

Griag Glassrecycling

# Transparently *successful in recycling glass*

German company Griag Glassrecycling is no ordinary glass recycler. The firm processes glass from TVs and computer monitors (cathode ray tubes) and LCD screens, and ships the reclaimed glass back to the manufacturers. But at the same time, the company also develops and produces products from the glass such as X-ray glass plates, fillings and high-quality customised products for the ceramics industry, and also a lead-free blasting material.

In Europe, some 35% or about 150 000 tonnes of the cathode ray tube (CRT) glass from e-scrap processing is currently recycled, meaning that around 300 000 tonnes is still landfilled or exported to countries outside Europe. Stena Metall Group's Business Area WEEE arm is Europe's leading recycler of electronics. Founded in the early 1990s, it has operations in 10 coun-

tries: Sweden, Denmark, Norway, Finland, Poland, Germany, Austria, the Czech Republic, Romania and Italy. Within Europe, the company runs 27 facilities where it collects and dismantles more than 170 000 tonnes of e-scrap and some 2 million items of cooling equipment. Its annual turnover totals Euro 140 million.

Phär Oskår, Business Area Director WEEE at

Stena, comments: 'We want to get a grip on the European e-scrap recycling market from collection to product. Too much e-scrap is still being exported to China and other countries without pre-processing in Europe.'

In Stena's e-scrap processing plants, the CRTs are dismantled, set apart and shipped to the Griag facility at Neuruppin near Berlin in Germany, a 100% daughter company of Stena. Although this glass processing plant currently treats around 7000 tonnes per month of CRT glass, its actual capacity is higher still and will even be expanded. This makes Griag by far the biggest CRT processor in Europe. It operates one-third of Europe's total recycling capacity for this glass.

But Griag is doing more than just recycling CRT glass, with the other two of its three core businesses being: the processing of entire LCD screens; and the development of new products and markets for the glass.





Phår Oskår, Business Area Director WEEE at Stena.



Griag's Managing Director Carl Johan Wahlund.



Griag's Plant manager Steffen Nehmzow.



During the entire process, the product is continuously controlled.

### CRTs out of favour

Over the years, Stena has recycled more than 10 million CRTs taken from television sets and monitors. Total annual global production of CRTs amounts to around 14 million; however, output is expected to have almost completely disappeared in 15 years from now in favour of LCD screens. Therefore, Stena is already looking to develop new products and markets to replace this division.

Once the CRTs have arrived by truck at Griag, they are first washed and the ferrous oxide, aluminium oxide and fluorescent layers are removed. They are then crushed in several steps to extract the ferrous metal which accounts for around 15% of this stream. A CRT consists of panel glass at the front (with aluminium and metal sulfites coatings) and funnel lead glass consisting of iron oxide and carbon coating. Griag removes this coating in a wet process and the remaining sludge is consigned to landfill. The panel and funnel glass are separated from each other using an X-ray sorting system, the development of which was a co-operative effort between Stena and manufacturers. Mr Oskar: We usually buy standard machines and components for our processing but we apply these to fit its specific needs. We give them a special twist. Stena's WEEE division has its own process development depot.

About 90-95 percent of the glass is converted into secondary raw material in accordance with applicable environmental legislation. It is

almost exclusively exported to CRT manufacturers in India and Malaysia. After having been cleaned and separated, the clean CRT glass - both lead and funnel glass - is grinded according to the demands of the different customers

into different sizes from 0.05-0.125 mm. The waste glass has effectively become a product.

Griag's Managing Director Carl Johan Wahlund comments: 'Actually, Griag is not a recycling company; we turn waste into a product. All our products come with a complete set of data sheets for the product, the powder, which includes safety and health aspects and much more.'

### LCD revolution

LCD flat screens have quickly taken over our homes. In 2008, already more than 100 million flat screens - in the form of TVs, computer monitors and lap-tops with LCD, LED or plasma technology - were sold in Europe. By 2015, end-of-life flat screen volumes in the EU could amount to as much as 750 000 tonnes.

Approximately a year ago, Stena Technoworld and Griag developed a unique automated closed process for the recycling of LCD screens. 'The degree of recycling is significantly higher than the requirements that will be set in the future with a tougher WEEE Directive which states how much of Europe's electronic waste must be recycled,' explains Mr Wahlund.

In its LCD recycling process, Griag extracts more than 88% mercury-free clean fractions which are separated into iron, other metals, plastics, circuit boards and glass with liquid crystals. The whole process operates in a closed, controlled environment: this is important, not least when it comes to handling all of the mercury lamps that are part of an LCD screen. It is easy for mercury lamps to break during manual handling, thereby creating health risks for the dismantlers. With Griag's sealed and automated process, this risk can be avoided. During the entire process, mercury levels are continuously controlled to ensure that this element is removed from all the material destined for recycling. Mercury-contaminated fractions are sent to special hazardous waste treatment facilities.

