SIMONA .report

Technical Newsletter from SIMONA AG 1/2008

SIMONA® EL Materials

Products for Potentially Explosive Atmospheres

Explosions are a constant hazard wherever flammable gases, vapours, liquids or dusts occur, are stored or are transported. Under certain circumstances, a flammable mixture may form when substances such as those listed above are exposed to atmospheric oxygen. This problem is compounded if there is an ignition source, which may ultimately lead to an explosion with tragic consequences. However, this hazard can be considerably reduced with electrically conductive plastics.

Potentially explosive atmospheres can be found in many areas, e.g. in the chemical and pharmaceutical industry, in refineries, tank storage depots and paint factories. What is more, companies which process and transport dusty bulk cargoes, such as grain and fodder, are also affected.

In the past each EU member state had its own requirements and regulations for operating equipment in potentially explosive atmospheres. This constituted a hindrance to the freedom of movement of such products in Europe. In the light of internal market harmonisation the various national explosion protection regulations were standardised throughout Europe. Since 1st July 2003 it has been obligatory to apply the new directives 94/9/EC (ATEX 95) and 99/92/EC (ATEX 137) in the EU.

ATEX Directive 95 defines the requirements for products and is directed mainly at manufacturers. It imposes the following duties on any manufacturer of equipment, systems and components:

- Performance of a risk assessment for the product
- Definition of intended use and operating conditions
- Classification in an equipment category

ATEX Directive 137 describes requirements for workplaces and is relevant to plant operators. Every EU member state is called upon to adopt the ATEX Directives in national law. In Germany this has been implemented by the so-called "Explosion Protection Ordinance" (11th Ordinance) within the Equipment and Product Safety Act (GPSG). Within this context, it should be noted that each country within the EU is itself responsible for adopting the ATEX Directives.

Within the scope of EU Directive 94/9/EC it is the employer's liability insurance association rules (BGR) regarding safety and health at work which are of relevance to explosion protection in Germany. BGR 132, which regulates the avoidance of ignition hazards due to static, is authoritative with regard to materials used. The Directive applies to all electrical equipment, protective systems and their components which are located in potentially explosive atmospheres. The new aspect is that in addition to electrical equipment non-electrical components that have their own potential ignition source are also included. An ignition source arises if owing to the static in a material or object such an electrical potential builds up that if an earthed component is approached a sudden discharge occurs. If the energy being released exceeds the minimum ignition energy, there is an explosion. Objects made of insulating materials (e.g. plastics) become charged by friction and on account of operational processes, e.g.

- emptying of tanks containing liquids
- transfer by pumping, stirring, mixing
- spraying of liquids when measuring, when taking samples or when performing cleaning operations
- pneumatic transport of particles
- static occurring when handling bulk cargoes, e.g. fine dust, coarse grain, granules, shavings.

When handling insulating objects or equipment in potentially explosive atmospheres, measures must be taken in accordance with BGR 132 to prevent an explosion:

Page 1 continued

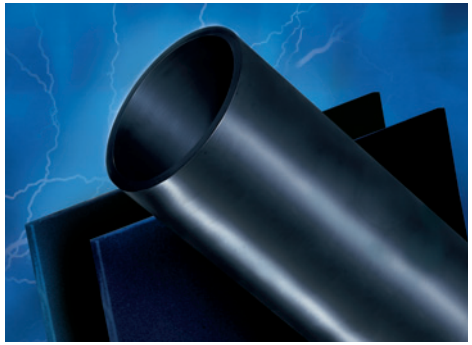
For example, in potentially explosive atmospheres the objects and equipment used must be electrically conductive or be capable of dissipating static.

Quotation from BGR 132 Section 3.1.1: "Depending on the likelihood of ignition, all objects and equipment made of conductive materials must be earthed and ones made of materials capable of dissipating static must be provided with earth contact. Earthed conductive objects cannot become statically charged to a dangerous level. However, if they are insulated from earth, spark discharges can occur". In the Technical Rules for Industrial Safety, TRBS 2131 (Electrical Risks), Section 6.3.3 contains a specific requirement for the use of materials which are either electrically conductive or are capable of dissipating static.

The individual EU member states have established so-called "Notified Bodies" for the purpose of advising on ATEX-related issues. You can download a list of "Notified Bodies" from the Internet (http://ec.europa.eu/enterprise/newapproach/legislation/nb/en94-9-ec.pdf).

