

## **Sustainability and ecological evaluation of common and alternative smart card materials**

The card materials currently in use are PVC, PVC-ABS blend, PETG, PC and PET as well as combinations to enhance one or more card properties.

These plastics are made from petroleum and energy and must be landfilled or incinerated to dispose of them. In the overall balance, the different materials are not to be assessed significantly differently. For example, when PVC is burned, hydrochloric acid is released, which was previously released during the production of PC in the necessary production process.

Possible alternative materials can only sensibly be manufactured from renewable raw materials that are easy to dispose. They should be compostable or biodegradable or should be fed into the waste paper cycle via the paper bin. This generally favors raw materials based on paper and cellulose, which grow back and whose production methods have been optimized for a long time, such as the production of paper and cellulose products from wood, cotton, straw and types of grass. Nevertheless, it must be noted that this production is very energy and water-intensive and no less expensive compared to the production of the card plastics mentioned above.

The resources for wood and cellulose as well as for petroleum products are becoming scarce due to increasing demand on the world market and overexploitation (especially in the case of wood in America and Asia) and the products are becoming more expensive.

In general, the first step towards sustainability should be the use of card bodies from production facilities as close as possible to the place of use (short transport routes).

The cards used should not only be made in Europe, but also come from raw materials that were made in Europe. Here, the share of green electricity is constantly increasing and the environmental requirements are subject to constant improvement.

In addition, materials from Asia, for example, often have dyes and fillers that require more energy for processing them. From our own experience with material provided, PVC imported into the EU or cards from China have a greatly reduced milling tool life of only 10% of the otherwise usual production quantities when milling cavities for chip modules.

A practicable solution for the purchase and use of smart cards should initially be long lasting cards that, for reasons already mentioned, come from European resources. For this purpose, products should be selected that do not contain any mixed material and whose manufacturing waste can be reused in down recycling.

At Thales in Wutha-Farnroda this has been practiced successfully for almost 20 years with PVC and for 5 years with polycarbonate.

Our medium-term goal is to establish card bodies made of renewable raw materials in the market, even with certain types of contactless cards. There are already practicable approaches for this and we are constantly developing them.

Electronic cards generally contain chip, dual interface or contactless modules, the latter two being connected to antennas. Chip modules should be separated by the user or system integrator using simple methods (e.g. a manual punching tool) before the card body goes into the paper bin.

A return of small amounts of cards for the pure purpose of recycling at the manufacturer is to be rejected for energy reasons (energy-benefit ratio).