AIR PROTECTION FROM POWER INDUSTRY EMISSIONS

1.3. Sulfur oxide emission reduction

1.3.2. Technologies of sulfur oxide emission reduction

1.3.2.5. Technology with the hollow absorber-dryer

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This technology is based on the same principles as the simplified one. But the difference is in application of the hollow absorber-dryer before the electrostatic precipitator (or the bag filter), which provides significantly more prolonged contact of flue gases with the reagent and, consequently, collection of sulfur dioxide up to 90 ... 92%. A layout of the plant is shown in Fig. 1.42.

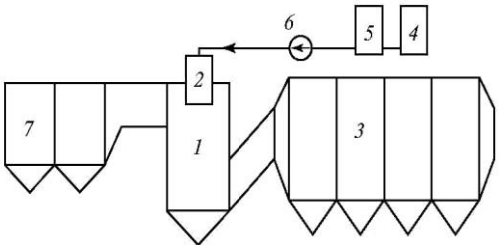

Fig. 1.42. A layout of the desulfurization plant with the absorber-dryer

The desulfurization plant consists of the hollow absorber-dryer *1* with spray device *2*; electrostatic precipitator *3*; lime silo *4*; tank of preparation and storage of lime slurry *5*; pump *6* for feeding the lime suspension into the absorber, preliminary included electrostatic precipitator *7*.

Flue gases from the boiler enter the absorber immediately. If their dust content is high (more than 7 g/m^3), the gases first pass the preliminary included electrostatic precipitator, which consists of two or three electric fields for reduction of the initial dust of gases. This is necessary because the excessive dust hardly reduces the mass transfer process in the absorber. Lime slurry is pumped to the absorber, which is usually sprayed with a mechanical sprayer. This device consists of a multiplier, on the output shaft of which a spray unit is installed. Rotary speed of the output shaft reaches 40 thousand rotations per minute, which provides a supply of drops with a diameter of about 100 microns in flue gases. In contrast to the nozzles of various types, mechanical sprayer provides maximum monodispersity of drops, which is also beneficial to the process of mass transfer. Because of the high rotary speed, the sprayer is made of an abrasive material, despite of relatively low hardness of lime particles.

The absorber has a specific construction, which should possibly eliminate an entry of suspension drops to the walls of the device, resulting in formation of hard-to-remove sulfite-sulfate deposits. This is primarily achieved by arrangement in the apparatus of two (sometimes three) swirl gas flows due to specially directed devices set in the inlet pipe. Sometimes a direct-flow device, where suspension drops and gas flow move cocurrent, is used. In all cases the average gas velocity, referred to the complete cross section of the absorber, is typically less than 1 m/s.

Large volume of the device at low gas velocity can profoundly cool flue gases with exceeding of water dew point temperature of 15...20 °C. This provides a high efficiency of desulfurization. Key parameters of the technology are presented in Tab. 1.20