

New Approach to Design of Mercury CEM Systems

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All the existing mercury CEM systems have rather long pipelines for gas transportation from the stack to a place of analysis. To reduce mercury losses in the transportation pipelines, the latter have to be heated. To provide the mercury concentration measurement accuracy, it is necessary to continuously measure the mercury loss factor in the transportation pipeline. Thus, transportation pipeline is a problem component in the mercury CEMs – it requires separate technical maintenance, it is one of the main sources of the analytical errors in mercury determination, and in addition it is rather expensive. New mercury CEM system uses no transportation pipelines. A sampling system and mercury analyzer are placed in the same cabinet which is installed directly in the stack. Downstream of the sampling system the analyzed gas is introduced in the developed thermal converter where all mercury compounds are converted to the elemental form. Since there are no catalysts in the converter, this provides a significant increase in the lifetime of the converter in the presence of various substances, e.g., HCl, SO₂, etc. Downstream of the converter the gas passes into the analytical cell of a Zeeman atomic absorption spectrometer where the total mercury concentration is determined. The use of ZAAS allows to eliminate all spectroscopic interferences in the required concentration ranges of different constituents. Continuous sampling of the gas from the stack is provided by a pump with the heated head, which is placed downstream of the analytical cell. A built-in calibration cell with saturated mercury vapor is used for fast monitoring (in less than 1 minute) of the calibration coefficient of the spectrometer. The absence of the transportation pipelines provides the shortest response time of 15 seconds as compared to that of the existing mercury CEM systems. The new mercury CEM system features a low detection limit of 0.1 ug/m³. The new mercury CEM system meets all international and domestic requirements imposed on automatic CEM systems for mercury determination in stack gases.