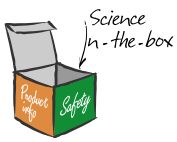


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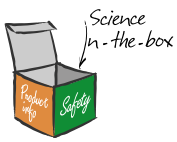
Five laundry detergent types are put to the test

Which laundry detergent has the lowest potential impact?



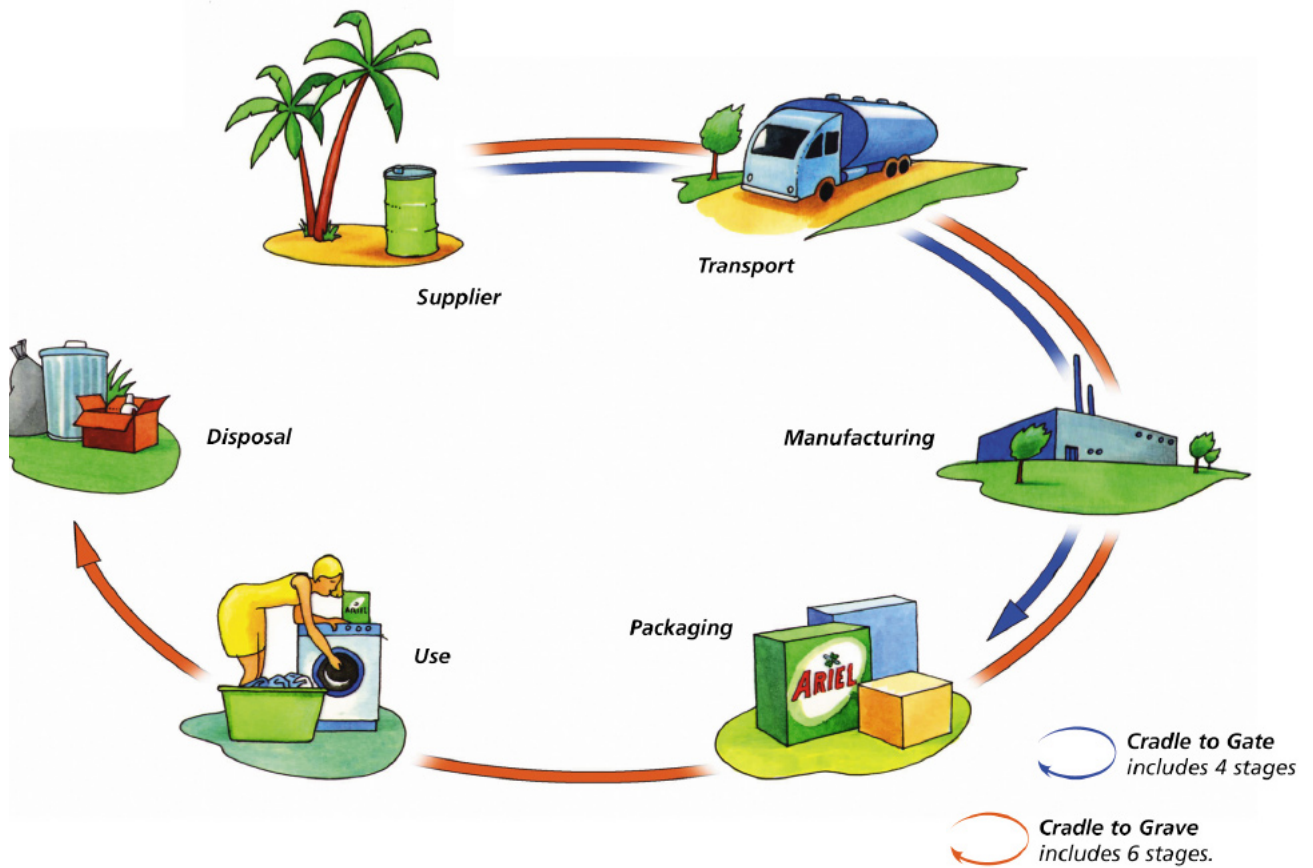


Within the last 15 years our lives have become more hectic than ever. We now access global information at the touch of a button, keep our mobile phones handy for any eventuality, and as consumers, we have become accustomed to the “get-it-now” life style. Our detergents have also kept up with this trend. The last decade and a half has seen the move from the traditional “big-box” laundry detergents, to the compact versions, and the most recent innovation, unit dose systems. In earlier studies we showed that when the compact powders of 1998 were compared to the regular powders of 1988, there was a 50% decrease in overall environmental impact. The unit dose systems were introduced in powdered tablets form in 1999, and the liquid unit dose systems came onto the market in 2001. Those detergents let you toss a sachet or tablet into the wash with the correct dosage, simply dissolving into the water without the bother of measurements and spillage? With these innovative products becoming a large part of our busy lifestyle, there are still many questions about these products. We can ask ourselves; “Are compact detergents still the best option from an environmental perspective? What about these new forms of detergents like the liquid sachets and tablets? What impact do they have on the environment compared to other detergent types?



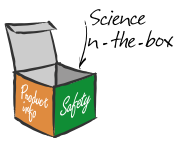
How can we assess environmental impact? Use Life Cycle Assessment (LCA)!

We conducted a Life Cycle Assessment (LCA) by comparing the environmental profiles of 5 types of laundry detergents from the Ariel brand marketed in 2001 in the United Kingdom (regular powder, compact powder, powder tablets, compact liquid, and liquid unit dose systems or sachets), throughout their entire life cycle (“cradle to grave”). The life cycle stages we looked at were: manufacturing of the ingredients, product formulation, packaging, distribution from the P&G plant to retailers, consumer use, and disposal via the sewage water treatment plant. For each detergent type we chose the size and packaging with the largest market share and considered one wash cycle using recommended dosage.



