Status of the research and development program on the reduction of mercury emissions at RWE Power
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Abstract

With its existing flue gas treatment facilities, RWE’s coal-fired power plants will safely comply with both the current and the upcoming mercury emission limits in Germany in 2019. The introduction of EU-wide mercury emission limits (with a bandwidth for the flue gas from existing large combustion plants >300 MW₉₈ of <1 to 4 µg/m³N for hard coal and <1 to 7 µg/m³N for lignite-fired power plants (annual average)), will again drastically tighten the framework conditions for the operation of our power plants from 2021 onwards. Up to now, no mercury control technique is available to achieve emission levels below the upper limit of the bandwidth of 4 µg/m³N (hard coal) or 7 µg/m³N (lignite) in an industrially applicable and economically viable way. Experts agree that the development or selection of a suitable mercury control technology for coal-fired power plants in each case must be plant-specific (especially depending on the type of firing, ducting and existing flue gas treatment facilities: dedusting, desulfurization, denitrification) and fuel-specific (lignite or hard coal, calorific value as well as ash, Hg, halogen and sulfur content of coal). In recent years, RWE Power has carried out extensive R&D activities and examined optimization options and new technical processes for mercury control in order to further reduce Hg emissions below the regulatory requirements and to be able to comply with the required emission limits in the future. Mercury control techniques have been evaluated and optimized in a holistic approach, which covers the entire process chain of the power plant and all relevant incoming and outgoing media streams as well as the whereabouts of the mercury. For our lignite-fired power plants, the focus is on mercury control by adsorption on activated lignite (hearth furnace coke / “Herdofenkoks”, HOK®) in an entrained flow process. HOK® is injected into the flue gas and binds both elemental Hg and oxidized Hg and is removed from the flue gas in the electrostatic precipitator together with the fly ash. Since 2014, two process alternatives - dry injection with air and wet injection of fine HOK® particles dispersed in water - have been tested at the high-performance wet FGD pilot facility in the Coal Innovation Center in Niederaussem (flue gas volume flow 30,000 m³N/h). In a next step, both variants were compared on a larger scale in several test campaigns from 2016 to 2017 at the Berrenrath power plant (flue gas volume flow 400,000 m³N/h). It has been shown that the innovative wet injection of very finely milled HOK® is promising in terms of adsorption capacity or reduced HOK® consumption and may require less effort for explosion and fire protection. In 2017, therefore, a pilot plant for the injection of HOK® dispersed in water was constructed and commissioned on one flue gas train of the BoA1 unit in the Niederaussem power plant (flue gas volume flow 1,600,000 m³N/h). The test program investigates changes of the injection geometry and thus into the more or less uniform distribution of the adsorbent in the flue gas stream and its influence on the Hg adsorption as well as into variations in the dispersion properties and other injection parameters. The results are incorporated in the design of a demonstration plant, which is currently under construction and scheduled for commissioning in 2019. Here, long-term experience in terms of wear, downtime, maintenance and operating costs will be collected, which are decisive for a commercial use of large-scale HOK® injection.