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A SEQUENTIAL WET SCRUBBER USING RE-CIRCULATED AND BIOLOGICAL PROCESSED WATER FOR PURIFICATION OF DISCHARGE AIR FROM PIG HOUSES

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ABSTRACT A prototype of a new wet scrubber has been developed to clean discharge air from a pig barn. It showed the ability to remove more than 90 % of ammonia and up to 90 % of odour (measured in OUE m⁻³) from the exhaust air of the pig barn. The system applies a two-step process: 1) Removal of pollutants from the air by absorbing them into spray water of two pH-levels. 2) The spent water containing pollutants is purified by a sequential biological water treatment process, which returns water with two different pH levels to the absorption column. It consists of an absorption column (airflow capacity of 500 to 1000 m³ h⁻¹), a water purification unit (total volume of 2 m³) and an ozone generator (10 g ozone h⁻¹). The absorption column is non-biofilm 3-stage spray tower including two different types of nozzles. Their spray rates differ largely from each other (0.35 respectively 0.011 kg s⁻¹). The water purification unit includes a rapid-purification bio reactor (RPBR) and a thorough-purification bio reactor (TPBR). The retention time of RPBR is about 1 min, while TPBR requires a retention time of more than 8 hours. Both bioreactors function in water with high concentrations, e.g. 500 mg l⁻¹ of ammonium, nitrite and nitrate. The system has been established at a pig farm and its performance has been explored.

Keywords: Odour, Ammonia, Scrubber, Bioreactor, Ozone.