Applicability
Applicable to the plants producing calcium carbide.

Economics
No data submitted.

Driving force for implementation
The protection of the environment.

Example plants
The calcium carbide plant in Landeck, Austria.

Reference literature
[60, UBA-Austria, 2004].

7.2.4.7 Waste gas treatment for other emission sources

Description
For the abatement of dust from other stages of production (wagon tilting-plant, crusher, coke drying, raw material dedusting, calcium carbide storage, recirculation of sewage sludge) fabric filters are applied.

Achieved environmental benefits
The reduction of dust emissions into the atmosphere.

Cross-media effects
No information submitted.

Operational data
Characteristic dust emissions from the example plant in Landeck are presented in Table 7.10.

Applicability
Applicable to the plants producing calcium carbide.

Economics
No data submitted.

Driving force for implementation
The protection of the environment.

Example plants
The calcium carbide plant in Landeck, Austria.

Reference literature
[60, UBA-Austria, 2004].

7.2.5 Best Available Techniques for the manufacture of calcium carbide

For general information on understanding a BAT Section and its contents, see Section 7.1.5.

Calcium carbide is produced in large electrothermic furnaces in a very energy intensive process at a high temperature by the reaction of lime with carbon (usually coke). In modern furnaces, carbon electrodes are completely closed, so that the carbon monoxide by-product can be recovered and the energy content in the furnace gas utilised downstream (e.g. lime kilns, fuel gas network). However, in the EU-25 calcium carbide is produced using closed, half-closed and open type furnaces and, as far as possible, BAT conclusions address those configurations.

For the production of calcium carbide by the electrothermic furnace, BAT is to:

1. Select appropriate quality raw materials and check their purity to avoid an excessive content of impurities in the raw materials, such as iron oxides, SiO_2, Al_2O_3, MgO and compounds of nitrogen, sulphur and phosphorus, to minimise undesirable side reactions and waste of energy – see Section 7.2.2. In particular:

   - use coke dried of below 2 % moisture content, with an ash content of below 15 % (optimally 10 %), and (for closed furnaces) a grain size of 3 – 25 mm

   - maintain the magnesium content in the lime below 2 % and the grain size between 6 and 50 mm. Use lime (usually quicklime) which is as soft as possible to allow the reduction of the CO_2 content to less than 2 %.

2. Design, maintain and properly operate the calcium carbide plant, to save raw materials and energy and reduce the impact of the production of CaC_2 on the environment. In particular:

   - in the calcium carbide plant with a closed furnace, use 930 kg lime (94 % CaO), 550 kg coke (dry, 10 % ash), 20 kg electrode material, and 3200 kWh electricity respectively per tonne of CaC_2 and, utilise the energy content of the CO furnace gas or use the furnace gas as a process input – see Sections 7.2.3.1, 7.2.3.4, 7.2.4.1 and 7.2.4.5

   - in the calcium carbide plant with an open type furnace (where CO gas is not collected), save raw materials and energy and reduce the impact of the production on the environment, also taking advantage of the possibility to select a broader range of raw materials used and of a higher flexibility of the process – see Sections 7.2.3.1, 7.2.3.4 and 7.2.4.1.

3. In the calcium carbide plants using closed furnaces, collect totally the dust-laden CO furnace gas, clean the gas to 1 – 5 mg/Nm^3 by using a dry or wet dedusting system, as appropriate, and utilise the energy content of the dedusted CO furnace gas in downstream operations at the site or outside of the calcium carbide plant site – See Sections 7.2.3.1, 7.2.4.1, 7.2.4.2, 7.2.4.3 and 7.2.4.5

   Notes:
   In the calcium carbide plants with closed furnaces, use a dry dedusting system with self-supporting candle filters made of ceramic fibres for furnace gas cleaning to below 1 mg/Nm^3, cool the hot dedusted furnace gas in a heat exchanger, and calcine the filter residues in order to destroy the cyanide – see Section 7.2.4.2 or, alternatively, use a wet dedusting system for furnace gas cleaning to below 5 mg/Nm^3, with an associated waste water treatment system for CN removal – see Section 7.2.4.2, 7.2.4.3 and 7.2.4.4.

   The cleaned furnace gas has a typical composition of 80 – 90 % CO, 1 % CH_4, 6 - 15 % H_2, 2 – 7 % N_2 and 0.5 – 3 % CO_2, depending on the characteristics of the raw materials used. The carbon monoxide rich furnace gas is usually utilised as fuel via a fuel gas network and the excess of the gas is flared. Other applications are known for the usage of the furnace gas (such as in a lime kiln, or as a process heating gas and raw material in other industries) – see Section 7.2.4.5.

4. In the CaC_2 plants where an open type furnace is used, reduce a final dust content in the furnace and tapping gas to below 3 mg/Nm^3 using a common dedusting system – see Sections 7.2.3.1 and 7.2.4.2.

5. Reduce emissions of fumes originating from the tapping operation to 9 g dust per tonne of CaC_2 produced by using a dry system of fume extraction and treatment in fabric filters (see Sections 7.2.3.1 and 7.2.4.6).

6. Capture the air and reduce dust emissions from other emission sources (wagon tilting-plant, crusher, coke drying, raw material dedusting, calcium carbide storage) to 1 - 5 mg/Nm^3 by using fabric filters – see Sections 7.2.3.1 and 7.2.4.7.