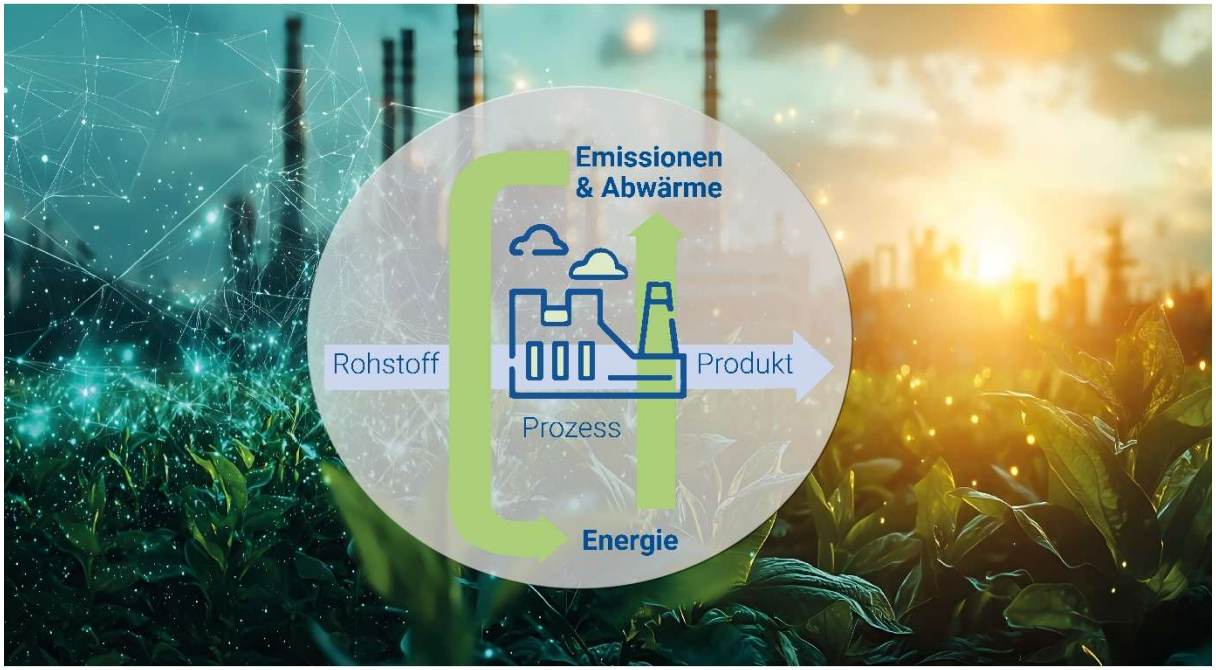
Future-proof in Germany thanks to innovative environmental technology

Double benefit through emission protection and cost reduction



Plastics processing in Germany causes around 850,000 tonnes of CO_2 emissions annually. Our industry faces the major challenge of significantly reducing these emissions while remaining competitive. Modern environmental technology in plastics processing offers remarkable solutions to this dilemma. In the following article, we present the plastics processors who are already benefiting from this green competitive factor.

It is not only compounders, extruders and rubber processors who are facing considerable pressure to change in Germany: while legal requirements for emission reduction are becoming stricter, rising energy costs are driving up the operating expenses of all plastics processors.
They are required to implement sustainable solutions that consider both environmental requirements and economic aspects.
From improved energy efficiency through intelligent heat recovery and energy-efficient exhaust air purification to comply with applicable limits, to optimised production processes through low-maintenance and reliable environmental technology – we present tried-and-tested approaches from plastics processors that pay off both ecologically and economically.

Legal framework binds companies to emission limits

In Germany, the Federal Immission Control Act (BImSchG) and the TA-Luft (Technical Instructions on Air Quality Control) regulate the permissible emissions from industrial plants. These laws define how much pollutants such as CO_2, nitrogen oxides and volatile organic compounds (VOCs) may be emitted into the environment from production processes. Companies must prove that their emissions do not exceed these limits.

At the international level, there are several agreements and regulations aimed at reducing emissions. In addition to the Paris Agreement on climate change, various European directives (such as BREF, short for Best Available Techniques Reference) apply, which are integrated into national legislation.
Compliance with these international standards is necessary for companies not only to meet national regulations, but also to ensure their competitiveness on a global level.

Dilemma: High emissions and energy losses

Compliance with increasingly stringent limits often requires the use of additional technical equipment, which not only entails investment costs but also, in some cases, considerable operating and maintenance costs. At the same time, energy prices are rising, making the operating costs of traditional processes such as gas-fired thermal post-combustion (TNV), or 'waste incineration of exhaust air', increasingly unattractive for many companies.
Nevertheless, plastic processing, e.g. during extrusion and vulcanisation, generates exhaust air streams with high temperatures and harmful aerosols that must be treated.
However, conventional methods of exhaust air purification such as TNV consume enormous amounts of fossil fuels and cause high CO_2 emissions. This leads to rising operating costs and additional burdens from CO_2 taxes, which further calls into question their economic viability.

