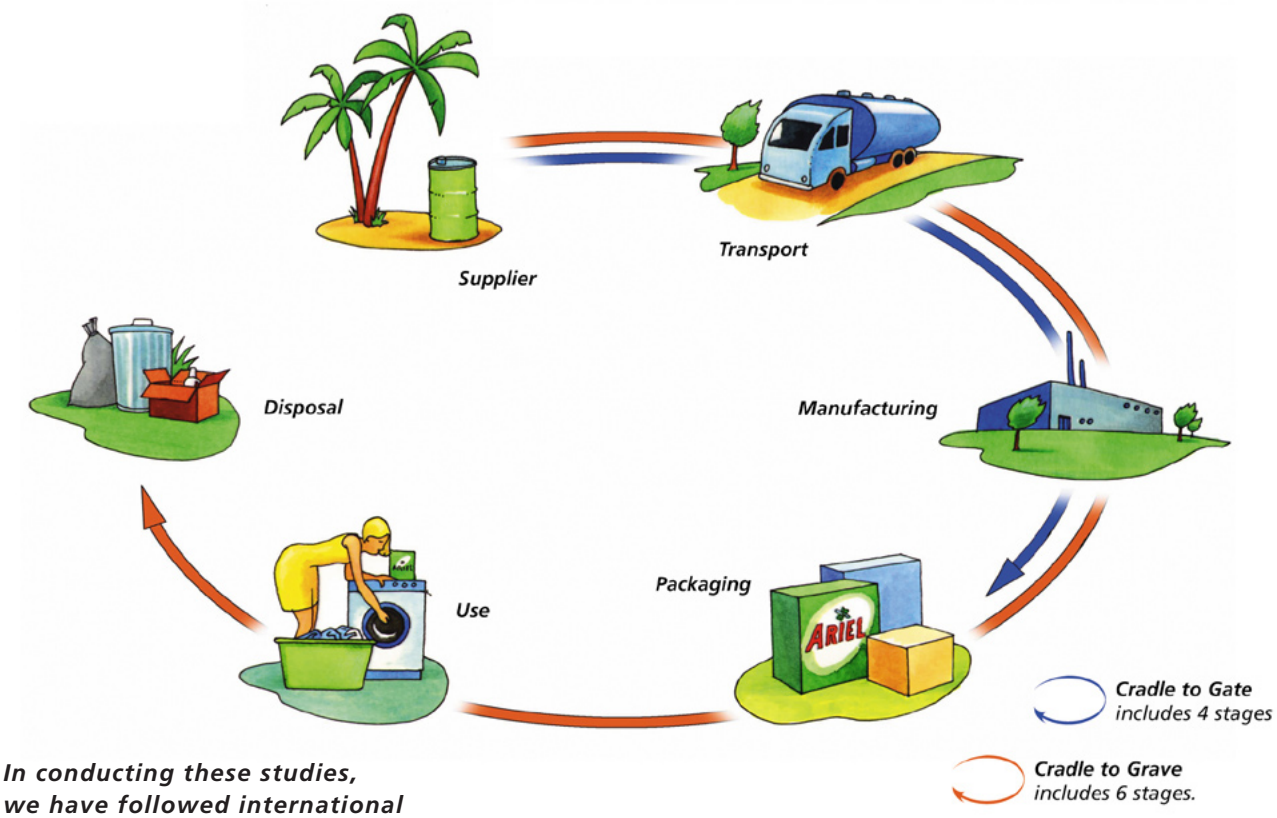
Touching lives, improving life. P&G

Part I: The LCA approach!

Slowly but surely, companies are building sustainable development into their business strategies. New exciting innovative technology has become important for companies to maintain market share in a highly competitive arena. Today you the consumer have more choice than ever and can exercise your right to "environmentally improved" products if you choose. Laundry detergents have not been omitted from this ideal. During the last fifteen years, consumers across Europe have seen great changes in the laundry detergent they use. In the early nineties, we saw the launch of the then "new" compact detergents versus the traditional "big-box" powders of before 1988. We then introduced the "super compacts" few years later. At the time, the introduction of these compact powder detergents was the result of major technological innovation. These compact products promised, along with the environmental benefit of smaller packaging and a reduction in manufacturing waste, the use of fifty percent less detergent per wash load and better cleaning power.

