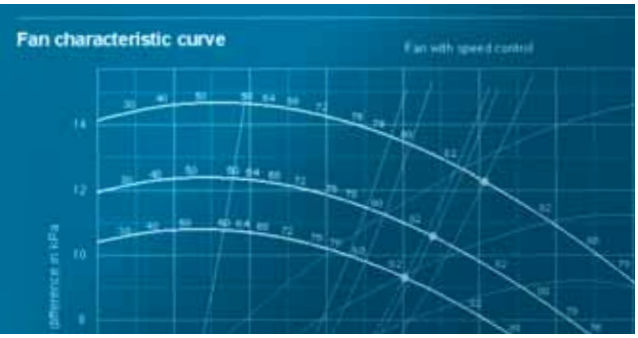
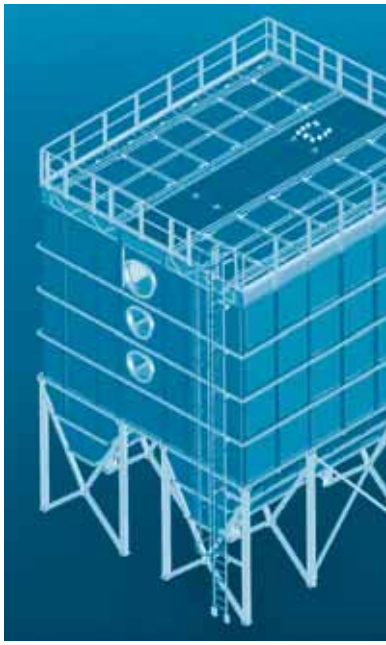
Venti Oelde

Exhaust plants for flame-cutting smoke





Venti Oelde

Environmentally sound filter solutions in metal recycling

Ventilatorenfabrik Oelde GmbH, the reputed manufacturer of industrial filters and specialist for air handling systems, provides efficient and environmentally compatible filter solutions for the flame-cutting process during metal recycling.

The versatile industrial filters from Ventilatorenfabrik Oelde GmbH (Venti Oelde) prove themselves in daily use in many branches of industry. Over the last 25 years they have also been successfully used to exhaust gas-cutting smoke in the recycling industry. The following example at Rohstoff Recycling Dortmund GmbH (RRD) shows how Venti Oelde provides support to recycling companies so they comply with environmental laws without constricting operation during scrap baking.

A well-known reference

The company Rohstoff Recycling Dortmund GmbH was formed in 2001. It is part of the Georgsmarienhütte Group (GMH Group) and located in the north of Dortmund port. RRD processes bulky scrap and bi-products from ironworks (so-called slag blocks) from iron and steelworks.

“In order to be able to compete on the market we have to rely on long service lives, efficient processes and plant operation without unpredictable legal risks and in Venti Oelde we have found a partner on whom we can rely in every respect”, is the verdict of Ralf Willam, Production Manager of RRD.

Every month RRD supplies about 48,000 t of treated, recycled scrap to steelworks and foundries in the key markets in Germany and Europe. Twenty percent of the processed material is delivered to the Georgsmarienhütte steelworks. The remainder is divided between companies within the GMR Group and external companies.

Size reduction of the scrap

During the treatment process the scrap is broken down into loadable pieces. This is usually accomplished by using flame-cutting equipment. Or, alternatively, a “blasting-pit” is utilized.

In preparation for treatment in the blasting-pit, so-called blasting holes are flame-cut into the scrap using thermal torches. These are filled with a blasting agent and fuses. Then the material is detonated.

Smoke produced during slag block flame-cutting

Mobile exhaust hood

Flame-cutting the scrap pieces

There are basically two different flame-cutting processes: on the one hand gas-cutting with oxy-fuel gases and oxygen with so-called gas torches; on the other hand there is gas-cutting using torches with pure oxygen. These torches serve as an energy source and are burnt up.

Gas-cutting with oxy-fuel gas and oxygen is generally used for breaking down large machines or other bulky pieces of scrap. The fuel gases used are usually acetylene or propane. The melting point is about 1,600 °C.

When gas-cutting with torches, so-called oxygen lances are used. These are steel pipes with or without core wires, which burn at the tip of the torch. Oxygen is introduced at a pressure of up to 12 bar, whereby a surface temperature of 2,200 °C is attained. Using this process holes are pierced in the slag blocks or milling waste products in preparation for blasting.

Shutoff device and duct system

In the name of the environment

Depending on the material being flame-cut, yellow to grey-black smoke is produced together with a considerable amount of fine oxide dust. This waste gas must be collected and filtered so as to prevent hazardous emissions. To ensure compliance with environmental protection regulations, Venti Oelde installed an exhaust plant with three mobile hoods in 2005 for RRD.

Mobile exhaust hoods ensure flexibility

The mobile exhaust hoods, powered by two right-angle geared motors, travel along a track until they are positioned above the steel scrap which has to be cut. During this process the electrically adjustable doors at the front are open.

