



Combined CO₂ and H₂S removal process for Upgrading Biogas

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Background and Research aim

- Development of energy efficient process for H₂S removal using sulphur oxidizing bacteria (SOB)
- Test the Biotrickling filter (BTF) for optimized bacterial activity
- Development of energy efficient scalable process for Carbon dioxide removal
- Combination and optimization of the integrated process

Research Aim 1 – H₂S Desulphurization

The main reaction principle involved

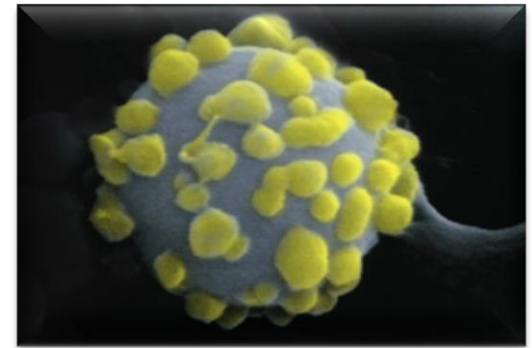


Biological oxidation

- Characterisation of sulphur oxidizing bacteria
- Active bio films

Biofilter performance for scale up

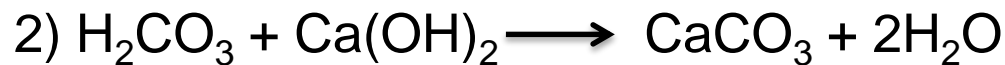
- Elimination capacity
- Removal efficiency
- Loading rate of H₂S gas



Elemental Sulphur Deposition
on a bacterial cell

Research Aim 2- CO₂ removal

The main principle involved:



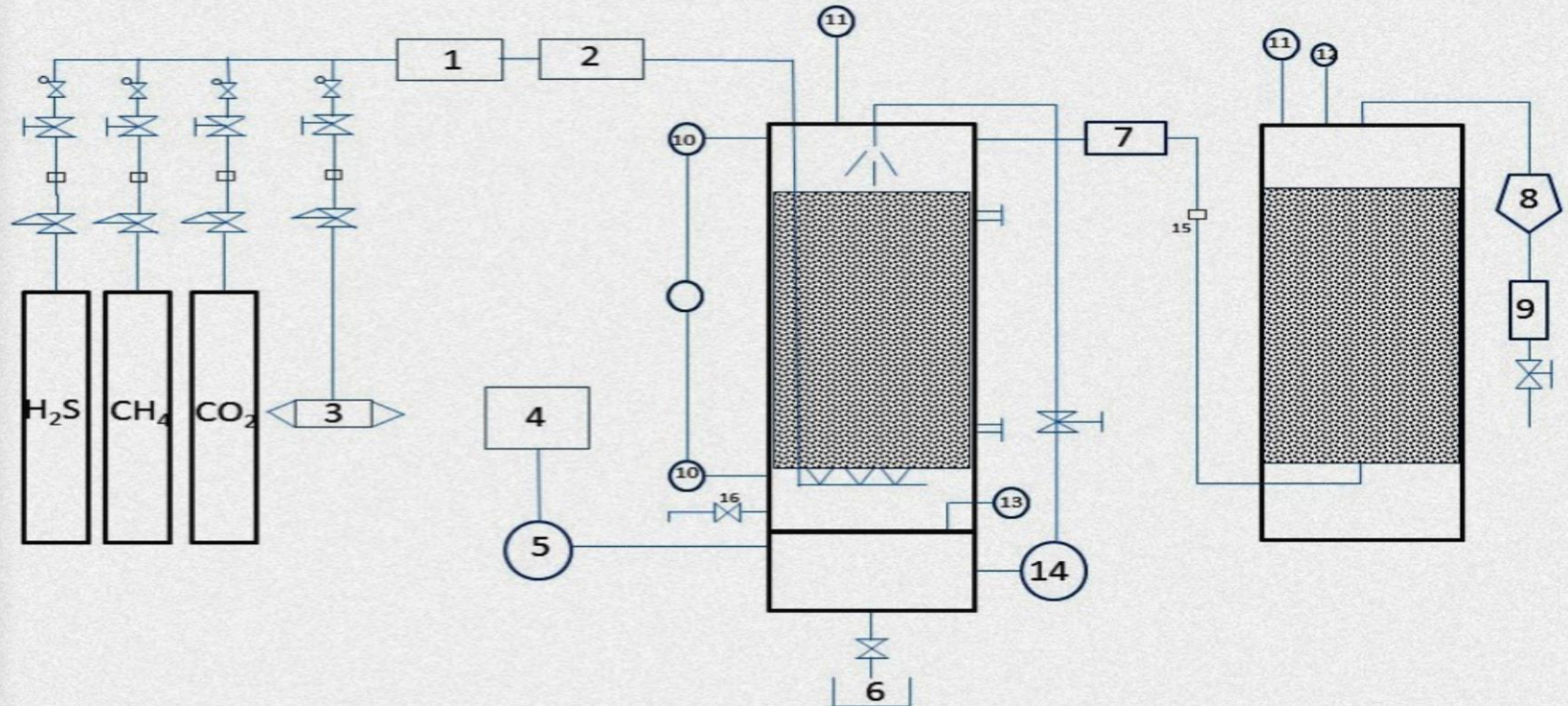
Operating parameters

- CO₂ pressure
- ash humidity,
- temperature
- L/S (liquid/solid) ratio



Bottom ash from MSW plant

Overview - Process layout



1) Mass flow rate controller 2) Gas analyzer 3) Air compressor 4) Nutrient storage tank 5) Pump 6) Waste medium storage 7) Gas analyzer 8) particle filter 9) Portable Gas Detector 10) Pressure drop measurement 11) Thermocouple 12) Pressure Gauge 13) pH probe 14) liquid recirculation pump 15) flow meter 16) Overflow valve