The Methodology – "How do we go about finding the environmental benefits?"

To clearly demonstrate how the environmental profiles of laundry detergents have changed over the last 15 years, we compared three P&G detergents: traditional powder detergent, compact detergent and super compact detergent. These were Ariel Regular (1988), Ariel Ultra (1992) and Ariel Futur (1998). We then utilized two distinct complementary methods. These were Environmental Risk Assessment and Life Cycle Assessment. In order to ascertain whether the trends were widespread, we analyzed products from two countries namely Sweden and the Netherlands. This summary will discuss the results of Life Cycle Assessment (LCA).



In conducting these studies, we have followed international guidelines and norms for lifecycle analysis.

Life Cycle Assessment (LCA)
The "Cradle to Grave Approach" and how we used it

This approach looks at the product from its infancy state, which is analogous to the "cradle" or a "beginning", to its disposal or end of life which is metaphorically the "grave". The stages that were considered are identified in the diagram below that consider raw material production, transport, manufacturing, packaging, the way in which the detergent is used by the consumer, and the disposal of the detergent and the packaging after use. We can also look at 'cradle to gate' where the LCA stops at the manufacturing gate and includes packaging. These two concepts are illustrated in the diagram above.

What did the LCA tell us?

We saw clear improvements for the environment after the introduction of the compact detergents in 1992 and the super compact detergents in 1998. When we compared them to the traditional "big-box" powders of 1988 the findings were:

Looking at the "Cradle to Gate"

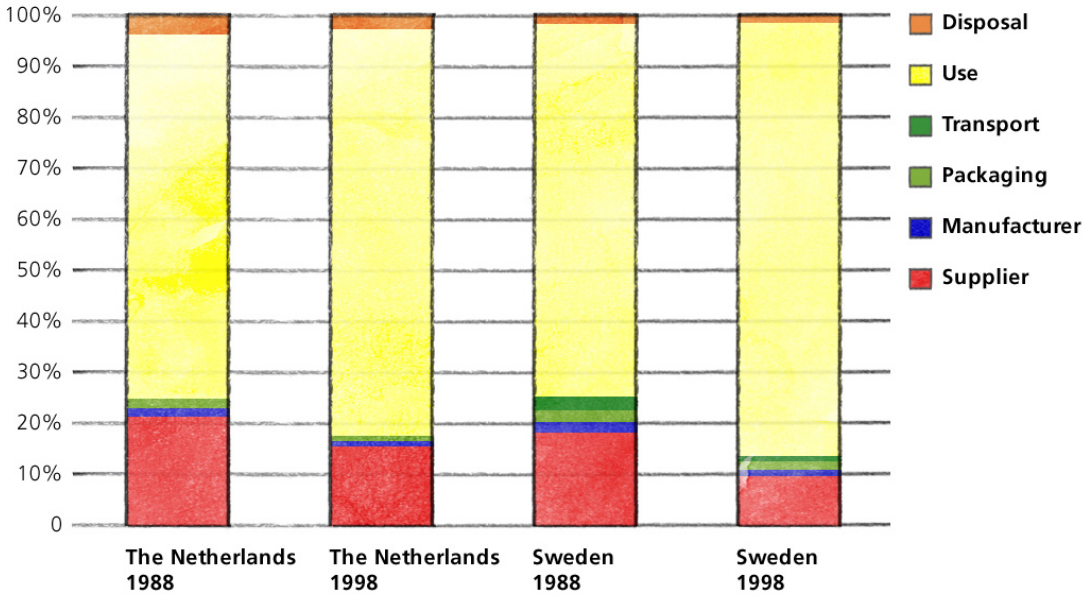
- Between regular powders and super compacts, there was a 50% decrease in environmental burdens
- More efficient chemistry in super compacts means less detergent per wash and washing at a lower temperature
- Less energy used means less CO2 and a reduction in solid waste

From the Cradle to Grave Approach

- The total energy usage between "big-box" powders of 1988 and the super compacts of 1998 declined by about 30% in the Netherlands. In contrast, Sweden saw a decline of 20% of total energy usage. In both countries, most of these energy savings were a result of a reduction of the average wash temperature, and less detergent used per wash.