When the hood is in position the doors are closed. The hood is now ready for the cutting process. The workmen stand in front of the enclosure to cut the workpieces with thermal torches. The sliding doors make their working position variable; they insert their flame-cutting equipment through the openings into the required position. Easily replaceable anti-splatter guards protect the sliding plates against caked material: two splatter guards are placed at the front and others are placed on the opposite inside wall.

On conclusion of the flame-cutting process, the hood travels to the next docking point, the flame-cutting position, so that the next cutting process can begin. The scrap which has already been broken down can be removed from the previous docking point and replaced by new scrap requiring processing. Thus ensuring short set-up times.

Extracting hazardous gases

The precise air flow routing within the hood collects the hazardous gases from the flame-cutting process and conveys them via a duct system to the fabric filter. The necessary negative air pressure is provided by a fan which is arranged downstream of the filter.

The duct in the dust-laden gas zone has several exhaust connections with shutoff devices. The mobile exhaust hood positions itself in front of the exhaust connection and autonomously opens the shutoff device, thus connecting the exhaust hood directly to the duct line.

To ensure that the plant functions perfectly, it is essential that the minimum air velocity in the duct system is upheld. Each hood is, therefore, connected to the filter through a single duct line.

Each duct line possesses an additional shutoff device at the filter inlet. By means of a frequency converter different operating states can be initiated depending on the number of hoods in operation.

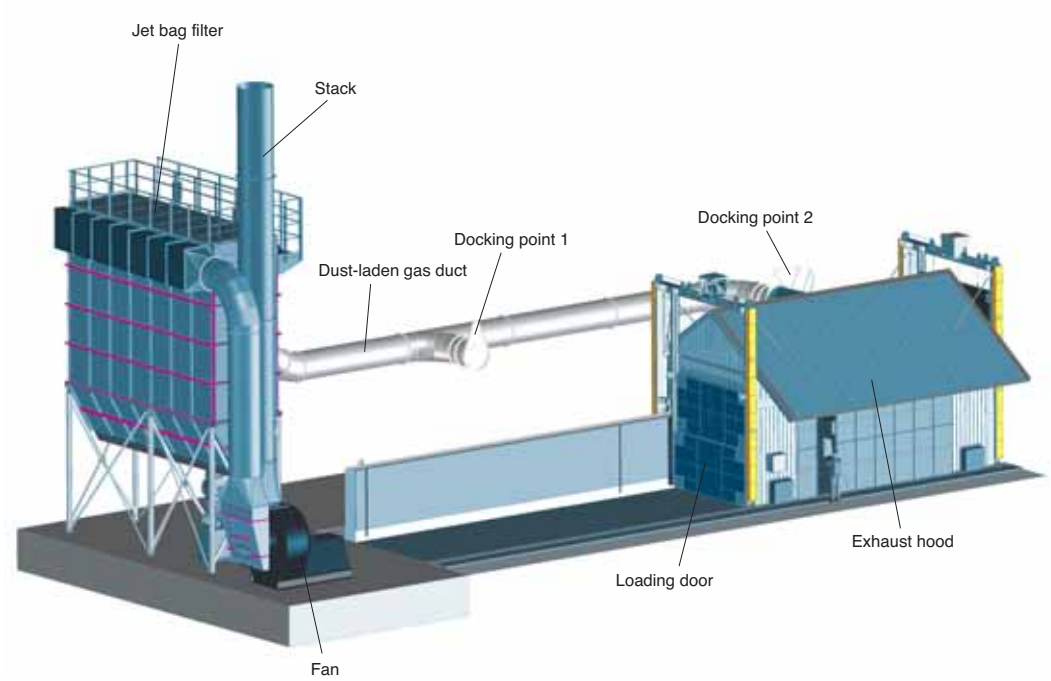


Diagramme: Filter plant with an exhaust hood

Filter plant with fan, silencer and stack

Filtering hazardous gases

The exhaust fan is arranged on the downstream clean air side of the filter. The dust-laden air enters the filter via an integrated pre-separator plenum. In the pre-separator plenum the large dust particles are separated out of the dust-laden air by gravity. The air rises laterally into the filter chambers to the filter bags. The filter media, which is heat-resistant up to 120 °C retains the dust and filters the fine air-borne dust particles. The dust is deposited on the exterior of the filter bags.

Filter bag cleaning is regulated by differential pressure, i.e. when a set differential pressure value within the filter is reached the filter bag cleaning process is automatically activated. Precise air routing within the filter plant ensures a uniform filter media dust load. This intelligent filter cleaning, regulated by differential pressure, achieves a long filter bag service life with low compressed air costs. The filter plant, which is now eight years old, is still working with the first set of filter bags (as of 31st Aug. 2013).

The dust separated out in the filter is discharged via a combination of screw conveyor and rotary airlock and temporarily stored in a container or “Big Bag”.

The exit air complies with the maximum permissible clean gas dust content regulations and is released into the atmosphere through a silencer and the exit gas stack.

