Plastic waste as raw material for carbide production

Chemical company AlzChem has worked for around five years on a new process that enables the recycling of plastic waste for producing carbide, an important raw material used, for example, in the production of fertilizers. This means that coke and coal from coalmines can now be replaced by secondary raw materials. Now that approval has been granted in accordance with the German Federal Immission Control Act, the new technology can now be transferred from pilot to regular operation. The process, which has been developed with support from the German Federal Ministry of Economics and Technology, uses the carbon contained in plastics in both energy and material terms. It is also capable of utilising problematic plastics with a chlorine content of up to 10% by weight. Particularly suitable is material from commercial and industrial plastic processing.

“The positive experience gained during the operating phase has shown that it is possible to use plastic-based carbonaceous material. We are therefore very confident that we can recycle around 1000 tonnes a month in 2011. Supplies can be delivered by train or lorry,” says Jürgen Franke, responsible for material flow management at AlzChem.

In the last five years, around twelve million euros have been invested in the development and installation of new technologies at the Hart facility in Upper Bavaria, combined with a sophisticated emissions reduction programme. There are around 220 members of staff working in carbide production at AlzChem.

Up to 100,000 tonnes of coal and coke are used throughout the year. In future, this will also include around 15,000 tonnes of plastic. At one time high-grade coal used to be processed from deposits in the Saar and Ruhr valleys. However, since the decline of German coal mining, the Hart facility has processed coal imported not only from the Ukraine and Poland but also from Australia and South Africa.

“The market for this raw material has dramatically changed over the past few years,” says Dr. Klaus Holzrichter, site manager at AlzChem in Trostberg. Former coal exporting countries such as China and India have since become importers themselves, and prices are increasing on the global market. By substituting coal with plastics in order to recycle the carbon contained in them not just for energy-related purposes but also to use the material for new products, AlzChem is taking an entirely new approach worldwide. AlzChem is Europe’s largest manufacturer of carbide and is considered to be a technology leader in the industry.

Carbide

Calcium carbide is used for various applications. The range of products that utilise the 120,000 to 160,000 tonnes
Calcium carbide is used for various applications. The range of products that utilise the 120,000 to 160,000 tonnes of carbide produced each year include not just high-grade fertilizers that are even used in organic farming but also food and feedstuff additives.

Around 600 kilograms of coal and coke are required for the production of one tonne of carbide. The coal and coke serve as an electrothermal reducing agent, two thirds of which is converted to calcium carbide and one third to carbon monoxide. The temperature in the core reaction zone amounts to around 2,200 °C. When it is “tapped” out of the furnace, the molten calcium carbide flows into carbide pans and solidifies into a block in the pans. The pans are cooled for about 30 hours, and then the block is pre-crushed. After sieving, re-crushing and grinding, the grain fractions are produced to the sizes required.