

The invention relates to a method for the introduction and proportioning of a liquid treatment medium into the exhaust stream in combustion processes.

For the introduction of a treatment medium, for example chemicals to reduce the NO_x content in exhaust gases, it is known that the chemical can be atomised by means of a carrier medium in a two-fluid nozzle and thus introduced into the combustion chamber. The two-fluid nozzle however has the disadvantage that steam or compressed air are supplied as the atomising medium or carrier medium, as a result of which there is undesirable dilution of the exhaust gases by air or steam, which impairs the efficiency of steam generation or possibly of the exhaust gas cleaning system, because a large quantity of this medium is needed for atomisation. Atomisation in a two-fluid nozzle takes place by kinetic energy of the atomising medium, which causes the high quantitative throughput of this medium. Moreover these atomising media are expensive, as they always need high quantities of energy and, in the case of using steam, treated boiler feed water. Conduction of these media to the individual nozzles is elaborate, because either heat-insulated pipes in the case of steam or relatively large cross-sections to reduce the pressure loss in the system must be used. Expansion of the media at the nozzle outlet or flow of the media in the pipes produce a relatively high noise level which frequently makes even sound insulation necessary.

From DE-A-35 41 599 is known a method and an atomising nozzle for adding an atomised liquid to a gas stream, in which the atomised liquid together with the atomising gas is divided into several partial streams, each partial stream having a component in the same direction as that of the gas stream into which the atomised liquid is to be introduced. In this method, by means of a two-fluid nozzle comprising two concentric pipes, in the inner pipe is conducted the liquid to be atomised and in the outer pipe is conducted the atomising gas which atomises the liquid at

the mouth of the inner pipe. In the process, the atomised liquid is first brought into a distributor chamber from which several pipes are arranged at an angle to the direction of flow of the gas stream, so that the exhaust stream to be treated can flow round the outlet openings of these distributor pipes on all sides, in order to avoid caking of the atomised liquid at the outlet end of the pipes. In an ordinary two-fluid nozzle in which the atomised liquid emerges in the direction of flow of the gas stream to be treated, owing to turbulence at the outlet opening of the two-fluid nozzle the atomised liquid may stick fast thereto. In addition to the disadvantages already described above with respect to a two-fluid nozzle, this known two-fluid nozzle has the disadvantage that proportioning of the liquid to be atomised poses problems, because the pipe of the two-fluid nozzle for delivery of the liquid to be atomised displays a certain delivery capacity and this quantity cannot be too greatly throttled, because otherwise uniform atomisation of the liquid does not occur.

From EP-A-185 630 is known a two-fluid nozzle in which a medium, e.g. a suspension, is atomised by a second medium, e.g. air, within a nozzle in an atomising zone, wherein the mixture of the two media, namely the medium to be atomised and the atomising medium, emerges in finely divided form from a common nozzle opening. To avoid caking at the nozzle, it is also planned to arrange a diffuser behind the common outlet opening from the atomising chamber, in order to obtain a pressure drop of the atomised mist, so that turbulence and hence the risk of caking on the outside of the nozzle are avoided.

Of course, mixtures of the medium to be atomised with the atomising medium, the energy carrier for atomisation, can be obtained here, but here too, as in the embodiment according to DE-A-35 41 599 described above, there are problems in proportioning the medium to be atomised, because the supply pipe of the two-fluid nozzle for

delivery of the medium to be atomised has a given delivery capacity and this quantity cannot be throttled as desired, because otherwise too little medium enters the mixing chamber in which this medium is to be atomised. On the other hand the second medium which introduces the energy for atomisation cannot be decreased as desired, because otherwise the pressure in the corresponding supply pipe drops too low, so that no more atomisation takes place.

It is the object of the invention to provide a method for the introduction and proportioning of a liquid treatment medium into the exhaust stream in combustion processes, whereby, with low structural expenditure and with low energy input, easy and reliable proportioning of the treatment medium to be atomised is ensured, this being in any desired quantity.

This object is achieved by the measures indicated in claim 1.

In this method, in which the two media are introduced under pressure, preferably under the same pressure, and mixed there, the quantitative ratio of treatment medium to carrier medium can be varied as desired within the range from 0 to 100%, because the mixing chamber is always filled with a liquid medium and the necessary atomisation pressure can always be kept constant, irrespective of whether there is no treatment medium at all or just treatment medium exclusively. As a result, infinitely variable control of the ratio of treatment medium to atomising medium is possible. The quantity of treatment medium to be atomised can easily and quickly be adjusted by varying the mixture ratio of treatment medium and carrier medium, by respective quantitative control of the treatment medium and carrier medium supplied under pressure. Thus, for example, it is possible to atomise only pure treatment medium and shut off the carrier medium, and vice versa. If only carrier medium is atomised from the nozzle, this serves to cool the nozzle if the carrier medium is water, for example.

The energy quantities to be used are very low, because

the media can be brought to the atomising pressure necessary at any given time with ordinary pumps. Moreover no significant noise is produced by flow of the media in the pipes, which have to be neither heat insulated nor sound insulated, so that the structural expenditure for the whole apparatus is low. The structural expenditure for carrying out the method is also particularly low on account of the fact that the atomising nozzle necessary therefor comprises a single atomising opening which is directly connected to the mixing chamber. Atomisation takes place exclusively on account of the pressure difference between mixing chamber and nozzle environment, wherein this pressure difference can be set so high that backflow of the atomised treatment medium and the associated caking at the nozzle cannot occur, and so the direction of injection can be adjusted as desired in relation to the direction of flow of the exhaust stream to be treated.

If in a further development of the invention the volume of the mixture is such that atomisation lasts a few seconds, not more than 30 seconds, then it is ensured that a regulating process which requires rapid changes in the mixture ratio or rapid shut-off of the nozzle can be performed easily, because there is only a small quantity with a respectively set mixture ratio in the mixing chamber.

The invention is described in more detail below with reference to the drawing, which shows a practical example of an atomising nozzle in longitudinal section for carrying out the method.

The atomising nozzle according to the single figure comprises a nozzle body 1 which includes on the one hand pressure supply pipes 2 and 3 and on the other hand a mixing chamber 4. The pressure supply pipes 2 and 3 lead into the mixing chamber 4 and are connected at their other ends on the one hand to a supply pipe 5 for the treatment medium and on the other hand to a supply pipe 6 for the carrier medium. Immediately following the mixing chamber

4 in which the carrier medium and the treatment medium are mixed together, is a nozzle head 8 which can be screwed onto the nozzle body 1 and which comprises a single atomising bore 9 from which the mixture of carrier medium and treatment medium emerges and is finely atomised on account of the prevailing pressure difference inside and outside the atomising nozzle. The mixing chamber 4 has only a small volume, so that in case of a change in mixture ratio of treatment medium and carrier medium, there is only a minor continuation of already mixed substances, i.e. the change can be effected very quickly if the mixing chamber 4 has a small volume.



Patent claims

1. Method for the introduction and proportioning of a liquid treatment medium into the exhaust stream in combustion processes, wherein a liquid treatment medium and a liquid carrier medium are introduced into a mixing chamber in any quantitative ratio to each other under pressure, mixed there and atomised from a common atomising opening exclusively on account of the pressure differences between mixing chamber and external environment of the atomising opening.

2. Method according to claim 1, characterised in that the volume of the mixture is such that atomisation lasts a few seconds, not more than 30 seconds.