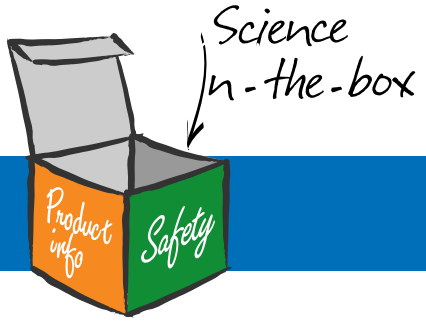


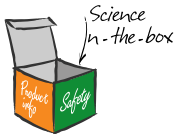
www.scienceinthebox.com

Cutting Environmental Effect by half:

Compact detergents have done it!

Part II: A Risk Assessment Approach

Read also the 'Compact detergents have done it! Part I: Life Cycle Assessment" on **www.scienceinthebox.com**



How can detergent manufacturers ensure that they are providing the best products to consumers and at the same time do their part for corporate environmental responsibility? The answer lies in continuously creating new and improved cleaning technologies. We at P&G have tried in the last 15 years to further develop your everyday laundry detergents to help you, as well as to have added benefits to the environment. We launched compact detergents in the early nineties and super compacts in mid-nineties. The real innovation was seen in these new compacts. When they were compared to the regular powders of 1988, they were found to be more weight efficient. We showed that they have a better cleaning performance while simultaneously producing a 50% reduction in the amount of detergent needed per wash. There are even some environmental benefits that include less emission of chemicals into the environment and smaller packaging. We can explore the effects that these "new" detergents have on the environment by asking two questions. "Did the introduction of compacts and super compacts mean that when compared to regular "big-box" powders of 1998, the "newer" more innovative products reduced the pos-sibility that detergent ingredients caused less environmental effect? After you wash, all the ingredients that make up the product are released into public sewer, and after treatment in wastewater treatment plant, into the environment. If we consider the environmental risk associated with each ingredient, is the entire product still safe for the environment?"

We compared 3 P&G detergents

To answer these questions and to show the change in the environmental profiles of detergents from 1988 to 1998, we compared 3 P&G detergents. These were a traditional, a compact and a super compact powder. We used two distinct approaches but complementary methods on Ariel Regular (1988), Ariel Ultra (1992) and Ariel Futur (1998):

- **Environmental Risk Assessment to address aquatic concerns**
- **Life Cycle Assessment**

It is important to note that in order to judge whether the trends were widespread we analyzed products from Sweden and The Netherlands. This summary will discuss the results of the Environmental Risk Assessment.

In nearly all European countries, the chemicals and detergends end up in a wastewater treatment plant, where bacteria start degrading all organic molecules, including detergent ingredients.

