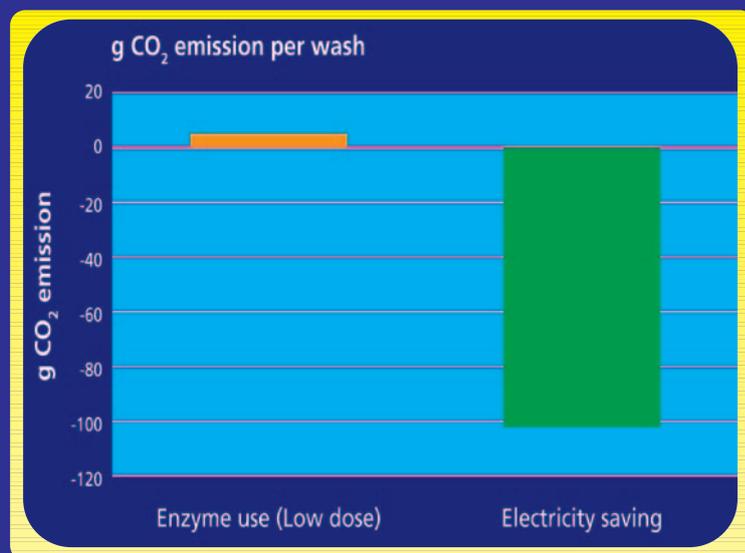
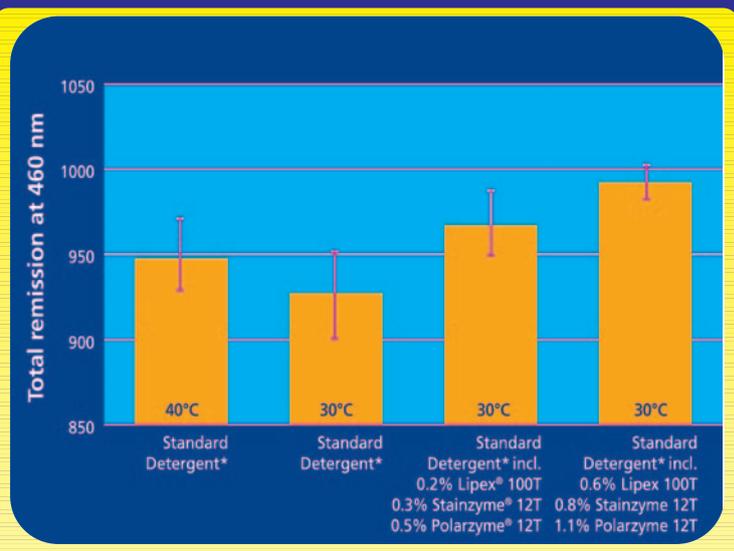




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Life Cycle Assessment Supports
Cold-Wash Enzymes



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Abstract

If all Europeans did their laundry at 30 °C instead of 40 °C, we could save 30% on one of the biggest overall consumers of household electricity – heating washing water. The benefits range from saving the consumer time and money to reducing CO₂ emissions. New detergent enzymes that perform at low temperatures make such a temperature reduction possible. Both proteases and amylases are now represented by cold-water enzymes, enabling manufacturers to brand detergents specifically for cold wash. A Life Cycle Assessment (LCA) for two specific cold-water enzymes – Polarzyme® and Stainzyme® – quantifies the environmental impact of switching to these enzymes. LCAs offer an objective decision-making tool for evaluating initiatives to promote sustainable development.

■ The world of difference

What difference does it make if my car does 15 km/l and not 10, or 6 for that matter?

And what difference does it make if I wash my laundry at 30°C instead of 40°C?

Well, all things being equal, it makes the world of difference. And Novozymes has started measuring how big a difference alternative methods make in relation to existing practices.

The evidence is starting to show that, while we've been waiting for the big breakthrough discovery to take us beyond fossil fuels and the associated global warming, enzymatic technology is already making astoundingly significant contributions to reducing CO₂ emissions. In fact, the contribution of enzymes is so significant that the sum of the differences can quite reasonably be discussed in the same context as the goals of the Kyoto Protocol.

For household consumers, the upside is that they can now save 30% net on the electricity cost of a wash and contribute further to reducing CO₂ emissions

■ A need to measure impact

To measure the value of this contribution, Novozymes is using LCAs to quantify sustainability initiatives. An LCA compares the environmental impact of an existing practice with an alternative method that provides the same user benefits. An LCA gives a complete picture of the di-

rect and indirect impact of both alternatives on the environment.

The LCAs have shown that, for every kilo of enzyme, there is a net downstream reduction of a conservative 100 kilos of CO₂ emissions.