The dilemma between emission limits and economic efficiency cannot be ignored by plastics processing companies in Germany. Especially in times of economic downturn, many companies are wary of making large investments in sustainable technologies and underestimate the potential savings that can be achieved with modern exhaust air purification systems. The waste heat from process exhaust air is a valuable, often untapped resource that can contribute significantly to energy efficiency.

Efficient alternatives: electrostatic precipitators and heat recovery

The choice of the appropriate process technology depends primarily on the specific properties of the exhaust air. Factors such as the type and concentration of aerosols (particles, gases, volatile substances, and odours) as well as the moisture content and temperature are decisive. Modern exhaust air purification systems rely on multi-stage technology that combines electrostatic precipitators, heat exchangers, UV light, activated carbon filters and wet scrubbers. The biggest advantage: these systems do not require fossil fuels and consume up to 98% less energy compared to conventional post-combustion processes. Electrostatic precipitators are characterised by high separation efficiency and low energy consumption, eliminating up to 99% of particles and aerosols from the exhaust air. Additionally integrated heat recovery systems also enable the use of process heat for heating production halls or for hot water preparation.

Practical example 1: Valeo reduces CO_2 emissions by over 500 tonnes per year

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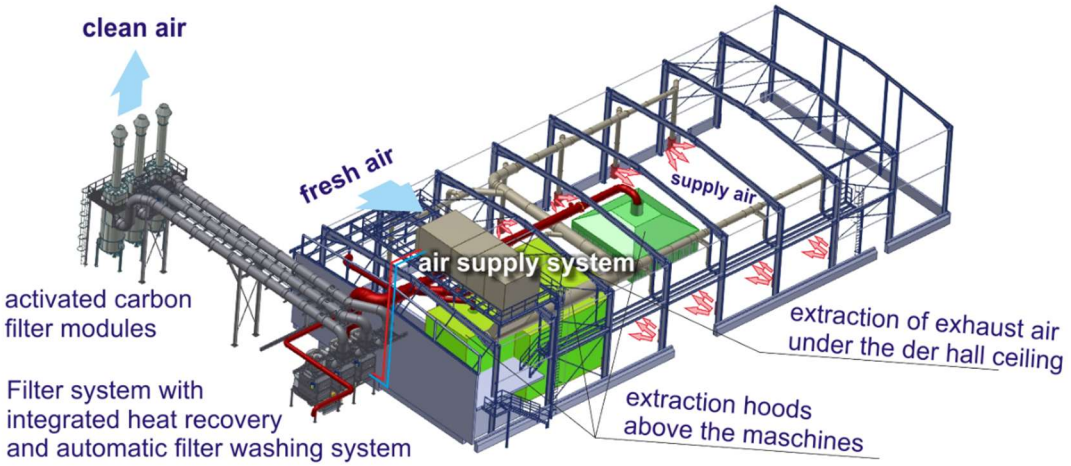
Automotive supplier Valeo relies on modern electrostatic precipitator technology at its Bietigheim-Bissingen site to clean the exhaust air from rubber processing. Instead of using post-combustion with operating temperatures above 750 °C, the modular system ensures energy-efficient cleaning at significantly lower temperatures. With an exhaust air volume of 5,000 m^3/h, the annual CO_2 savings amount to an impressive 525 tonnes. In addition, Valeo

saves over €240,000 in energy costs per year thanks to the new exhaust air purification solution.

The individual components of the modular exhaust air purification system are arranged one above the other and so, require very little floor space.

Practical example 2: Kraiburg Elastik reduces operating costs and increases energy efficiency

Rubber and plastics specialist Kraiburg Elastik also relies on modern exhaust air purification technology, not only to minimise odour emissions in the long term, but also to recycle waste heat from process exhaust air in an energy-saving manner.
By integrating a modern heat recovery system, Kraiburg was able to use the recovered energy to heat the production halls. When using conventional gas-powered hall heating, the heating costs would amount to around €90,000 at the standard operating capacity of 3,280 annual working hours per heating season. In contrast, the operating costs of the KMA filter and heat recovery system are only around €11,000. The energy-efficient environmental technology has not only drastically reduced CO_2 emissions, but also significantly lowered operating costs. Compared to a regenerative thermal oxidation (RTO) system, Kraiburg Elastik saves over €200,000 in energy costs and 400 tonnes of CO_2 annually.



First, the exhaust air is cleaned of particles and aerosols using an electrostatic precipitator. The heat exchanger extracts the heat contained in the filtered exhaust air stream. This heat is then used by the heat exchanger to warm the fresh supply air. In addition, the carbon filter separates the odours produced during the manufacture of the recycled rubber mats.