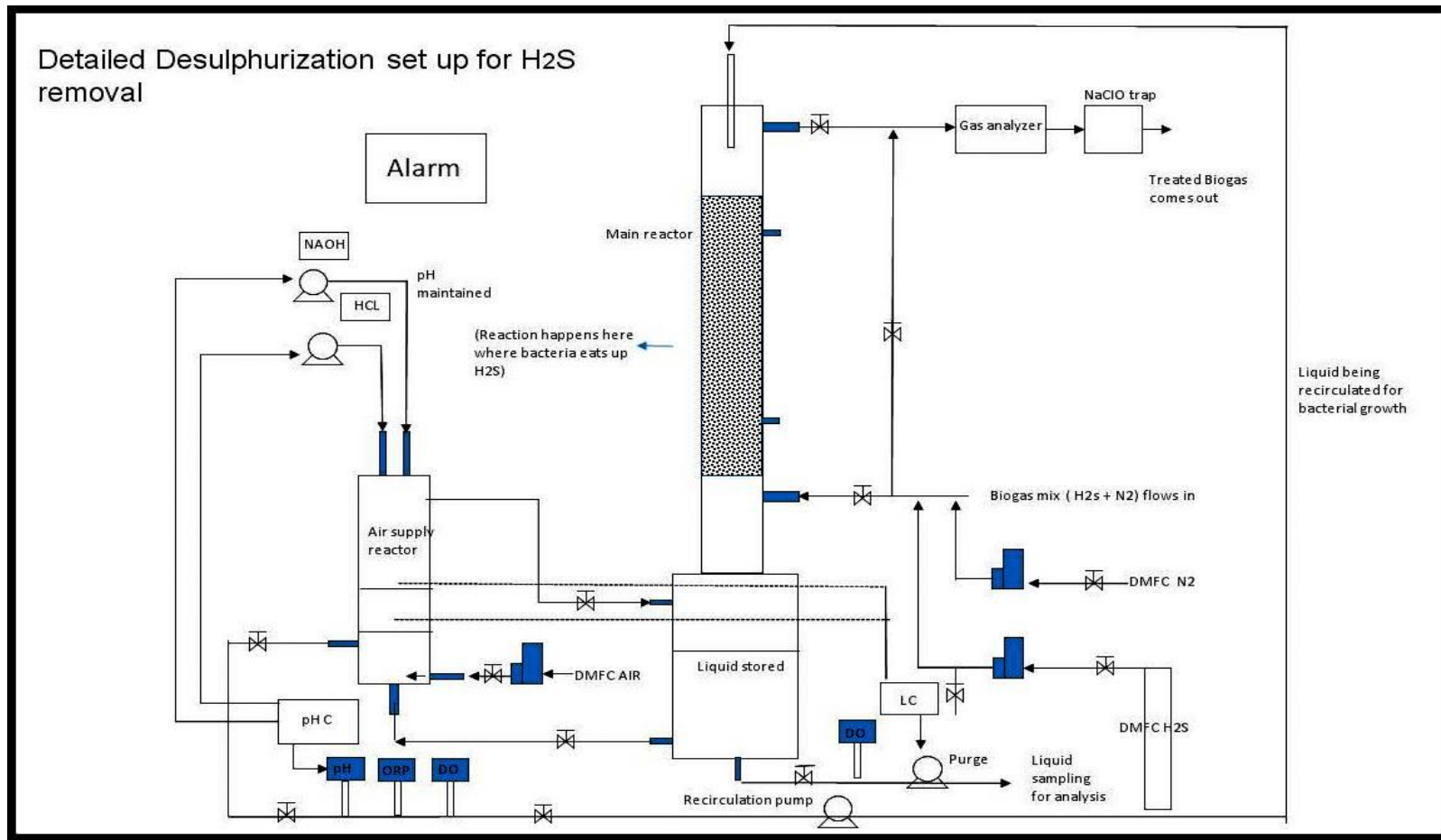
Main results

(Biotrickling filter) set up for biological desulphurization designed and operated in lab scale (start up and initial operation)

Characterization of the Sulphide oxidising bacteria using FISH analysis

Sulphate production ($S-SO_4^{2-}$) as a result of Biological activity is evaluated

Process layout of designed Desulphurization set up



Personal Introduction

Study background:

- Bachelor - Biotechnology, India
- Master - Energy engineering, India

Current Position:

- Research scholar
- Supervisor - Prof. Dr. Martin Denecke
- Research Team - ADGE





Thanks for listening



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