"There was a distinct difference between 1998's compact detergents and 1988 bigbox powders"

- 80% of the overall energy consumption is associated with use of the product by the consumer when you heat the water and run the washing machine. Raw material supply accounts for only 15% of the energy and the remaining 5% of the energy consumption is distributed between the production and manufacturing process, transportation and disposal. The same distribution energy patterns were noticed in both Sweden and The Netherlands (see chart below).

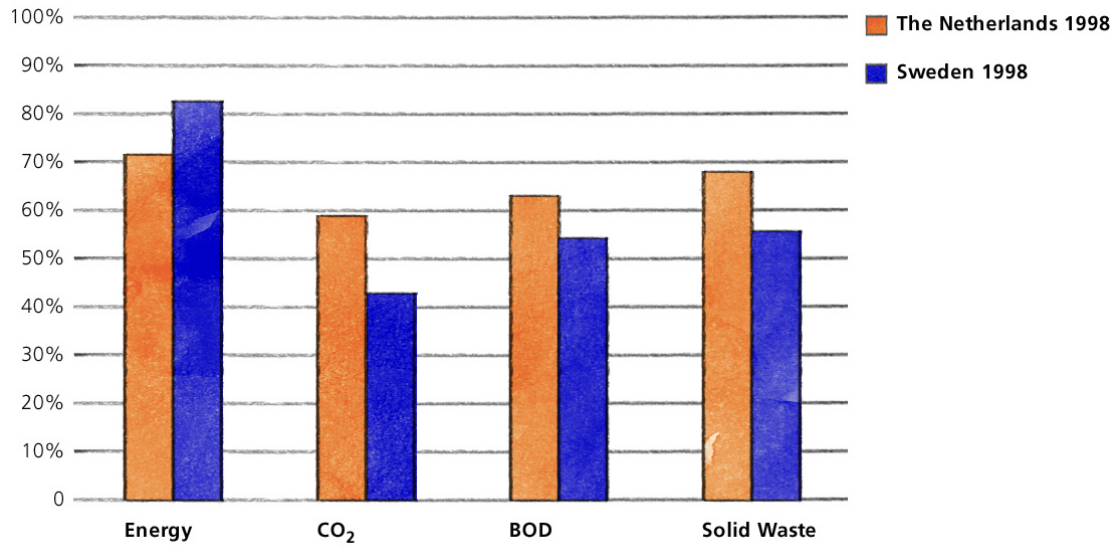


• When we looked at the period 1988 to 1998, a clear reduction in Carbon Dioxide (CO2) emissions were observed in both countries. This is good news for reducing the Greenhouse Effect. This was as a result of a decrease in emissions when the consumer washed at lower temperatures. There was also a smaller reduction observed due to energy savings at the wastewater treatment plant. This occurred because compacts use less product to get the same cleaning effect so there is less material to be treated.

• Biological Oxygen Demand (BOD) is the amount of oxygen necessary for all the organic material to decay in the presence of bacteria and protozoa. Emissions decreased by about 40% in The Netherlands, and by 50% in Sweden.