Compacts – What did the LCA tell us?

The short answer is that environmentally speaking, both the liquid and powder compact detergents are still better. We saw reductions on total energy consumption, CO₂ emission and solid waste for compact powders and compact liquids. This is because they use the least amount of chemicals when we compared them to today’s regular powders. We should add however, even with the differences we found, no detergent really outperformed each other.



	Regular Powder	Compact Powder	Powder Tablet	Compact Liquid	Liquid Tablet
For 1 wash in the UK					
Recommended dosage	High Impact (H)	Medium Impact (M)	Medium Impact (M)	Medium Impact (M)	Low Impact (L)
Packaging	Medium Impact (M)	Low Impact (L)	Medium Impact (M)	Medium Impact (M)	High Impact (H)
Energy, air/waterborne emissions, acidification, climate change, human toxicity	Medium Impact (M)	Medium Impact (M)	Medium Impact (M)	Medium Impact (M)	Medium Impact (M)
Aquatic toxicity	Medium Impact (M)	Low Impact (L)	Medium Impact (M)	Medium Impact (M)	High Impact (H)
Eutrophication	Low Impact (L)	Low Impact (L)	Medium Impact (M)	Medium Impact (M)	High Impact (H)
Ozone depletion	High Impact (H)	Medium Impact (M)	Medium Impact (M)	Low Impact (L)	Low Impact (L)
Photochemical smog	Medium Impact (M)	Medium Impact (M)	High Impact (H)	Low Impact (L)	Low Impact (L)

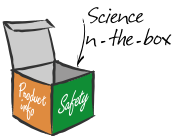
The table allows a direct comparison of the environmental impact categories of the various detergent products. It illustrates that within the powder category, compact powder is the preferred detergent type. None of the parameters were classified to be of highest impact, but compared to the other powdered detergents, it has the highest number of 'low impact classification'. Compact liquid is for the same reason the preferred detergent variant within the liquid category. Even with the observed differences, it should also be acknowledged that there is no single detergent type clearly outperforming all the others on all parameters.

The classification process is done in four steps.