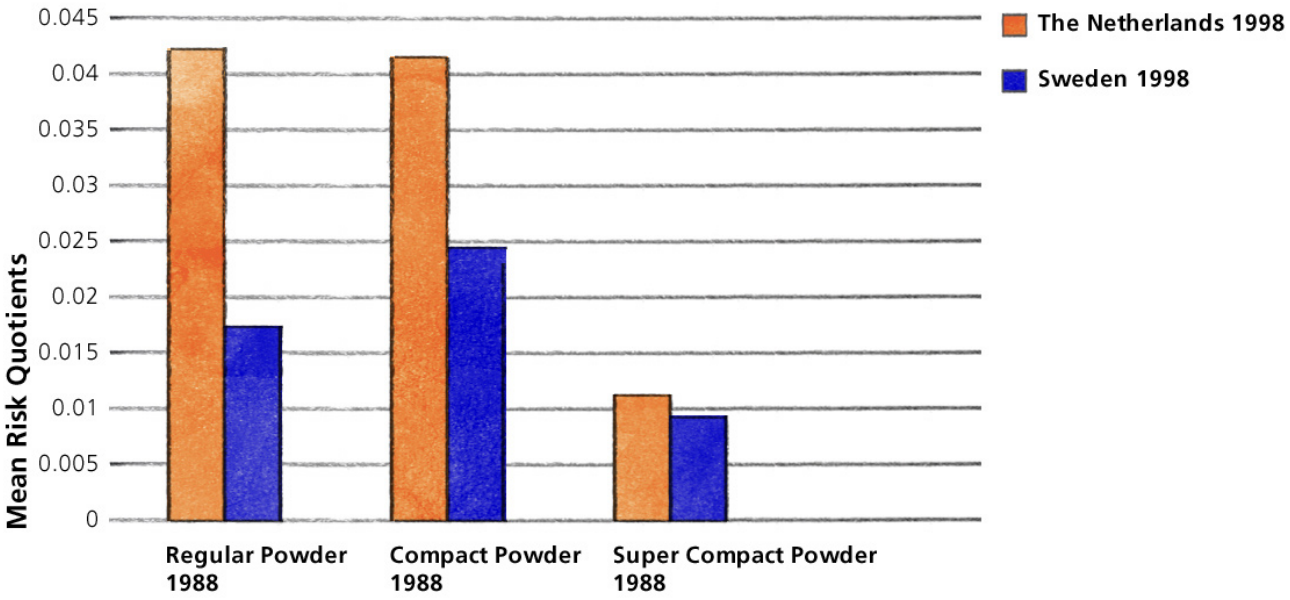
After degradation, we can compare the Predicted Environmental Concentration (PEC) in the river with the concentration that has no effect on the organisms living in the river (PNEC: Predicted No Effect Concentration). If PEC is below PNEC, the ingredients can be safely used in a detergent. To learn more about the Risk Assessment approach, visit our safety pages on www.scienceinthebox.com.

The ERA and use of the "risk quotient"

The ERA allowed us to assess the safety of the product ingredients for the environment. It determines the probability that an adverse effect will occur in the environment after exposure to an ingredient. Therefore we compared two things. The expected concentration that will occur in the environment following the use of a particular ingredient, this is known as Predicted Environmental Concentration (PEC), and the concentration below which there is no effect on the environment is also determined. This is known as the Predicted No-Effect Concentration (PNEC). This results in a "risk quotient" where the ratio of the PEC is taken with respect to the PNEC. After making adjustments that account for any uncertainties we have in the analysis, whenever the "risk quotient" is below 1, the risk is then deemed acceptable.

The results of the ERA

First and foremost it is important to note that the ERA clearly shows that all our ingredients when released at levels under use conditions are safe for the environment regardless of the detergent formulation.



• For all ingredients used in the 1988, 1992 and 1998 detergents, the calculated risk quotients were always below 1. This means that the environmental effects are considered to be negligible and therefore safe to use. This was true for both the Swedish and the Dutch products for the years indicated.

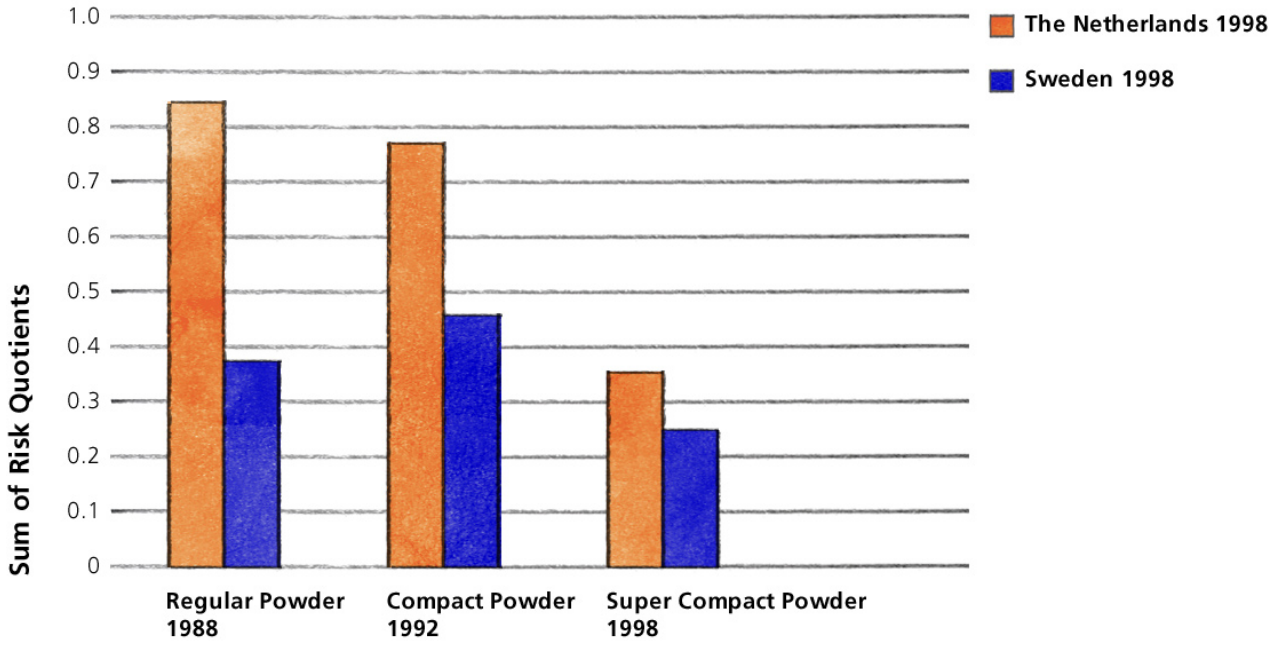
• Risk quotients in The Netherlands were not really affected with the use of compacts in 1992. In Sweden there was a small increase in risk quotient despite a clear decrease in detergent con-sumption. This was due to the higher level of cleaning agents in compacts compared to traditional powders.

