Cupola furnace (koepeloven) https://en.wikipedia.org/wiki/Cupola_furnace

Refractory (vuurvast, hittebestendig) https://en.wikipedia.org/wiki/Refractory

Table 5.1: Emission to air associated with the use of BAT for ferrous metal melting and treatment

Type	Parameter	Emission level (mg/Nm^3)
Hot blast	Carbon monoxide	20 – 1000
	SO_2	20 – 100
	NO_x	10 – 200
Cold Blast	SO_2	100 – 400
	NO_x	20 – 70
	NM - VOC	10 – 20
Cokeless	NO_x	160 – 400

Pouring, cooling and shake-out

Pouring, cooling and shake-out generate emissions of dust, VOCs and other organic products. BAT is to:

- enclose pouring and cooling lines and to provide exhaust extraction, for serial pouring lines (Section 4.5.9.2), and
- enclose the shake-out equipment, and to treat the exhaust gas using wet or dry dedusting as discussed in Section 4.5.9.3. The BAT associated emission level for dust is specified in Table 5.6.

4.5.9.2 Pouring and cooling lines encapsulation

Description

The collection of emissions during pouring, cooling, and shake-out is as a rule more extensive as the plant becomes bigger.

The further the pouring process can be restricted to a fixed area or position, the smaller the amount of extracted air will be, and the easier it will be to capture emissions with ventilators and housings, and therefore air-treatment can be carried out more effectively.

In serial pouring, the emissions increase with increasing production capacity. Without extraction, the air at the pouring plant could at some point reach unacceptable concentration levels of noxious substances. To lessen the pollution in the work area, extractor ventilators or extractor surfaces are fitted as close to the moulds as possible, but without hindering the pouring process. The extractor elements are arranged in such a way that all emissions occurring during pouring, are moved away from the work area to the extracting equipment. The air-speed at the free extraction cross-section is kept between 0.5 and 1 m/s.

Achieved environmental benefits

Reduction of diffuse emissions of CO, PAHs and other organic decomposition products.

4.5.9.3 Exhaust capture and treatment from shake-out

Description

The technique used for the emission collection from shake-out depends on the degree of mechanisation, the emissions to be extracted and the size range of the castings, in particular the smallest and largest item cast on the same machine.

The best way of achieving good emission levels with relatively small ventilation rates is when shake-out is performed in enclosed units. Roof openings, possibly with a moving screen, doors and entry/exit chutes make it possible to use a crane or other means of transport. In addition, the closed cabins reduce the noise level.

Appropriate techniques for dedusting are cyclones combined with wet scrubbers or dry filters. Biofilters are also used and are discussed in Section 4.5.8.6.

4.5.8.6 Exhaust gas cleaning using biofilter

Description

Biofiltration is based on the ability of microbes living in a fibre-peat filter bed to oxygenate malodorous gases and convert them into odourless compounds. The gas to be purified is blown by a fan through a bed of humid filter material, exiting odourless from the upper side. The odorous compounds are adsorbed in the water phase and are decomposed by micro-organisms living on the filter material. The good performance of the filter depends on the balance between the supply of nutrient (compounds for abatement/decomposition) and the number of micro-organisms.

In foundries, biofilters are applied for the removal of odorous gases, which mainly consist of amines from the off-gas from cold-box core-making processes and for the removal of VOCs (e.g. benzene) from casting shop exhaust gases.

In de volgende onderdelen van de BREF worden emissiebeperkende voorzieningen voor VOC beschreven, maar daar wordt uiteindelijk niet naar verwezen in de BBT conclusies.

4.5.8.6 Exhaust gas cleaning using biofilter

Description

Biofiltration is based on the ability of microbes living in a fibre-peat filter bed to oxygenate malodorous gases and convert them into odourless compounds. The gas to be purified is blown by a fan through a bed of humid filter material, exiting odourless from the upper side. The odorous compounds are adsorbed in the water phase and are decomposed by micro-organisms living on the filter material. The good performance of the filter depends on the balance between the supply of nutrient (compounds for abatement/decomposition) and the number of micro-organisms.

In foundries, biofilters are applied for the removal of odorous gases, which mainly consist of amines from the off-gas from cold-box core-making processes and for the removal of VOCs (e.g. benzene) from casting shop exhaust gases.

For adsorption to activated carbon, the exhaust gas flows through a carbon bed. Upon saturation, the carbon is thermally regenerated. Activated carbon has a very high adsorption (and abatement) efficiency. For benzene, the efficiency is >99 %. Nevertheless, it has the following disadvantages:

- the high flue-gas volumes require large amounts of activated carbon
- dust and aerosols need to be filtered out of the off-gas before the carbon adsorption. Since very fine dust particles show a tendency to stick, the filtering is only possible using wet dedusting techniques and this thus generates a waste water flow.

To successfully exploit post combustion to eliminate VOCs from off-gases, specific minimum concentrations are necessary. These limit values are compound specific and depend on the chosen technique. Post combustion is possible for the exhaust gas from shell moulding. Generally, the exhaust gas from the casting shop does not have high enough VOC levels to operate post combustion. One alternative to post combustion is to use exhaust air from the core blowers as combustion air for the cupola.

The use of biofilters is discussed in detail in Section 4.5.8.6.

4.5.9 Casting/Cooling/Shake-out

4.5.9.1 Introduction

The emissions during pouring, cooling and shake-out are diverse and differ broadly in quality and quantity from one foundry to another. Basically, dust emissions are produced, as well as inorganic and organic gaseous compounds. These are mainly reaction products, caused by the high temperature and the reducing atmosphere upon pouring and cooling. The composition of pouring fumes is complex. They consist mainly of CO, CO_2, H_2, and methane as the main representatives of the organic decomposition products. Polycyclic aromatic hydrocarbons and benzene occur, depending on the composition of the mould- and core-system.