Local control point

Controlling the hoods

A local control point is mounted directly on the exhaust hood. The drive motors are safely and conveniently controlled and handled from here. The drive motors move the exhaust hood and open and close the doors. The position status of the doors is also controlled from here to authorize process start-up.

The fan speed can be changed by a potentiometer (frequency converter) to enable the air volume to be adjusted according to the workpiece. Two rotating flashing lights on both sides of the hood signalize that it is about to change position. A signal sounds before the hood starts to move.

Main control is effected through the programmable controller (SPC) in the switchgear cabinet. This is placed in a ready-built garage directly adjacent to the filter plant. Here is also placed the compressor which provides compressed air to clean the filter bags.

The speed of the screw conveyor and the rotary airlock are also monitored. At the filter inlet the temperature is measured so that the flame-cutting process can be stopped if the temperature is too high. This is to protect the filter media. In this case, cooling air is added through a leakage air valve to cool down the exhaust gas flow. The total exhausted gas volume is 140,000 Sm^3/h. About 1,000 t of material are cut per hood each month.

Keeping pace with demand

Capacity requirements at RRD regarding the material to be gas torch cut have increased since Venti Oelde installed the plant in 2005. The plant was already operating at full capacity with the three hoods. “Cooperation with Venti Oelde has been excellent over the years. Response time is short and we get all the help we need. Only Venti Oelde was contemplated for the plant upgrade”, commented Ralf Willam the working relationship.

When a detailed analysis had been concluded, Venti Oelde completely redesigned the new hood in 2012, adapting it to the increased demands. The development is based on the many years experience which Venti Oelde as plant manufacturer has gained in the area of gas torch cutting and fulfils in every respect the demands of the operator, RRD. Willam specifically confirmed this: “Venti Oelde constructed the new hood individually and exactly in accordance with our specifications and dimensioned the additional exhaust plant precisely in compliance with our requirements. Their many years experience was from the beginning the basis of the project and the result has completely fulfilled our expectations.”

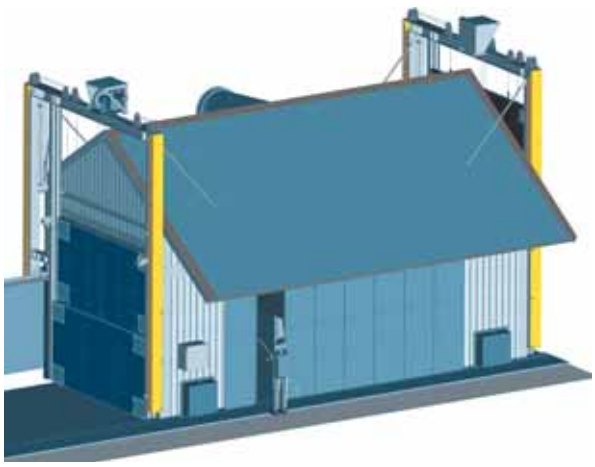
Upgrading the filter plant

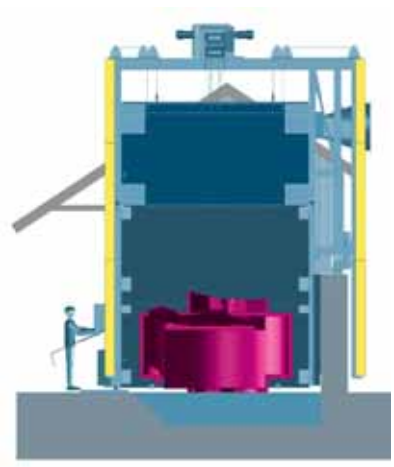
Additional exhaust hood – “new design”

A further mobile hood was added to the plant, an additional fan installed and another filter with an appropriately selected air-to-cloth ratio integrated into the system. The exhaust volume of the additional hood is 66,000 Sm³/h.

The complete new exhaust plant is incorporated into the existing plant; it partially uses the duct supports, the dust discharge system and the stack of the existing plant, thus saving space and costs.

Among other things, the drive unit was mounted on a continuous concrete wall, so that the geared motors are protected. Both electrically driven doors at the front have also been divided horizontally into two and designed as lifting doors. Each segment of the door is two metres high, meaning that, when the door is raised, the force of the wind only acts on two metres height instead of on four. Furthermore, all segments are fitted with a mechanical fall arrester.





Ralf Willam (Plant Manager RRD) and Michael Huld (Blaster at RRD) in conversation with Venti-Oelde Project Manager Thorsten Kilp (from left to right)

Successful operation

After five months of planning, construction and assembly time, the RRD upgraded plant was ready for operation. Venti Oelde continues to support the operator, available to answer questions on any matter from maintenance to filter replacement or to discuss possible further expansion plans.

Technical Data

Type of dust:	Fine dust from ferrous scrap (iron oxide and mineral components)
Inlet gas dust content:	1 g/Nm³
Clean gas dust load:	< 4 mg/Nm³
Throughput per hood:	1,000 t/month
Total flow volume in operating state:	206,000 Sm³/h
Operating temp. normal operation:	80 °C
Maximum operating temperature:	100 °C

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