

# Quadrogen®

## Quadrogen® Biogas Clean-up Systems



Effective and efficient biogas clean-up solutions proven to surpass the most stringent fuel quality specification in the industry.

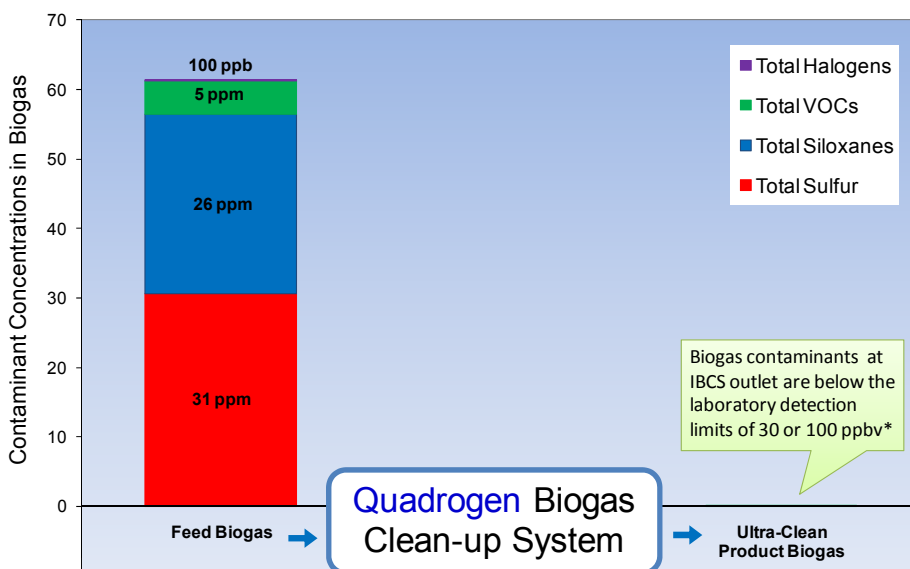
**Ultra-Clean Solutions for Fuel Cells**



Quadrogen’s IBCS 300 system purifies biogas from a variety of sources – including those with challenging constituent gases and contaminants, such as landfills – for use with fuel cell applications.



### Quadrogen Biogas Clean-up System Performance



\* Volume basis; siloxane species analyzed: D4, D5, D6, L2, and L3 to 100 ppbv detection limit

In a recent installation at California’s Orange County Waste Water Treatment Plant (shown left), the Integrated Biogas Clean-up System (IBCS) has been successfully configured to supply ultra-clean biogas to a 300kW fuel cell. Independent customer validation has shown that the system continues to remove all specified contaminants to levels below the 30 parts per billion required by the project.

Siloxanes, sulfur species, halides, and VOCs are all removed to below the ppbv-level detection limits of the customer laboratory.

“The biogas must be cleaned prior to being used by the fuel cell, so effective pre-treatment systems are crucial to the success of the project. The biogas pre-treatment system provided by **Quadrogen** is **supplying fuel that meets the specification requirements of our Direct FuelCell power plant.**”

Tony Leo, Vice President, Applications Engineering and New Technology Development, FuelCell Energy, CT, USA

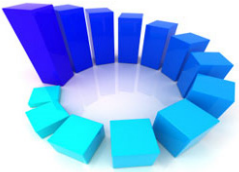
Modular and scalable by design, this technology is a cost-effective solution that delivers on even the most stringent industry needs.

Effective clean-up solutions to protect your equipment.

## The Quadrogen Advantage



- Modular functionality to meet specific customer requirements
- Fuel-flexible and capable of removing entrained oxygen



- Scalable for flow rates from 100 scfm to 1,500 scfm
- Efficient design minimizes energy and media costs



### Proprietary C<sup>3</sup>P Process:

- **Condensation** of contaminants with sub-zero cooling



- **Conversion** of remaining contaminants to known species



- **Capture** of known species on high-capacity media
- Long-lasting media can be replaced while system is running



- **Polishing** of gas to trace levels (< 30 ppbv) with chemisorption
- Ultra-Clean fuel delivered for reliable power generation

- Contaminant conversion and capture reduces risk of break-through and subsequent equipment degradation or failure.
- High efficiency clean-up system minimizes gas treatment costs.
- Cleaner biogas reduces O&M costs and polluting exhaust emissions.

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