## Griag's history

Griag was founded in 1997 by Dr Detlef Oertel and two partners as a research and development project. Previous jobs had provided Dr Oertel with experience of the e-scrap recycling business and, after having completed a major



Dr Detlef Oertel, a member of the Griag board.

project, he decided to concentrate on the recycling of CRTs. This was the basis for the co-operation with Stena, from which Griag purchased CRT glass. In August 1996, Stena had opened an e-scrap recycling plant near Berlin but had no means of treating the CRT glass emerging from the dismantling operations. So Stena contacted Griag and since then the company has recycled all Stena's CRTs. Dr Oertel duly developed a closed-loop process for CRT recycling which has proven to be highly successful. Up until 2004, Griag had the capacity to treat 24 000 tonnes of CRTs each year - a figure which has since been increased to 54 000 tonnes. In 2005, Dr Oertel sold his company to Stena. He is currently a Griag board member specialising in identifying and nurturing new products and markets. 'Developing new business is very challenging and interesting,' he asserts.



## Innovations

### X-ray glass plates

One of Griag's innovations is the development of X-ray glass plates, for which the company has received a patent. These glass plates, containing 80% lead glass from Griag's process, shield against radiation but are completely transparent. They are used, for instance, in hospitals and other health-care applications, as well as in the production of traditional glass products.

Made from CRT tube funnel glass, these plates can be up to 30 mm thick and up to 2.2 metres long. Griag provides the raw material for the production of this glass.



### Ceramics

As a result of Griag's state-of-the-art processes, a very high separation and cleaning rate is achieved with the CRT glass. The glass powder from the process has a very low lead content of less than 0.1% which makes it highly suitable for lead-free glass-making. It is also used in the high-quality ceramics industry.



### Cutting/blasting material

From its CRT panel glass, Griag also produces '2G Blast' - an innovative, lead-free blasting and '2G Cut' cutting abrasive for which an international patent is also pending. The grain size of the fully-certified material can vary from 0,05-25 mm for blasting and water-cutting applications, including steel, stainless steel and aluminium surfaces and welded joints. '2G Blast gives a much smoother cutting surface than traditional laser cutting,' says Dr Oertel. 'What's more, it comes with certificates such as product and safety data sheets. When compared to silicon sand, which is still used as a blasting abrasive, 2G Blast has no silicosis risk and is therefore much safer for workers.' The product can also be used for polishing and is highly-efficient for surface painting applications such as the removal of paint from ships. Griag has developed a take-back system for used abrasive. The CRT powder can be used three to six times in a closed loop.



Griag currently treats around 7000 tonnes per month of CRT glass.

### Mercury extraction

The process for recycling LCD screens - also sourced from Stena's European e-scrap processing plants - is similar to that employed with CRT glass. However, Griag is unwilling to disclose too many details for competitive reasons. 'Let me just say that the secret is how we extract and remove the mercury,' says Mr Oskär.

In the first stage of the Griag process, the mercury is separated, collected and stored. The screens are then shredded and the different fractions are separated. 'Griag is unique for Stena, especially the mercury extraction from the fluorescent tubes,' Mr Oskar underlines. 'Compared to CRT screens, the number of LCD screens becoming available for recycling is still very small,' he goes on to explain. 'The first LCD screens had a lifespan of two to three years, but today's screens last as long as five to ten years - still very short-lived when compared to the lifespan of CRT screens which is 10 to 20 years.' Griag's LCD plant has the capacity to handle

3000 tonnes per year of computer monitors, TV screens, portable computer screens, etc. Since some 120 LCD screens make up one tonne, it can easily be calculated that Griag is capable of processing well over 300 000 screens per annum. 'Griag is unique for Stena, especially the mercury retraction from the LCD screens,' notes Mr Oskär.

### Research and development

A team in the research and development department, headed up by Dr Detlef Oertel, is responsible for developing new products from the CRT glass. This group has a high focus on quality definitions in cooperation with the specialists throughout the whole processing chain. Most of Griag's new products are developed internally, often in close consultation with customers. 'We do this in-house because we are the drivers behind new technologies,' says Mr Wahlund. 'And as for process development, we do this 100% ourselves. In total, we have some fifteen people working in our R&D department.'

When asked how Griag and Stena go about developing new products, Mr Oskär responds: 'Sometimes we start from our product, sometimes from demand. We know our material and we know what our customers want. We can produce to their specifications and, if needed, change these according to customers' wishes. Basically, the Stena-Griag combination is a raw materials provider. Combined, we process and subsequently sell on a contract basis more than 350 000 tonnes of e-scrap per annum under the conditions set down in the European WEEE Directive. This volume includes some two million items of cooling goods - as well as 175 000 tonnes of brown goods and IT' □



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