

Sweets Processing

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Die Premium-Schokolade der Marke Frey blickt auf eine 130-jährige Tradition zurück. (Bild: Delica)
Frey brand premium chocolate looks back on a 130-year tradition. (Image: Delica)

Sustainability and economic efficiency in the focus of cocoa processing

Chocolate production releases large quantities of pollutants and odours in the exhaust air. Official regulations, complaints from the neighbourhood and environmental protection require high-performance filter systems. This is where the wheat is separated from the chaff: In addition to air quality, filter systems differ greatly in energy consumption and thus in sustainability and operating costs.

Post-combustion is a standard process for cleaning chocolate exhaust air. Due to the high temperatures required, this process is associated with high energy consumption and a corresponding CO₂ footprint. If the pollutant load increases, the energy input of the afterburning system also increases.

In chocolate production, the exhaust air must be treated at 750 °C in order to sufficiently eliminate pollutants and odours. "We were looking for a specialist who could do justice to the demanding task—removing pollutants while using little energy," says Oliver Hausmann, Member of the Management of the Swiss food producer Delica AG. "With a hybrid filter system from KMA, we are breaking new ground and showing that sustainability and economic efficiency do not have to be at odds." The approximately 2,200 Delica employees develop and produce high-

quality luxury products for numerous own brands, including the traditional Swiss brand Frey, at five locations in Switzerland and several branches abroad.

Modular filters suitable for small and large companies

"As part of our internal sustainability strategy, we take our responsibility seriously along the entire value chain: from the cultivation and procurement of raw materials to production and consumption," explains Oliver Hausmann. Due to the energy shortage and the associated increase in energy prices, the topic of energy saving is increasingly becoming the focus of the sustainability strategy. For Delica, this opens up new perspectives for making chocolate production more sustainable and at the same time more economical.

"The roasting and grinding of cocoa beans in particular produces intensely polluted exhaust air," explains Roland Berger, Project Manager Engineering at Delica. The unpleasant odour produced during roasting is different from the scent of the finest chocolate mass. In addition, there is a high concentration of VOCs (volatile organic compounds) in the air. "As an alternative to the common thermal afterburning at around 750 °C, we decided to use a filter system from KMA, which does not require fossil energy and causes only a fraction of the CO₂ emissions and operating costs of an afterburning system," Roland Berger notes.

When calculating the size of the exhaust air technology, great importance was attached to economic efficiency. Measurements on site and extensive calculations led to the result that it is possible to work with a significantly lower exhaust air volume if

the four roasters are switched one after the other with a time delay, thus avoiding parallel peaks.

The filter system was designed for an exhaust air volume of 6,000 m³ without considerable additional expenditure. KMA filter systems are available for exhaust air volumes from 750 m³ to 20,000 m³. This means that both large and small companies can be equipped with filter solutions. In addition to Delica, KMA's customers include well-known companies such as Lindt & Sprüngli and Mondelez.

KMA filters effectively remove VOCs and odours

A collecting pipe collects the hot and humid vapour exhaust air from roasters, mills and the potash reactor and leads it to the filter system. Due to the tight structural conditions, the exhaust air flow is first divided in half and cooled down via two gas scrubbers of 3,000 m³ each. The resulting circulating hot water is cooled down again to the temperature required for cooling by means of a plate heat exchanger and a roof re cooler. The thermal energy obtained is available for further use and is used by many customers for certain production steps or to heat the hall.

The water from the two scrubbers circulates in a primary circuit and absorbs the heat energy from the exhaust air flow. From the central collection tank, the common pump draws the heated water and sends it to a water/water plate heat exchanger. This system transfers the thermal energy from the water to a secondary glycol circuit, which in turn releases the thermal energy to the environment via a roof re cooler.

As a side effect, the air volume is reduced from the original 6,000 m³ to 4,000 m³, which means that further exhaust air

technology can be designed for a smaller volume. The air is recombined and fed into a third gas scrubber. Here, the filtering of the VOC pollutants is started.

An exhaust scrubber works according to the absorption principle. Here, the polluted exhaust air is cleaned with the help of a scrubbing liquid, such as sodium hydroxide solution. The scrubbing liquid is sprayed into the exhaust air stream, whereby the impurities are absorbed and bound by the small drops of liquid.