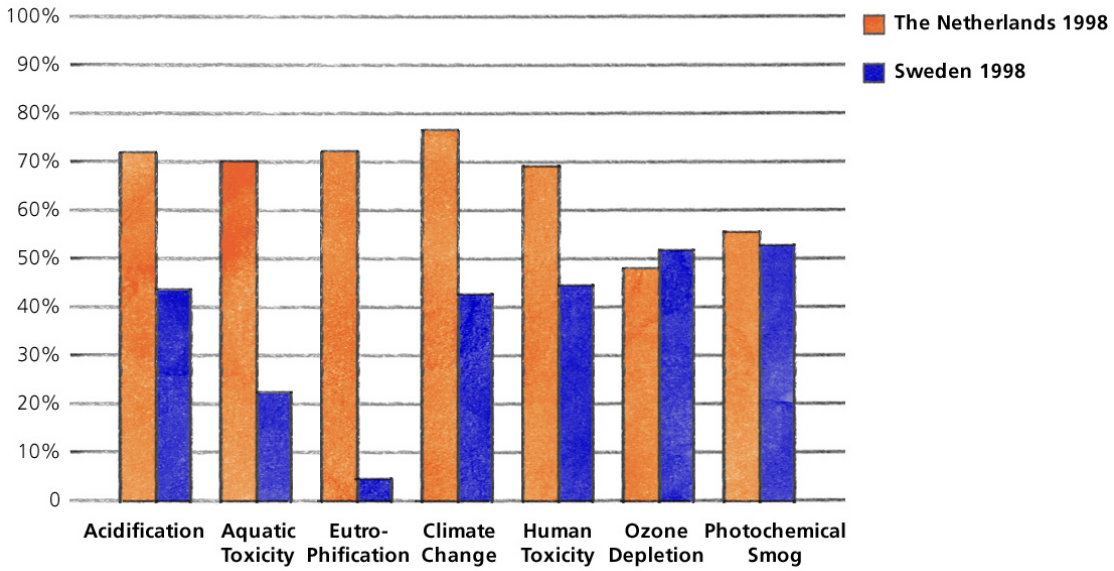
"Most of the decreases from 1988 are driven by lower energy consumption at the use phase which is due to a lower wash temperature, a lower dosage per wash and a corresponding decrease in environmental emissions."

• A 34% reduction in solid waste production in The Netherlands was seen with a reduction of almost 50% experienced in Sweden. The major sources of solid waste in this analysis were ash from electricity generation, sludge from wastewater treatment, and packaging. The 13% difference between the two countries was a result of more waste-efficient power generation in Sweden.

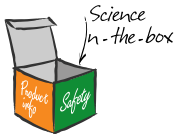


How do P&G detergents rate in other environmental impact categories?

Among the impact categories we considered were acidification (this is the production of acid rain and its effects on soil, vegetation, buildings and waterways), aquatic toxicity, and eutrophication (the over enrichment of nutrients in lakes and rivers). Also included were the potential climate change of which the largest component was CO2, human toxicity, and production of summer smog. For each of these categories, the 1998-super compact products showed significant improvements when compared to the 1988-regular "big-box" powder products in both The Netherlands and Sweden.



When we considered the wash cycle in Sweden, there was a lower environmental impact score across all these categories (except for ozone depletion). This demonstrates that the laundry process in Sweden generated fewer emissions over-all. The reason for this is due to the different method of energy generation which is based on nuclear production. Another major factor was the water. The water in Sweden contains less calcium carbonate which is also known to cause "softer" water. This means that you need a lower dosage of detergent per wash for the same cleaning power.



What the LCA shows us

Use of energy and environmental emissions such as air, water and solid waste decreased significantly. Impact categories including acidification, aquatic toxicity, greenhouse effects, eutrophication, human toxicity, ozone depletion and smog were also reduced This was as a direct result of the use of more efficient chemistry which results in a lower recommended dosage and better wash performance for the super compacts of 1998 when compared to the "big-box" of 1988. Both The Netherlands and Sweden saw reductions in energy consumption and a reduction in the other impact environmental categories. Some differences were observed between the two countries were caused by:

- Different electrical generation in Sweden.
- Different energy consumption during consumer use. The Dutch consumer used more energy.
- "Softer" water in Sweden which results in less product used per wash.
- More efficient wastewater treatment infrastructure in Sweden.

It should be emphasized that the majority of the energy consumption and associated emission came from the use phase of the lifecycle. This means that "how" we use detergent products has more environmental effect than which product we choose. With this in mind, we have to provide consumers with relevant usage instructions, and try to develop improvements that lead to lower wash temperatures, the use of less water, reduced energy usage, lower dosages, and less packaging.

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October 23rd 2003

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