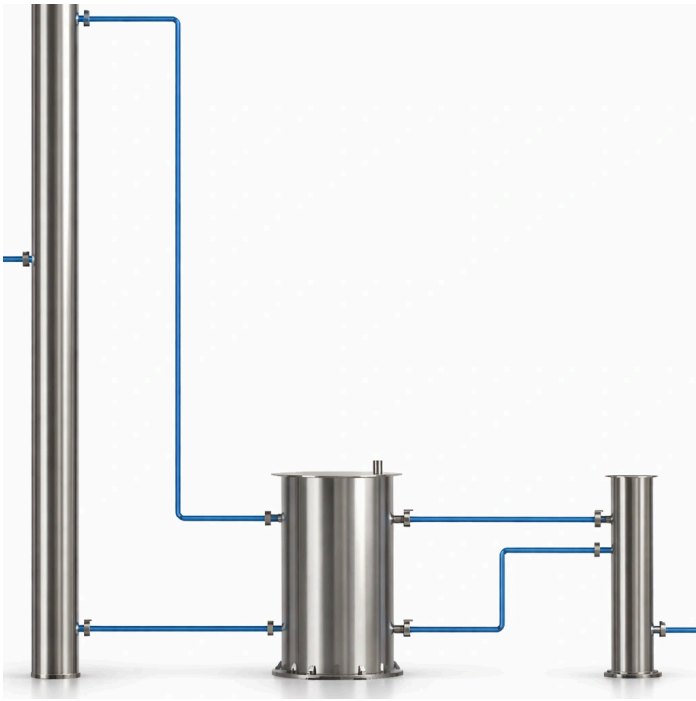
BIO-REGENERATIVE CHEMICAL H2S SCRUBBER

Engineering a Safer World

HIGH-LOAD H2S REMOVAL FROM BIOGAS BY BIOLOGICALLY REGENERATED SCRUBBING

The CRA Bio-Regenerative Chemical Scrubber absorbs H2S in a counter-current alkaline scrubber, then routes the sulphide-laden liquor through a biological regeneration stage where sulphur-oxidising bacteria (Thiobacillus) convert it to elemental sulphur and restore the solution's alkalinity before it recirculates back to the absorber. The bioreactor is aerated with a controlled, sub-stoichiometric air or oxygen dose, roughly 0.5–0.7 mol O2 per mol H2S, well below the 2 mol O2/mol H2S needed for full oxidation to sulphate, to favour elemental sulphur formation[E]. This aeration stays inside the bioreactor loop and never contacts the product gas stream.

The closed loop keeps chemical makeup to what the sulphur bleed stream carries away, cuts reagent consumption by up to 70% against conventional caustic scrubbing, recovers up to roughly 95–97% of removed sulphur as elemental sulphur in well-controlled, optimised systems[L], and every skid is built under the same ISO 9001 quality system that governs every CRA system.



CRA ADVANTAGE

+ Deep H2S Removal At High Inlet Loads (rated to 20,000+ ppm inlet)	+ Optimal Design & Performance + Accomodate Special Requirements
+ Low Chemical Consumption Via Bio-Regeneration (up to 70% less NaOH makeup)	+ On-Time Delivery + Responsive & Organized Team
+ Elemental Sulphur Recovery (up to ~95–97% sulphur selectivity in optimised systems)	+ Stringent Quality Management + Fast Turnaround
+ Zero Air Injection, Stable Gas Quality	+ Cost Effective Maintenance Packages + Long-Term CRA Support

APPLICATIONS

Supplied for high-load H2S removal across biogas, RNG, and sour gas duty

+ Biogas Desulphurisation Upstream Of CHP
+ Renewable Natural Gas (RNG) Upgrading
+ Landfill Gas Treatment
+ Sour Gas Polishing
+ Wastewater And Sludge Digestion Systems
+ Odour And Corrosion Control

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ISO 9001 QUALITY ASSURANCE MANAGEMENT

WORKING & PERFORMANCE

CRA
Engineering a Safer World

CHEMICAL ABSORPTION AND BIOLOGICAL REGENERATION IN ONE CLOSED LOOP

WORKING

+ Raw biogas enters a counter-current chemical absorber, where H2S reacts with the alkaline scrubbing solution held under haloalkaline conditions at pH 8–9[L]

+ The sulphide-laden liquor transfers to a bioreactor, where Thiobacillus bacteria oxidise it to elemental sulphur and restore the solution's alkalinity, using a sub-stoichiometric air/oxygen dose of roughly 0.5–0.7 mol O2 per mol H2S[E]

+ Regenerated solution recirculates back to the absorber, closing the loop between chemical absorption and biological regeneration

+ Elemental sulphur accumulates as a slurry in the bioreactor and is periodically harvested, typically on a weeks-to-months cycle depending on load[E]

WHY BIO-REGENERATIVE

+ Up To 70% Lower Chemical Consumption

+ No Air Or Oxygen Carryover Into Product Gas

+ Recoverable Elemental Sulphur Byproduct (up to ~95–97% selectivity in optimised systems)[L]

+ Continuous Operation At High H2S Loads

+ Preserves Biogas Calorific Value

Regenerated liquor recirculates continuously; fresh reagent is needed only to replace what leaves with the sulphur bleed stream.

TYPICAL DESIGN & PERFORMANCE PARAMETERS

Inlet H2S range	Up to 20,000+ ppm; economically favoured above ~2,000–3,000 ppm versus single-pass caustic[E]
Outlet H2S	<100–300 ppm as a large-scale published field benchmark; <50 ppm achievable with a polishing stage[L]
Removal efficiency	96–99%+ sustained in published full-scale installations[L]
Reagent (NaOH) reduction	Up to 70% versus single-pass caustic scrubbing
Elemental sulphur selectivity	Up to ~95–97% of removed sulphur as S8 in optimised two-stage bioreactor designs; standard single-reactor systems typically run lower[L]
Bioreactor conditions	Haloalkaline, pH 8–9[L]
Aeration dosing	~0.5–0.7 mol O2 per mol H2S, sub-stoichiometric, bioreactor loop only[E]
Operating temperature	Ambient to ~35°C, mesophilic bacteria[E]
Sulphur harvest interval	Weeks to months, load-dependent[E]

A published third-party biological desulphurisation installation (7,000 Nm3/hr, inlet up to 8,000 ppm, outlet ~300 ppm, >96% removal sustained over a year of operation) is the basis for the outlet-ppm and removal-efficiency benchmarks above. It is cited for context on what large-scale biological regeneration can achieve, not a CRA project reference, and should not be quoted as CRA's own performance data.

[C] Calculated from reaction stoichiometry · [L] Published literature, sources on file · [E] CRA engineering estimate, pending sign-off

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