SIMONA offers you more information on the subject of ATEX and electrically conductive plastics on its website at: www.simona.de

Plastics offer a number of advantages within the field of industrial installation and apparatus engineering, their excellent



SIMONA® EL materials considerably reduce the risk of explosion

anti-corrosive properties being one of key benefits. However, as they are non-conductive, they also pose a significant risk in potentially explosive areas. To be able to exploit the advantages of plastics for those fields of application as well, special types of carbon are added, so-called conductivity carbons, thus significantly increasing their conductivity and considerably reducing their electrical resistance. On account of this precaution the electrical volume resistivity of PE, for example, can be reduced from 10^{16} ohm to < 10^{6} ohm. The plastics become capable of conducting an electrical discharge. If they are earthed, static can thus be prevented.

Whilst – provided there is sufficient contact with earth – static in conductive materials and dissipative materials is so low that no spark capable of provoking ignition can occur during discharge, "dangerous static" can develop if materials are non-conductive or inadequately conductive. This means that if the discharge occurs in a potentially explosive environment a spark can arise which is capable of provoking ignition and triggering an explosion.

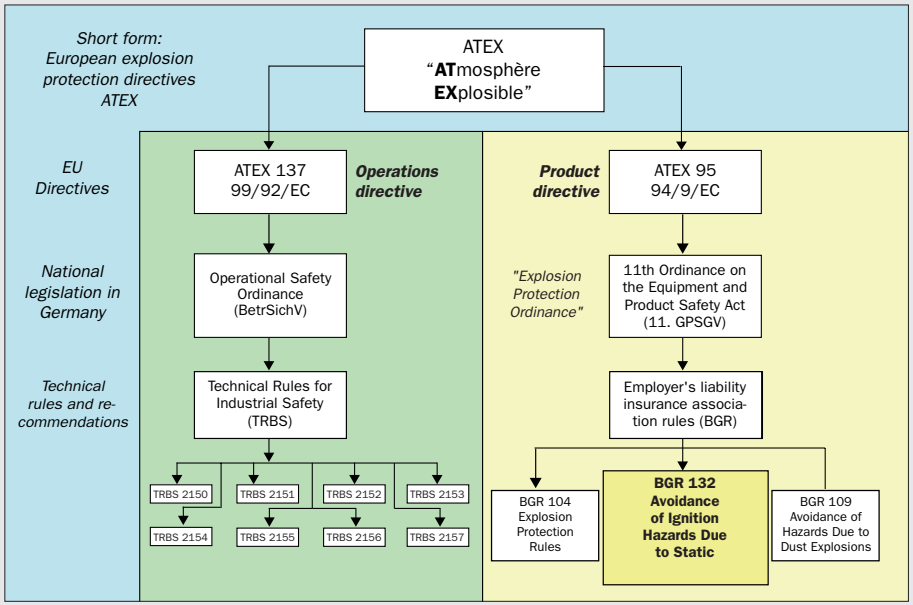
The resistivity of plastics treated antistatically is between 10^{9} ohm and 10^{12} ohm, which lies within the range of dissipative materials (see chart on page 3). However, the antistatic treatment only acts in conjunction with ambient atmospheric humidity.

At a low level of relative humidity the effect of antistatic treatment can no longer be guaranteed. The static discharge time for static may be higher than the charging time, despite earthing. The object may become dangerously charged despite the use of antistatic materials and earthing. For this reason SIMONA only recommends using its EL materials for the purpose of complying with EU Directive 94/9/EC and BGR 132.

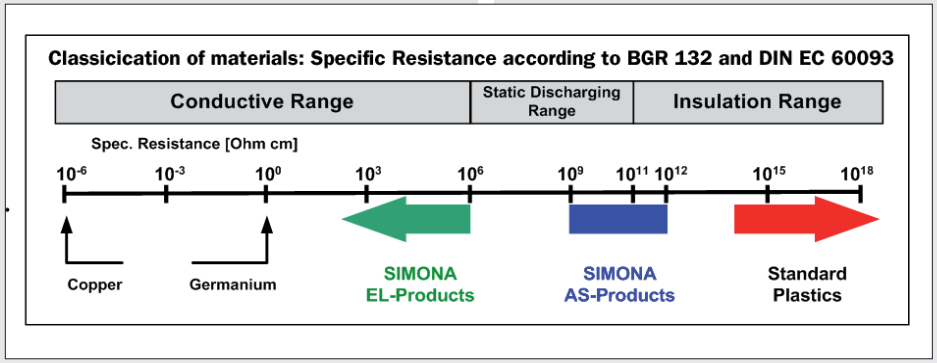
jochen.coutandin@simona.de

Knowledge of Explosion Protection

Relationships between the EU directives and laws, ordinances, technical rules and recommendations at national level, taking Germany as an example



SIMONA® EL Materials



Specific Resistiance according to DIN IEC 60093

SIMONA® PE-EL

PE-EL is a high-heat resistant, UV-stabilised, electrically conductive product designed for the avoidance of critical static. Consequently, PE-EL can be used not only for chemical tank and apparatus manufacture but also for applications within the electrical industry and all other potentially explosive atmospheres. For solutions in composite construction we also offer electrically conductive PE sheets in the form of backed sheets

dehoplast® PE-1000 EL

dehoplast® PE-1000 EL is an ultra-high-molecular-weight polyethylene which has been made electrically conductive specially for applications in potentially explosive atmospheres.