- First, the highest and lowest value is determined for each parameter.
- Second, the middle value (MV) is calculated by taking the average from both values.
- Third, a lower limit value (LLV) is calculated as 80% of the MV. Similarly, a higher limit value (HLV) is calculated by adding 20% to the MV.
- Fourth, all parameters are compared to the LLV and HLV. Numbers equal or below the LLV are classified as "L", numbers equal or greater than the HLV classified as "H" and all other values are classified "M".

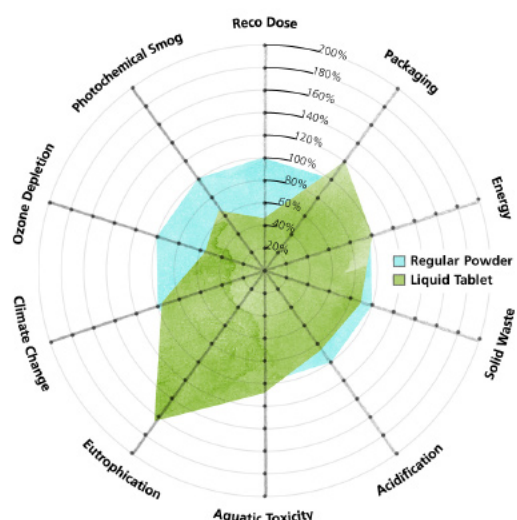
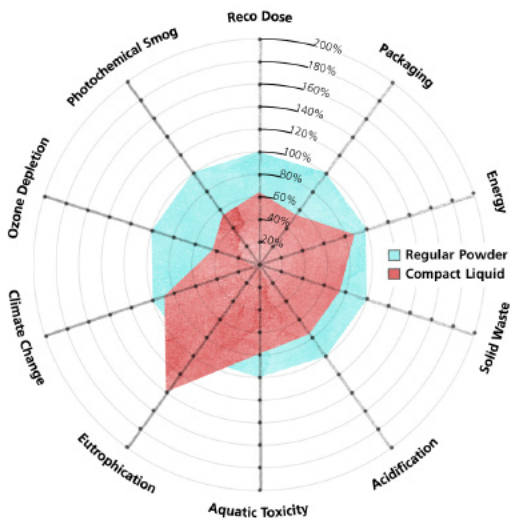
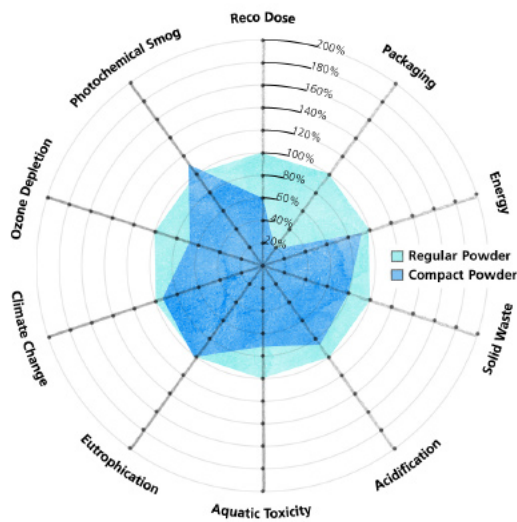
The benefit of this presentation is that it is very meticulous, since it takes only the extreme values to calculate the MV, LLV and HLV. In a table format, it allows for a quick evaluation of strengths and weaknesses for each parameter and product variant. For LCA studies, this is extremely helpful given the number of parameters and product variants.

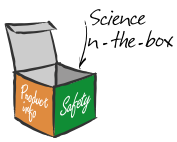
However, the weakness of this presentation is that results are transferred from a continuous scale to a discrete system with 3 classes and working with an arbitrary cut-off rule of 20% vs. the MV. As a consequence, it is impossible to discriminate between large and extremely large differences.



What about the effects of all types of detergents on other environmental impact categories? Which detergent has the lowest potential impact?