When planning production expansions or conversions, it is advisable not only to consider compliance with the required emission limits through environmental technology systems, but also to benefit from the use of the waste heat generated through integrated heat recovery. Thanks to forward-looking construction planning, a compounder in North Rhine-Westphalia was able to achieve considerable energy savings with the help of its filter system on the strand extruders: with an exhaust air volume of 18,000 m^3/h and an exhaust air temperature of 30°C, it managed to utilise 160 kW per hour for heating its production hall.

These practical examples demonstrate that sustainable technologies are not only worthwhile from an environmental perspective, but also bring tangible economic benefits. Thanks to federal subsidies for energy and resource efficiency (BAFA module 4), companies can also apply for attractive subsidies for investments in energy-efficient exhaust air purification systems.

Reduce maintenance costs and protect technical equipment

A decisive factor when choosing new exhaust air technology is the associated effort and maintenance costs. Plastics processor Freudenberg faced the challenge that its outdated electrostatic precipitators required frequent and costly maintenance. By replacing it with a modern electrostatic precipitator with an automatic cleaning system – comparable to an integrated dishwasher – a reliable and low-maintenance solution was achieved. The integration of an automatic filter cleaning system (CIP – Cleaning in Place) contributes significantly to the longevity of the filter system and the heat recovery system, as it reliably removes contaminants and aerosol residues from the electrostatic precipitator, UV light module and heat exchanger.

Improvements in maintenance processes, longer filter service life and a cleaner production environment are key reasons why plastics processors are increasingly turning their attention to modern environmental technology. One example of this is the company Treffert, which has switched to a more efficient exhaust air purification system for the production of masterbatch. The bag and HEPA filters previously used quickly became clogged with sticky particles from

the exhaust air, which required time-consuming cleaning and replacement measures. The installation of a two-stage electrostatic precipitator system now eliminates the need for costly filter cartridge replacements.
A similar picture emerged at Nitto's film extrusion facility: before switching to a high-performance exhaust air filter system, plastic deposits on roof surfaces, pipes and fans led to regular and costly cleaning measures. Since the installation of the new system, these plastic deposits have disappeared from the production site.
In addition to air pollution control, environmental technology can also make an important contribution to protecting technical equipment and product quality. For example, a self-cleaning electrostatic filter system used as a pre-filter in extruder degassing ensures that the downstream vacuum pump is reliably protected against volatile components and gases. The high separation efficiency compared to conventional boiler filters contributes to process optimisation, as the component can be produced continuously without gas inclusions.

Problem with odour emissions: recycling makes environmental technology even more important

The recycling of plastics often produces unpleasant odour emissions, which are problematic for both the environment and employees in production facilities. These emissions result from the thermal decomposition of polymer compounds, additives and impurities that have accumulated in the plastic.
The growing relevance of the circular economy and the European Commission's goal of making all plastic packaging on the EU market either reusable or economically recyclable by 2030 underscore the need for sustainable environmental technology. To treat the odours and volatile organic compounds (VOCs) caused by recycling, modular filter systems, in combination with UV light or carbon filters depending on the application, offer a cost-effective option for effective emission control.

Practical example 3: Neidhardt Rohstoff GmbH minimises odour emissions during compound production

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Neidhardt Rohstoff GmbH manufactures high-quality regranulates and compounds at its sites in Bavaria and Thuringia and has an annual processing capacity of around 16,000 tonnes. At its site in Thuringia, the compound expert ensures that the 10,000 m^3/h of exhaust air from the four extruders leaves the new production hall purified and free of plasticiser odours.
To comply with TA-Luft limits, Neidhardt opted for a combination of double electrostatic precipitators and activated carbon filters. After particle separation by the compact electrostatic precipitator, the filtered exhaust air is fed into the open air via an activated carbon filter installed outdoors for further odour minimisation. Such carbon adsorbers are suitable for the adsorption of gases, odours, and many non-water-soluble pollutants in the exhaust air.

No odour emissions during compounding: an electrostatic precipitator (left) and activated carbon filter (right) clean the exhaust air at Neidhardt in a sustainable and energy-efficient manner.

Conclusion: Sustainable environmental technology as an investment in the future

Those who want to remain competitive must act. Given the economic situation, reluctance to purchase new environmental technology is understandable at first glance. However, practical examples from future-proof plastics processors in Germany show that innovative exhaust air filter solutions and heat recovery systems not only save energy costs while complying with applicable emission guidelines, but also reduce maintenance costs and improve production processes.

Companies that rise to the challenge secure a decisive competitive advantage for the future – both financially and in terms of sustainability. KMA Umwelttechnik provides advice to interested companies and answers all questions relating to exhaust air purification and heat recovery without obligation. On request, individual operating cost comparisons can also be prepared to highlight potential savings.