This can be multiplied relatively simply by the 130,000 tonnes of Novozymes enzymes that reach the market each year to give an annual total net reduction of 13 million tonnes of CO₂.

And what difference does that make? Germany has had an enormous task reducing emissions to meet the country's obligation to Kyoto – a target of 263 million tonnes of CO₂ equivalents. This corresponds to 5% of Germany's obligation to reduce CO₂ emissions according to the Kyoto Protocol. For Denmark, 13 million tonnes represents 100% of the country's obligation.

»The point is that the more we use enzyme-assisted technology as a replacement for conventional technology, the more we can bring down emissions and reduce the environmental impact of industrial processes. A common factor in almost all enzymatic applications is that the user can reduce process temperatures or replace chemicals with a higher energy demand in their life cycle« says Dr Per H. Nielsen, Life Cycle Assessment Expert at Novozymes.

■ Next step 30°C

In Europe and North America, more than 80% of the energy consumption for

COLD WASH ENZYMES

washing laundry goes on heating up the water. And energy isn't getting any cheaper, so it's not surprising that the current trend is towards lower wash temperatures.

The time seems ripe for helping the consumer to save some money. In response, more and more brands such as Proctor & Gamble's Tide and Unilever's Omo are promoting the energy-saving and convenience benefits of cold-water washing. And these claims are being supported by significant marketing campaigns. Using an LCA, Novozymes has recently analysed and compared the environmental impacts of four different washing situations on machine washing laundry at 40°C and 30°C – a European standard detergent containing 0.4% Savinase®8T was tested at 40°C and 30°C, and the same standard detergent at 30°C but with the addition of extra enzymes designed for cold-water washing. These enzymes include novel protease, amylase and lipase in two different dosages. The two latter detergent formulations had to meet the performance at 30°C of the standard detergent at 40°C.

Fig. 1 shows that the detergent performed better at 30°C than at 40°C even with just a small increase in enzyme dosage.

Fig. 2 shows the total wash performance transposed to individual stain types. The overall impression is that consumers can reduce washing temperature from 40°C to 30°C and still expect the same level of stain removal as before, in some cases even higher.

The calculation that has to be made is to subtract the cost of the extra enzymes from the energy saving. Danish studies have shown that a household can save around 30% net on the cost of electricity per wash by reducing the washing temperature from 40°C to 30°C.

■ Pay more to save more

Consumers are generally willing to invest in solutions that are more expensive but, in the long term, more economical. Low-energy fridges and washing machines may cost more, but they have a very good return on investment for the consumer in terms of electricity savings. For

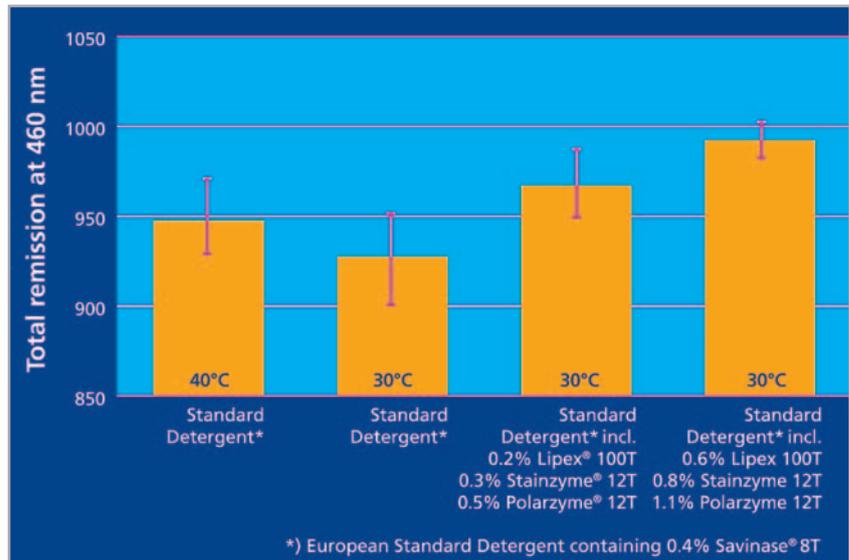


Fig. 1 The standard detergent performed better at 30°C than at 40°C with just a small increase in enzyme concentration

