

# Let's work together

ABB is cooperating with Chalmers University of Technology, Sweden,  
to enhance environmental performance

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With a global population of six billion people, planet earth's resources are being stretched to the absolute limit. ABB has been acutely aware of this for many years and its response has been to develop environmentally friendly and energy efficient technologies and products as well as adopting sustainable practices throughout its sites.

On top of this, ABB is an active partner in common efforts to improve the environment. One of these, to build and maintain a competence center dedicated to sustainable product development, is a joint collaboration between nine industrial partners, Chalmers University of Technology in Sweden and VINNOVA, the Swedish Agency for Innovation Systems.

Ten years ago, efforts to reduce pollution released into water, soil and air by global industrial processes, products and waste were mainly focused on so-called "end-of-pipe" solutions. At the same time, however, the concept of "eco-efficiency" was gaining a lot of support in the field of manufacturing. Eco-efficiency is concerned with increasing the efficiency of manufacturing processes and products, while at the same time reducing their environmental impact.

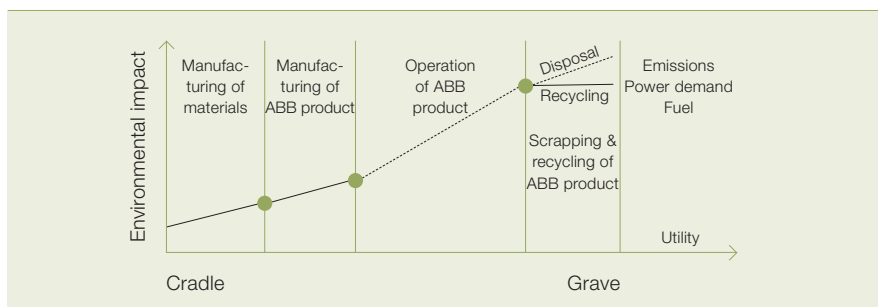
For most companies, the development of eco-efficient processes and products requires a holistic approach to product development and the manufacturing processes involved. This means that each phase of the entire life cycle of a product – from the raw materials and components used, the production process (ie, use of energy, emissions and waste), transportation implications, performance during its useful operating life and its disposal or recycling at the end of its life – has to be assessed.

Having established what needs to be done, the next question is how to do it? Shifting the focus from end-of-pipe to life cycle management is a challenging task for industry. Credible tools and databases are needed to measure, compare and communicate the life cycle environmental impact of all products. Furthermore, educational programs need to be established to integrate the tools and methodology into daily practice.

The solution lies in what is perhaps the most useful management tool in this area: Life Cycle Assessment (LCA). LCA is a method used to quantify the environmental impact of each stage in a process and product life cycle **1**.

ABB has always taken environmental issues seriously and is committed to sustainable development by offering its customers eco-efficient products and systems that achieve reduced environmental impact over their complete life cycles. Eco-efficient products and systems consume less material and energy, and generate lower emissions and less waste. To help fulfill this commitment, the company started working with LCA in 1990 and by 1992 had a first generation LCA database in operation. In 1995, it released the first of many LCA application tools that was implemented in many of ABB's business areas [1].

**1** The environmental impact of a product's various life cycle phases.



With a wealth of experience behind it, ABB and nine international companies joined forces in 1996 with Chalmers University and the Swedish Agency for Innovation Systems, VINNOVA, to build a center of competence for the environmental assessment of products and materials. Officially known as the Center for the Environmental Assessment of Product and Material Systems (CPM)<sup>1)</sup>, its main objectives are:

- The eradication or reduction of the environmental impact associated with products.
- To become competent in the development of eco-efficient and sustainable products at a high international level.
- To provide industry and society with the relevant methods and support to facilitate decision-making with regard to the environmental aspects of products and materials.

CPM is now in its tenth year and is currently one of ABB's longest-running university projects. So what is it that drives ABB's motivation behind this sustained cooperation?

Environmental legislation, particularly within the EU, means that manufacturers will need to ensure their products – and the components that make up these products – comply with certain directives. Such legislation presents business growth opportunities to companies like ABB who had long anticipated such moves and who now provide solutions that not only make its customers more compliant but also more competitive.

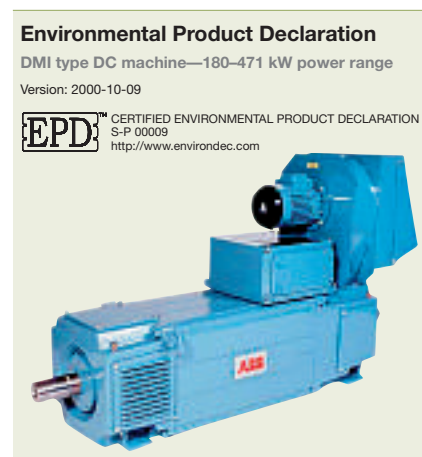
#### Milestones

During its first two years in operation, CPM focused on the development of scientifically based LCA tools and comprehensive databases containing

quality assured data which would produce credible, consistent and comparable LCA analyses. To achieve this, an understanding of the environmental impact of products across a range of industries was required.

