Emission Simulation Apparatus (ESA) of the Hessian Agency for Nature Conservation, Environment and Geology

1 Introduction

The Hessian Agency for Nature Conservation, Environment and Geology (Hessisches Landesamt für Naturschutz, Umwelt und Geologie, HLNUG) plans and offers stack emission proficiency tests on behalf of all Federal States of Germany. Thus, an important contribution to quality control in the field of industrial emission measurements is made to eventually protect human health and the environment. As a matter of fact, each institute, which strives to perform legally valid stack emission measurements in Germany in accordance with § 29b and § 26 BImSchG, is obliged to participate in such proficiency test by law on a regular basis (41. BImSchV).

To meet this obligation, an in-house-constructed emission simulation apparatus (ESA) stands at the HLNUG’s disposal that is unique throughout Europe. Here, attendees of the proficiency tests are provided with gas flows loaded with defined amounts of particulate matter or gaseous pollutants.

The ESA is also a place for basic and advanced training courses in the field of emission control as well as to research and test new measurement procedures and devices.

2 Milestones in the history of the ESA

- delivery of the main conduit
- dosing of gases into the ESA
- sampling site on the 1st floor, operating since 2013
- sampling of an odour sample

version: 26.10.2017
1990: first operation of the ESA [1]
1994: 1st dust proficiency test [2]
1999: 1st accreditation
2000: 1st gas proficiency test
2011: accreditation according DIN ISO 17043 (proficiency tests) und DIN ISO 17025 (testing laboratory)
2013: new sampling room (=doubling the sampling openings to 8) [3]
2013: formaldehyde as new component [4]
2014: new scheme for proficiency tests (dust and gas tests in one week) [5]
2015: 1st odour proficiency test [6,7]

3 Description of the ESA

The ESA was designed as a replica of an industrial chimney. It has a total length of 110 m spreading over seven floors of the HLNUG building in Kassel, Germany.

The key component is a round stainless steel conduit with a diameter of 40 cm and a height of 23 m. 28 identical sampling openings, located on two floors, can be used for sampling and measuring pollutants. A stable test atmosphere with a known composition is generated by feeding
filtered and heated ambient air into the system, before precisely dispensed pollutants are added in the dosing laboratory. Each fed-in amount of liquids and solids is determined gravimetrically; furthermore, continuous measurements allow surveilling the generated concentrations of each added component in a real-time manner. This ensures controllable and constant conditions concerning temperature, gas flow velocity, composition of the flue gas, and the concentration of each of the gas components throughout a whole proficiency test.

The offered components comprise the following the classes:

- **substance range G**: organic (ETX, propane, individually or as TVOC; formaldehyde) / inorganic (NOx, SO2)

- **substance range P**: total dust w/different particle sizes / heavy-metal content (Cd, Cr, Cu, Ni, Co, Pb)

- **substance range O**: single odorants / mixtures

Each year, more than 7000 measurement results from approximately 60 different participants are evaluated within the scope of the stack emission proficiency tests hosted by the HLNUG. The standards DIN ISO 17043 and DIN ISO 17025 thereby guarantee the quality of the offered services.

### 4 Literature