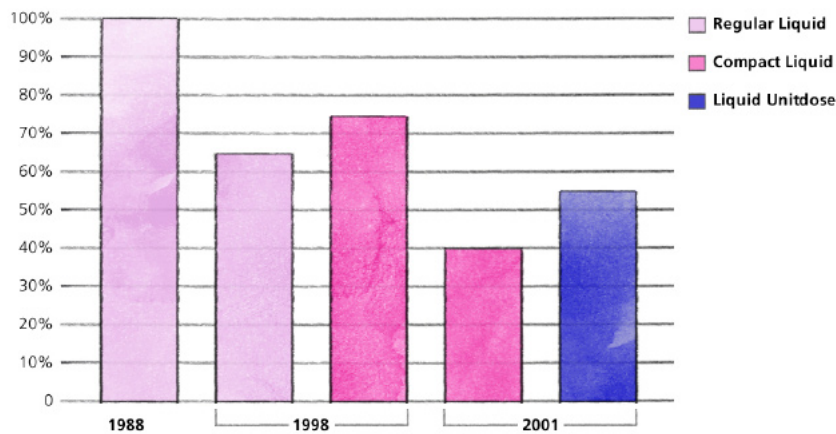
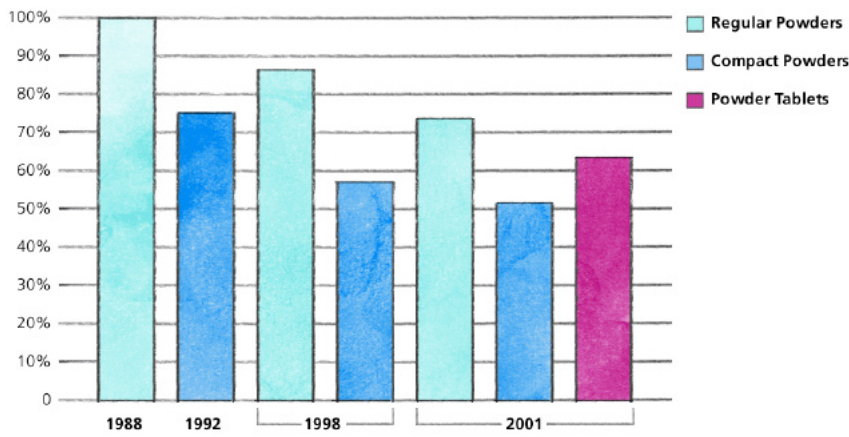
The environmental impact categories selected for this study were: acidification (production of acid rain and its effects on lakes), aquatic toxicity, eutrophication (over enrichment of nutrients in lakes and rivers), human toxicity, climate change, ozone depletion and the production of smog. For the eutrophication impact category, the score is only driven by the release of organic matters. None of our laundry detergents on the Western European market contain phosphate. Both powder and liquid compacts use less detergent per wash than the other forms of detergents and require less packaging. Because they release a lower number of chemicals into the environment, they perform better in almost all impact categories. Eutrophication is higher for liquid detergents as they release a higher amount of organic chemicals into the aquatic environment.





How do powder tablets and liquid unit dose systems stack up?

We can put all these results into perspective with earlier studies that we have conducted. We saw that with the introduction of new technologies, traditional powders have improved to such an extent, that the difference in environmental impact between the laundry detergents is now much smaller. For example, if we just look at aquatic toxicity for both liquids and powders, we see a clear decrease of the regular powders of 1988 to the regular powders of 2001!



The LCA based on one wash cycle, showed that there are no significant environmental benefits associated with these new forms of detergents as their environmental profiles are very similar. However, unit dose systems, because they allow for better control of dosage and are more concentrated (only 50 ml for liquid-tab) represents a great opportunity for reducing the total chemical usage and emission associated with the laundering process. This means less chemicals released into the environment. These forms however, still use more packaging to protect the tablets and sachets from breaking and leaking. Our scientists continue to try to find new and innovative ways to further reduce packaging.

And as always, watch the Wash Stage!

The use stage was a dominant factor in the study. Electricity and associated emissions for heating water in the washing machine provided an 80% contribution to the study. This wash temperature and energy consumption have the highest influence on the overall impact on the environment. This means that by following the washing instructions of the detergent, you will be getting maximum benefits each time you wash!

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October 23rd 2003

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