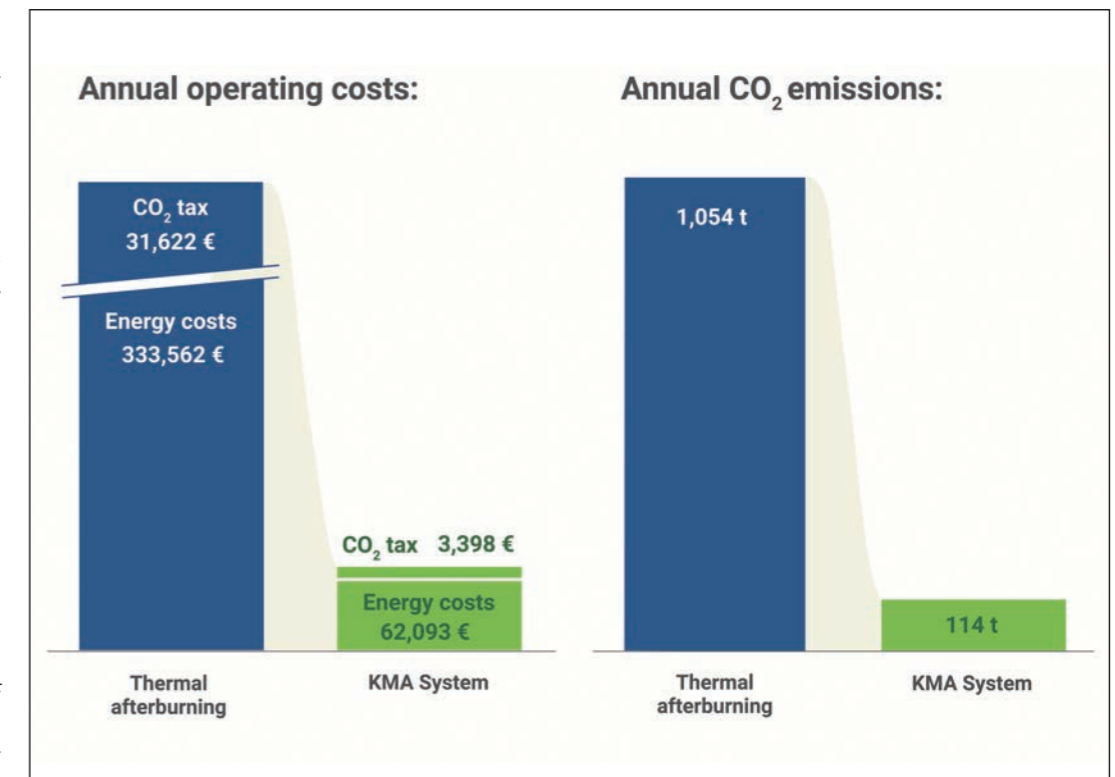
Finally, the pre-treated exhaust air flows through two biofilters that remove almost all VOCs and odours from the chocolate exhaust air. As the name suggests, the exhaust air is filtered using biological material. The microorganisms contained in it convert the pollutants into CO₂ and water with the help of oxygen, thus decomposing the VOCs naturally. Measurement results at Delica show that the efficiency of the KMA filters is over 97%. "This means we remove almost all VOCs from the chocolate exhaust air," sums up Jörg Ribbeck from R&D at KMA.

Biofilters are particularly popular because they entail only low operating costs. The biomass is only replaced every two to five years, and energy consumption is limited to air transport.

Significant reduction of CO₂ emissions and costs

Delica operates an ISO 14001 certified sustainability management system. With the installation of an energy-efficient exhaust air filter system, the company succeeds in operating even more sustainably. KMA's calculation, based on the specific application at Delica, revealed a clear savings potential.

"Instead of an annual CO₂ emission of 1,054 tonnes with afterburning, the KMA filters come to only 114 tonnes. At current gas prices and the current CO₂ tax, operating costs of 65,491 Euros with the KMA technology are thus compared to around 365,184 Euros with afterburning – this means a saving of almost 300,000 Euros in operating costs per year," Jörg Ribbeck explains.



Im Vergleich zur thermischen Nachverbrennung spart die KMA-Lösung 82 % an Betriebskosten und knapp 90 % an CO₂ ein. (Bild: KMA)
Compared to thermal afterburning, the KMA solution saves 82 % in operating costs and almost 90 % in CO₂. (Image: KMA)