tive humidity. Controller **30** may be any programmable logic controller (PLC), DCS or other controller such as typically used for automation of industrial processes. The Controller **30** is pre-programmed to maintain a temperature setpoint of the CFB scrubber **1** within a given range (e.g., 30 degrees Fahrenheit) above the adiabatic saturation temperature. The adiabatic saturation temperature is measured in real time and is communicated to the CFB scrubber controller **30**, which accordingly adjusts the CFB scrubber temperature setpoint within pre-programmed parameters in real time. Presently, it is envisioned that the adiabatic saturation temperature range for most (95%) projects will be set between 30-40 deg F. with the possibility of a range of, for example, 20 deg F. to 60 deg F., and on extremely rare occasions something outside that 20-60 deg range. In the preferred embodiment probe **22** is mounted on a mounting structure which, in a preferred embodiment, may comprise a 4" pipe with 150 # ANSI flange.

The controller **30** determines whether the sensed temperature is above or below the predetermined set point and by how much. Controller **30** determines a proper adjustment based on a simple linear function or incremental cross-reference table. A proportionate signal is emitted from the controller **30** and passed to a suitable actuator valve **40** associated with the inlet water feed line (or water return line) which opens the feed line (or closes the return line) to increase the spray of water into the reactor in order to decrease the flue gas temperature entering the scrubber absorption chamber.

As an example of the process, for a typical coal fired application having a scrubber flue gas inlet flow rate of 2,110,000 lb/hr at 307 deg. F., and with gas chemistry resulting in a saturation temperature at the scrubber exit of 130 deg. F., it is desired to maintain the scrubber exit temperature at 160 deg F. For the above conditions, approximately 78,000 lb/hr of water is required. In this example, due to an instantaneous 10% decrease in the inlet gas flow rate, we assume that the actually measured outlet temperature falls to 145 deg. F., as measured by sensor **20** with probe **22** placed in outlet duct **14**. If controller **30** is programmed with a temperature setpoint value of 160 deg. F., the temperature control system would react. The controller **30** would partially close the valve **40** to decrease the water injection rate to approximately 70,000 lb/hr, resulting in an increase of the gas temperature back to 160 deg F. This injection rate would then be maintained so long as the new operating conditions remain unchanged.

The software logic used by the controller **30** continuously adjusts the position of the control valve **40** relative to the degree if difference between the actual measured temperature and the setpoint, e.g., how far the actual temperature is above or below that setpoint. Thus, the signal emitted by the controller **30** will adjust the valve **40** more drastically if the measured value is very different than the setpoint. The actual correlation between measured difference and degree of valve **40** adjustment may be quantitatively determined.

Alternatively, the system may be setup such that the water injection is increased not by opening valve **40** on the water feed line, but instead by closing down a valve on the water return line back to a water tank. Typically, on each water nozzle **6** there is a water supply line and a water return line to the water tank. Water supplied to the nozzle **6** that is not injected into the scrubber **1** leaves the nozzle **6** via the return line. This means that water injected into the scrubber **1** can be controlled either by a control valve **40** on the supply line (wherein opening of valve **40** increases water injection), or on the return line (wherein closing the valve **40** increases water injection). The valve **40** may be placed on the supply or return line with the foregoing in mind, and one skilled in the art should understand that both alternatives are within the scope and spirit of the invention. As the dry scrubber outlet temperature exceeds the predefined set point temperature, the cooling water rate to the spray nozzles **6** increases. The cooling water flow rate is decreased as the outlet gas temperature falls below the set point temperature. By maintaining the flue gas temperature leaving the reactor **1** above the adiabatic saturation temperature, it is ensured that only dry particulate matter will be present in the exhaust flue gas, and this can be efficiently removed by a downstream dry particulate collector such as a baghouse, or alternatively an electrostatic precipitator, or cyclone collector.

It should now be apparent that the above-described system has the ability to monitor the flue gas dewpoint temperature in real-time, and automatically adjust the scrubber temperature setpoint within pre-determined parameters to maintain optimal scrubber conditions, thereby increasing SO_2 removal efficiency, improving scrubber system reliability and/or reducing lime consumption. Having now fully set forth the preferred embodiments and certain modifications of the concept underlying the present invention, various other embodiments as well as certain variations and modifications thereto may obviously occur to those skilled in the art upon becoming familiar with the underlying concept. It is to be understood, therefore, that the invention may be practiced otherwise than as specifically set forth herein.

I claim:

1. In a circulating fluidized bed (CFB) scrubber for removing sulfur oxides from a flue gas produced during the combustion of a sulfur-bearing fuel in a reactor vessel, the CFB further comprising a flue gas inlet duct leading to said reactor vessel, a dry circulating fluidized bed of dry lime sorbent, fuel ash and by-products in said reactor vessel, a water spray infeed for spraying cooling water into said reactor vessel, and an exhaust outlet duct leading from said reactor vessel to a downstream particulate collector, an improvement comprising:

a probe mounted in the exhaust outlet duct proximate said reactor vessel or downstream particulate collector for sensing moisture characteristics of the flue gas leaving the CFB scrubber, said moisture characteristics including humidity of the flue gas;

a temperature monitor for monitoring approach to adiabatic saturation temperature at said probe based on said sensed moisture characteristics;

a programmable controller for automatically periodically comparing said sensed approach to adiabatic saturation temperature at said probe to at least one predetermined setpoint and for selectively outputting a cooling water adjustment signal in response thereto;

an actuator coupled to said water spray infeed for adjusting an amount of cooling water sprayed into said reactor vessel, said actuator being electrically connected to said programmable controller;

whereby whenever said sensed approach to adiabatic saturation temperature level differs from the predetermined setpoint said programmable controller outputs a cooling water adjustment signal to said actuator to adjust the amount of cooling water sprayed into said reactor vessel.

2. The improvement of claim **1**, whereby said programmable controller includes memory storing a predetermined temperature setpoint, and software for comparing said sensed approach to adiabatic saturation temperature to the predetermined setpoint, and for outputting a cooling water adjustment signal to said actuator when the sensed approach to adiabatic saturation temperature is less than the predetermined setpoint to decrease a volume of cooling water sprayed into said reactor vessel.