

Ammonia reduction and recovery through wet scrubber/biotrickling filter combined with microalgae system

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BACKGROUND

- Livestock is largely responsible for the emission of ammonia worldwide.
- Usually, ammonia can be efficiently reduced through acid-base reaction (using sulfuric acid), and the obtained liquid containing ammonium sulphate can be reused in field application. However, this method is currently not widely applied in China, as sulfuric acid usage is strictly restrained.
- Biological air filters were often applied as an efficient solution for simultaneous removal of ammonia and other odorants, with however careful and regular operation optimization needed by professionals.
- In China, the wet scrubber is typically applied as a simple and cheap solution for removing ammonia (and little of other odorants) from livestock facilities, causing however extra cost for wastewater treatment.

METHOD

A comparison evaluation was conducted using a wet scrubber and microalgae system (WSM) for simultaneous reduction of ammonia and recovery of resource.

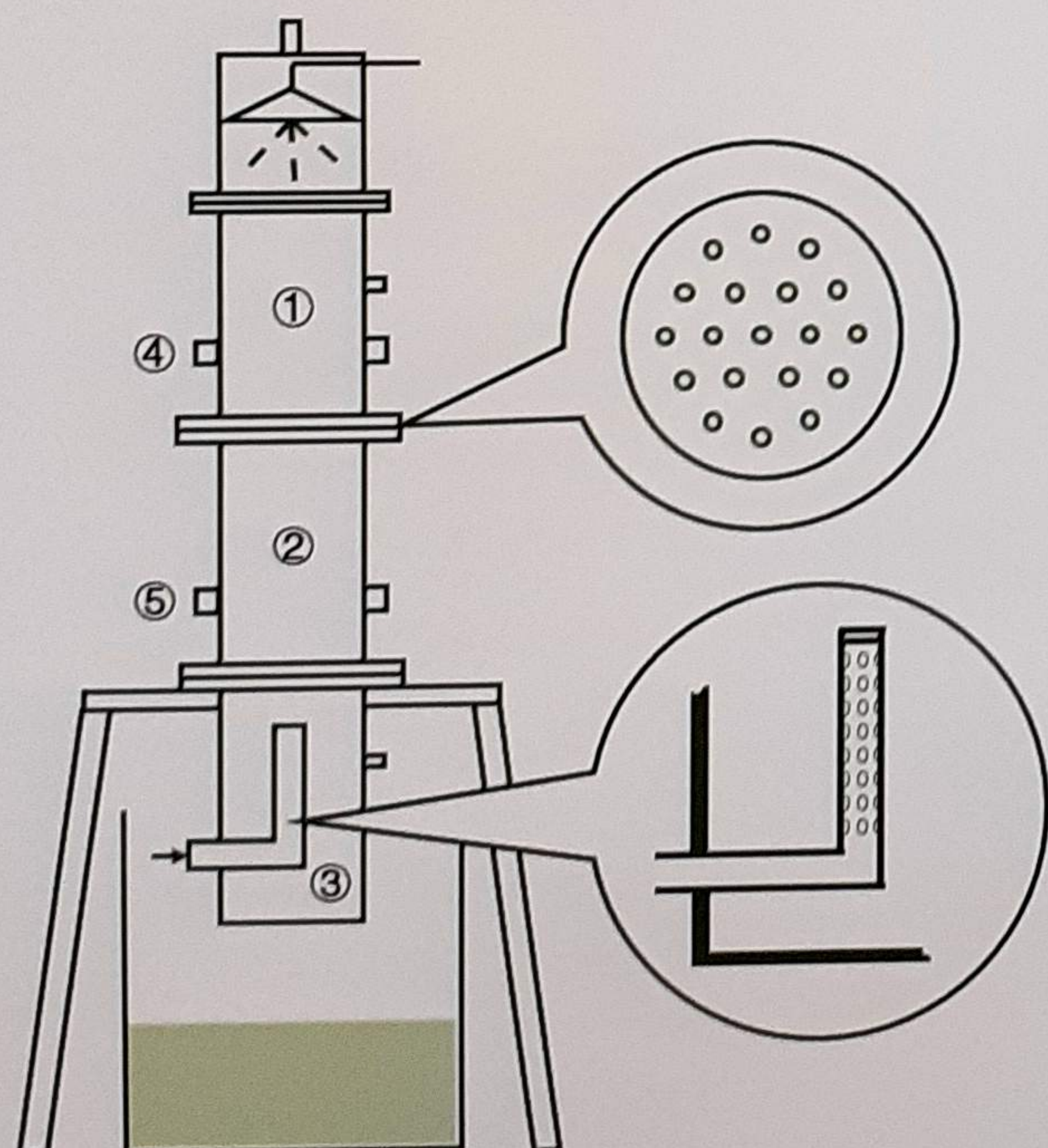


Figure 1. wet scrubber-microalgae system (WSM)

- * The bottom of ①② is equipped with air distribution plate. The bottom of ③ is porous.
- * ④⑤ are filler sampling ports, which are totally 4 in a circle and surround the container at equal intervals.
- * Each section is connected by flange.
- * The circulating solution is added to the reservoir of the wet washing system.

ADVANTAGES

- A reservoir for the wet scrubber system was used for cultivation of microalgae to avoid using more facilities.
- Chlorella sp. was chosen as the microalgae for cultivation since it was proved to be efficient for degradation of ammonia.

RESULTS

- The results showed that the WSM could better remove ammonia from the air (50-70% removal) as compared to the wet scrubber system without microalgae (WS; control; 25-40% removal).
- Microalgae biomass was observed to be well cultivated and can easily be harvested from the system.



DISCUSSION

This simple wet scrubber combined with microalgae system demonstrated a reasonable solution for simultaneously reducing ammonia emission and recovery of resource.