Between 1998 and 2000, ABB invested a lot of time and energy into implementing the latest generation of easy-to-use LCA tools so that LCA reports

**2** Cover page of a typical ABB Environmental Product Declaration (EPD) for a DC motor.



**3** ABB's new dry capacitor for high-voltage DC stores twice the energy in half the volume and weighs 80% less than a conventional capacitor with the same rating.



#### Footnote:

1) <http://www.cpm.chalmers.se>

## LCA process at work

Power capacitors are important devices in utilities because they reduce network losses, increase voltage stability and improve network quality. Earlier capacitor designs used impregnated PP-film as the dielectric material. Known as "wet" capacitors, there was always a risk of leakage into the environment. In the late 1990's, ABB decided to develop a new dry capacitor for high-voltage DC application [2] 3.

LCA was used to identify environmental aspects of earlier designs and set a superior sustainability performance for the new design. Recyclable and non-hazardous materials were selected, requiring minimum energy for the manufacture of the capacitors. A more compact, modular design was achieved with less material; it is significantly lighter; transportation pollution has been reduced; and less land area is occupied. Some of the major changes include:

- The elimination of impregnation fluid so there is no risk of leakage into the environment.
- The plastic housing means no painting and chemical treatment, and the capacitor is quieter in operation.
- It can be recycled at the end of its operating life.
- It has a much improved environmental performance over its life cycle. It is also cheaper, cleaner and quicker to manufacture.

for key products across the company could be produced. Coincidentally, around the same time, LCA methodology and processes were gaining international recognition and were eventually incorporated into the ISO standards.

The information obtained from LCAs form the basis of Environmental Product Declarations (EPDs). EPDs describe and quantify, in accordance with ISO/TR 14025, the environmental performance of products and systems over their complete life cycles. These declarations must also include disposal or recycling information.

From 2001 to 2004, ABB produced some 50 EPDs – an example of which is shown in 2 – covering key ABB core products and systems. These EPDs are now being used to inform current and potential customers of ABB's extensive eco-efficient portfolio.

During this period, ABB also incorporated LCA into its Gate Model. The ABB Gate model is an internal mandatory approvals process governing the development of new products and projects. At the development stage, an assessment of every product in terms of its sustainability impact is required.

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### The benefits and results

This long-term collaboration with CPM has been very beneficial for all partner companies. Each are well equipped with the experience, tools and data that will enable them to utilize LCA in tackling new challenges. An example of where this is possible is in carbon-reduction initiatives to mitigate global warming.

ABB, however, has benefited significantly in that:

- It has become a major player in the application of LCA – a key pre-requisite in the production of eco-efficient products.
- The company has played a major role in the construction of, and access to, a credible and comprehensive database containing verified environmental data applicable to a host of industries. The skills acquired by ABB in working with such databases have been re-applied to enhance the performance of environmental management systems within the group.
- ABB's competitive edge has improved because product developers have access to tools and data to improve the environmental performance of new products and systems. In addition, they are able to communicate this performance to clients through the production of EPDs verified by recognized third parties.

The long-term nature of this collaboration has generated a valuable exchange of information between the member companies, many of which are important clients of ABB. It has also opened up channels to academic experts who are leading research and development activities in several related areas such as sustainable production. The project has also generated a lot of awareness among many ABB customers of the product life cycle impact in a wide range of applications.

As an example, ABB has used LCA to optimize the design of eco-efficient power capacitors [2] and a summary of this is given in the text box.

### Ongoing cooperation

The collaboration with CPM will continue until at least 2006 and will focus on further integrating life cycle thinking into the strategies and day-to-day decision-making of ABB's businesses. CPM will further promote the business relevance of LCA, exploring its uses in the development of environmentally sound products and systems to meet new market opportunities.

As well as product development, LCA needs to be applied to projects. ABB's customers are coming under increasing regulatory pressure to not only reduce the environmental impact of their operations but to also respond to environmental threats such as resource depletion and escalating carbon dioxide emissions and waste.

Finally, the Internet should be used as a means of distributing LCA tools and methods, thus enabling life cycle assessment to be used universally as an integral stage in the development of new products, systems and projects.

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### References:

- [1] ABB Review Issue 2, 2000 pages 63–70  
[2] ABB Review Issue 1, 2003 pages 15–20