SIMONA® PP-EL/PP-EL-S

PP-EL is an electrically conductive homopolymeric polypropylene. PP-EL has a low resistivity and is ideal for use in potentially explosive atmospheres. In the form of PP-EL-S the material has a flame-retardant additive

SIMONA® PVDF-EL

PVDF ranks among the high-performance materials. In the form of PVDF-EL the material is electrically conductive and has a resistivity of < 10^6 ohm cm.

Areas of use of SIMONA® EL materials include not only chemical tank and apparatus construction but also the electrical industry and all other potentially explosive atmospheres.

Examples of applications of electrically conductive plastics

- Packagings and transport pallets in order to prevent static for high-quality products endangered by dust
- Tanks with fire-hazard contents
- Pipelines for conveying combustible liquids, solvents, vapours and their mixtures
- Laboratory hood pipes
- Pipelines for conveying combustible gases
- Gas collection pipes on landfill sites
- Tanks and parts of machinery in explosion-proof rooms
- Tank linings for storage and filling of powders
- Vent pipes at coal-processing plants
- Tanks and linings for fire-hazard contents
- Laboratory hood ducts
- Packagings and transport pallets for sensitive products

jochen.coutandin@simona.de

If you have any questions relating to this article, please contact Mr Dieter Eulitz at Business Development Industry.
E-mail: dieter.eulitz@simona.de
Telephone: +49 (0) 6752 14-718

Your contact

Dieter Eulitz
Business Development Industry

Dieter Eulitz has been employed at SIMONA AG for over 12 years. Up to June 2006 he worked in the Applications Technology Department, where he was mainly involved in the following fields: chemical resistance of SIMONA® materials, projects focusing on linings and composite construction as well as applications for fluoroplastics and electrically conductive plastics. In July 2006 he switched to the Business Development Industry Department, where he has been attending to new applications and products, working in close collaboration with customers.

Project Report

SIMONA® E-CTFE-GK in Composite System for Chimney Lining

From left to right: Installation steps through to the finished chimney.

Together with Plasticon Germany, OIH (Ooms-Ittner-Hof) was awarded a contract in 2007 to line a steel chimney for the OMV AG refinery in Schwechat, Austria, using a composite design made of E-CTFE-GK/GFK. For the chimney, which was 88 m high and had an outside diameter of 5.5 m, Plasticon Germany supplied four composite pipes made of SIMONA® E-CTFE-GK/GFK.

Initial situation

Construction of a free-standing steel outdoor chimney for a refinery belonging to OMV AG, Schwechat, with a total height of 88 m and an outside diameter of 5.5 m, certified for service temperatures of 105 °C to 110 °C and a design temperature of 120 °C.

Task

The E-CTFE-GK/GFK composite system was made by Plasticon The Netherlands in Hengelo, Netherlands, which possesses not only the necessary know-how but also an ideal technical basis when it comes to using the two materials E-CTFE-GK and GRP to construct a composite system with an inside diameter of 5 metres. In terms of material selection the following criteria had to be considered:

- High chemical resistance
- Excellent weather resistance
- High structural load capacity
- Thermal resistance

Solution

SIMONA® E-CTFE can be used almost universally in plant construction on account of its chemical resistance and wide surface temperature range. For this application SIMONA® E-CTFE is an ideal material because of its chemical properties. However, it does not meet static requirements. In such a case, a composite system can be used to achieve the necessary parameters by combining the properties of more than one material: SIMONA® E-CTFE-GK offers chemical protection against the smoke gas, while GRP, a thermoset plastic, in conjunction with SIMONA® E-CTFE-GK guarantees structural load capacity; the outer shell of the chimney is made of steel. Plasticon manufactured four composite pipes made of SIMONA® E-CTFE-GK/GFK (three pipes with a length of 19 m and one with a length of 13 m), which were inserted into the relevant steel tubes (outside diameter 5.5 m) at a special contractor in Belgium. These four tubes made of E-CTFE-GK/GFK/Steel were then transported by waterway to Schwechat in Austria and assembled entirely on site.

dieter.eulitz@simona.de

Publication details

SIMONA AG, Teichweg 16, 55606 Kirn

Responsible for content
Dr. Jochen Coutandin
Phone +49 (0) 67 52 14–721
jochen.coutandin@simona.de

www.simona.de