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MV Technologies Provides ALL Solutions and Will Help Evaluate the Best Technology for Your Unique Project Requirements.

Comparison of Common H_2S Removal Technologies for Biogas and Landfill Gas

	Dry Scrubber Technology MV Technologies H2SPlus™ System	**Dry Scrubber Technology** Iron Oxide Coated Dry Granular Media	**Filter Technology** Activated Carbon	**Filter Technology** Enhanced Activated Carbon (limited to 200 ppm)	**Chemical Treatment** Ferric Chloride	**Wet Scrubber Technology** Biological Scrubber (aqueous only - no caustic solution)
Media Cost per lb. of H_2S Removed from Gas Stream (+/- 10%)	$1.31	$5.35	$13.00	$3.58	$14.00	$0.35 to $3.00+[1]
Initial System Capital Cost	Low	Low	Low	Low	Low	1.5 to 3 times the cost of dry scrubbers
Water and Effluent Management Requirements	Nominal, < 20 gal/wk for large tanks	Gas must be fully saturated before scrubbing	Moisture must be removed from gas before filter	Moisture must be removed from gas before filter	Sulfur accumulates and may obstruct gas flow through process pipework	High, due to additional water treatment to remove solids
Operating Considerations	"Set and Forget" **H2SPlus** systems allow full vessel top entry for media replacement [2]	Media changeout most always requires confined space entry [3]	Media loads up quickly and requires frequent changeouts [4]	Media loads up quickly and requires frequent changeouts [4]	Hazardous handling required, pH of 2	No media. However, system operating variables are complex and challenging to control [5]
Loading Capacity Pounds H_2S Removed / Pound Media	0.24	0.1	0.1	0.72	0.2	No Media
Approximate Cost per Pound of Media	$0.31	$0.55	$1.30	$2.59	$1.80/gallon	No Media
Operator Attention Required	Low	Low	Low	Low	Moderate	High
Ability to Hold Fixed H_2S Outlet Concentration Levels	Excellent	Excellent	Filters may clog quickly and result in early breakthrough	Filters may clog quickly and result in early breakthrough	Poor	Poor - biological systems cannot respond quickly to fluctuations in H_2S loads
Disposal Method	Spent media may be composted, land-applied or non-hazardous landfilled	Non-hazardous landfilled	H_2S is not converted, only captured. May be considered hazardous waste. Landfilled or incinerated	H_2S is not converted, only captured. May be considered hazardous waste. Landfilled or incinerated	Reaction by-products go out with effluent and digestate	Sulfur may be reclaimed from effluent through subsequent processing

Notes

1) Includes costs of nutrients and estimated labor for active system control.
2) MVNet™ systems provide for media changeout without confined space entry.
3) Media sets up "solid" if run to full life, making removal very difficult - often requires hydroblasting.
4) Vacuum truck removal is typical.
5) Active bacteria is sensitive to temperature, nutrients, pH and other environmental conditions. Systems may require up to 10 days to start and stabilize after shutdown for maintenance. Sulfur bearing effluent must be handled/managed and may pose additional water treatment considerations. Fluctuating H_2S concentrations pose operating problems. Too much H_2S and the bacterial action cannot respond quickly enough to hold to outlet concentration limits - too little H_2S and the bacteria population can "starve" and reduce effectiveness.

There are other well known and practiced technologies used to remove H_2S in much larger flow rate environments. These include: caustic scrubbing; caustic scrubbing with biological conversion of the H_2S; and iron based liquid "redox". All of these involve much higher levels of capital expenditure than represented by the technologies compared above and, as a result, are used in applications where sulfur removal requirements exceed 1,000 Lbs per day.

751 Pine Ridge Road • Golden, CO 80403 • 303-277-1625 • MVSeer.com