• There was a sharp decline in risk quotients with the use of super com-pacts in 1998 in both countries. Lower detergent consumption as well as the introduction of a number of ingredients

Let's take a look at the whole detergent!

When we presented these first results at our second stakeholder workshop (see the page 'Being open" on **www.scienceinthebox.com**) we were asked to look at the results assuming full additivity. Although there is today no scientific consensus for doing so, (the mode of action of different chemicals can be very different), we agreed to do it to answer one of the most frequent question asked by our external partners: "what is the effect of the ingredients when mixed together and released into the environment".

To answer this we assumed the effects of the different ingredients would be additive and subsequently added up the risk quotients for all the ingredients that made up each product. This calculation is equivalent to a product score, similar to the approach used in the EU ecolabel criteria for detergents. So, here is the answer:



Super compact detergents have the lowest potential impact for the environment when compared to the compacts from 1992 and the regular "big-box" powders of 1988.

The product score clearly showed that under the assumption that all chemicals have additive modes of actions (which again is only an assumption), all P&G detergents are safe for use (i.e sum of riskquotient below 1).

• There was no risk that an adverse effect would occur as in both The Netherlands and Sweden the risk quotients were below one for each of the three years.

• Data clearly shows an overall improvement after the development of compacts and super compacts as the sum of the risk quotients decreased over the 10 year period (60% in The Netherlands and almost 40% in Sweden).

What conclusions can we draw from the ERA?

It was clear that when we assumed that the mode of action for all our ingredients was additive, our detergents had a risk quotient well below 1 in both The Netherlands and Sweden. It was interesting to note that in the space of 10 years, the risk quotient was reduced by half in both countries. This was as a result of lower overall consumption of detergents since the introduction of compacts and super compacts. In fact, as less detergent is needed for every wash, it follows that less chemicals are released into the environment. Among the things that have changed during the years is that consumers have a new attitude to pre-washing. Improved washing technology and a more efficient washing process has also contributed to the lower risk quotients that were observed.

What about differences in results between The Netherlands and Sweden?

The difference in risk quotient between the two countries was a result of the difference in the domestic water quality. The water in Sweden contains less calcium and magnesium ions making it "softer" than the water in The Netherlands. This means for the consumer in Sweden, less deter-gent is needed to provide the same washing performance. It is interesting to note that if we assumed the same water hardness and dosing for both countries, the results of our ERA become very similar.

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For further information, please contact:

Erwan Saouter, PhD
P&G External Relations. GBU F&HC
47 route St Georges,
CH-1213 Petit Lancy, GENEVA
saouter.e@pg.com
Tel:+41 22 709 7436
Fax: +41 22 870 4436

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