	Standard Detergent*	Standard Detergent* incl. 0.2% Lipex® 100T, 0.3% Stainzyme® 12T, 0.5% Polarzyme® 12T	Standard Detergent* incl. 0.6% Lipex 100T, 0.8% Stainzyme 12T, 1.1% Polarzyme 12T
WASH TEMPERATURE	30°C	30°C	30°C
STAIN TYPE			
Wfk20D pigment/sebum	Red	Green	Green
EMPA106 oil/carbon black	Yellow	Yellow	Green
EMPA111 blood	Green	Green	Green
EMPA112 milk/cacao	Yellow	Green	Green
EMPA164 grass	Red	Yellow	Green
Wfk10D pigment/sebum	Yellow	Yellow	Green
Wfk10ppm veg. oil/milk	Yellow	Yellow	Green
Wfk20LS lipstick	Red	Red	Green
Wfk20MU makeup	Red	Yellow	Yellow
CS-28 rice starch	Yellow	Green	Green
Wfk20M motor oil/pigment	Yellow	Yellow	Green
Wfk10TE clay	Red	Yellow	Yellow
CS-10S butterfat	Yellow	Green	Green
Total remission	Yellow	Green	Green
Legend	*) European Standard Detergent containing 0.4% Savinase®8T		
Red	below benchmark		
Yellow	within standard		
Green	on par or above		

Fig. 2 Relative cleaning performance when adding enzymes to make the energy-saving 30°C detergent (detergents@novozymes.com for the data behind these results)

this reason, manufacturers have devoted significant resources to developing innovative, energy-efficient appliances. Independent consumer groups have also contributed to these efforts through non-traditional, grass-roots initiatives to raise public awareness. Consumers have a more positive perception of calls by consumer groups to »pay more to save more« than of a campaign from a detergent manufacturer with an interest in selling an »upmarket« detergent.

■ Motivated by government regulation

Government programmes are further raising consumer awareness of the benefits of energy efficiency and are having a significant impact on consumer choice as shown by current and forecasted adoption rates.

As government action plans are implemented all over the world in response to global warming, we will see it become more and more expensive to consume energy and release so-called greenhouse gases. This will obviously encourage use of the most energy-efficient solutions and drive the innovation of more sustainable alternatives.

■ The natural solution

Recent innovations in enzymatic technology such as Polarzyme® and Stainzyme® used in the study above provide a natural solution for addressing these market demands for cheaper and cleaner alternatives.

»Enzyme technology is the type of technology that can make a world of difference to the environment. With Life Cy-

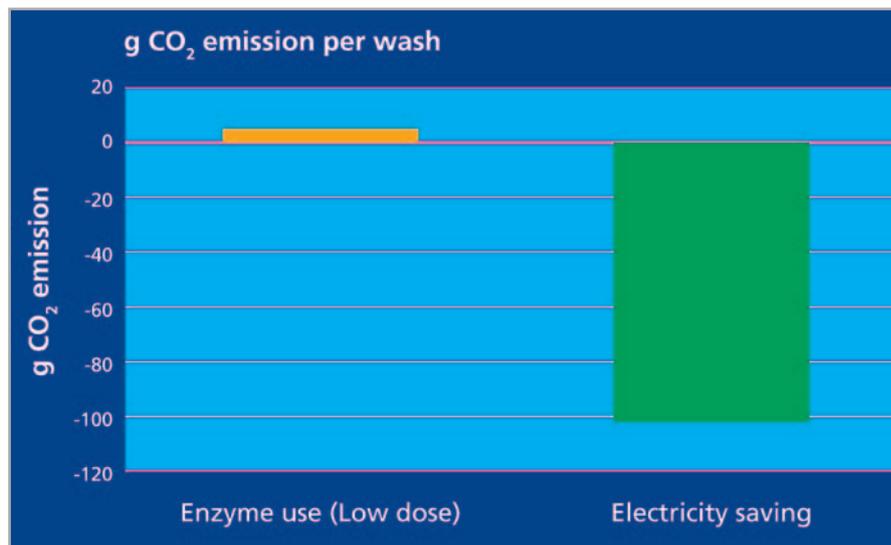


Fig. 3 Thanks to enzymes, the positive impact of washing at 30°C is almost 100 g less CO₂ emissions per wash

cle Assessments, we can evaluate the positive impact of enzyme solutions by analysing and comparing environmental impacts of conventional technologies and enzyme assisted technologies« says Dr Per H. Nielsen.

■ Summary

Washing machines are one of the biggest consumers of household electricity. 80% of electricity for washing laundry goes on heating the water.

By reducing the washing temperature from 40°C to 30°C, Europeans could save 30% of the electricity used on the laundry.

This one small step would not only have an impact on electricity bills; it would make two major power plants redundant if implemented in all of Europe.

By comparison, it requires a minimal consumption of energy to produce the enzymes that makes this possible. Looking at electricity consumption for heating wash water, the enzymes save 20 times as much energy as it takes to produce them (Fig. 3).

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