MATHESON
Nanochem® GuardBed™

Manufactured for Nippon Sanso Matheson *by* SulfaTrap™

High Performance Sub-PPM Sulfur Removal

For Hydrocarbon Streams, Natural Gas Feedstocks, and Liquid Fuels

Defining the Problem

Sulfur is an unwanted component in hydrocarbons that can lead to:

- Poisoning of expensive catalysts
- Irreversible contamination of downstream processes and equipment
- Corrosion of piping and hardware
- Formation of pollutants such as sulfur oxides
- Hazardous exposures and safety concerns

Desulfurization materials available without vessels or with vessels of various sizes and configurations

Performance of conventional desulfurization materials is typically limited to H_2S removal down to approximately 1-5 ppm. These conventional materials suffer from common processing problems brought about by the presence of moisture, heavy hydrocarbons, aromatics, carbon dioxide, and unconventional sulfur species. Additional complications include low purification capacity, and difficulties with handling, regeneration or disposal.

Introducing the Solution

Nanochem® is a family of proprietary, advanced purification sorbents and systems that has been implemented on a global basis in many industries such as semiconductor, pharmaceutical, aerospace, welding, and industrial processes. Nanochem® is widely known for innovation, performance, reliability, and safety, and now introduces a series of materials designed as "super-polishers" in desulfurization applications at a cost competitive price relative to conventional polishing desulfurization solutions.

The ***Nanochem® GuardBed™*** series of Deep De-Sulfurization purifiers is a lineup of more than 12 different high performance purifiers specifically targeting sulfur removal to well below ppm levels. ***Nanochem® GuardBed™*** purifiers have been designed, tested and characterized to remove H_2S, light and heavy mercaptans, organic sulfides, di/tri-sulfides, thiophenes, COS, and other sulfur species.



Nanochem® GuardBed™ Series purifiers can be used for de-sulfurization of:

- Natural gas
- Liquid hydrocarbons (natural gas liquids, iC4 / iC5 feedstock)
- Fuels (diesel, jet fuel, logistic fuel, bioethanol)
- LPG
- Olefins
- Refinery off-gases
- Biogas
- Propane
- Heavy fractions

Typically, sub-ppm performance is achieved; and in many applications, sub-0.1 ppm sulfur can be routinely expected.

Features

Nanochem® GuardBed™ Series purifiers offer:

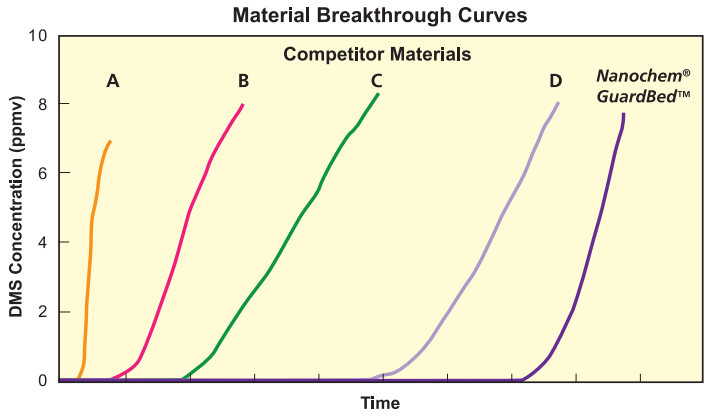
- High performance in the presence of water, heavy hydrocarbons, and/or CO_2
- High selectivity for different sulfur-containing species, including H_2S, light and heavy mercaptans, organic sulfides, di/tri-sulfides, thiophenes, COS, and other sulfur species
- Ability to combine multiple materials for optimal performance in different applications
- High capacity – 5 to 32% weight saturation capacity
- High efficiency – sub-ppm and sub-0.1 ppm
- Reversible/regenerable or single-use
- Low temperature operation for light hydrocarbons (< 180° F for most applications)
- High temperature capable for heavy fractions (up to 520° F)
- Easy handling and disposal (non-flammable, non-toxic, nonpyrophoric)

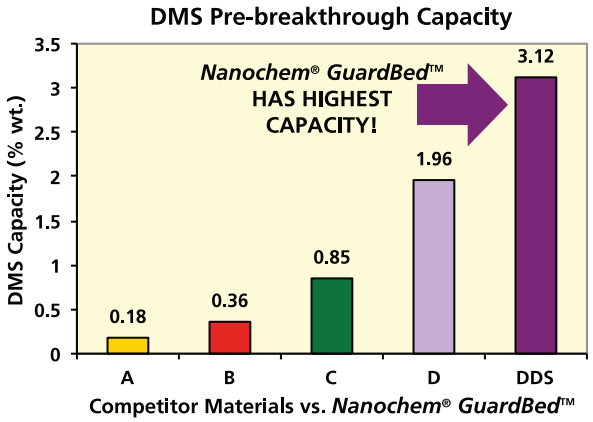
Analyze Your Process Stream

Nippon Sanso Matheson can offer sulfur analysis of your process streams, both upstream and downstream of ***Nanochem® GuardBed™*** to verify successful performance and process integrity. We can install onsite monitoring or we can analyze your gas or liquid sample at our Advanced Technology Center.

PERFORMANCE DATA

Natural Gas: Dimethyl Sulfide Removal ***Nanochem® GuardBed™*** has the highest capacity of all competitor materials tested for removal of sulfur components from natural gas.





Conditions *Temperature: 68°F; Pressure: 3 psig; Challenge: 12.3 ppm dimethyl sulfide (DMS) 9.0 ppmv; tert-butyl mercaptan & 9.0 ppmv tetrahydrothiophene in natural gas; GHSV: 60,000 h^{-1}*

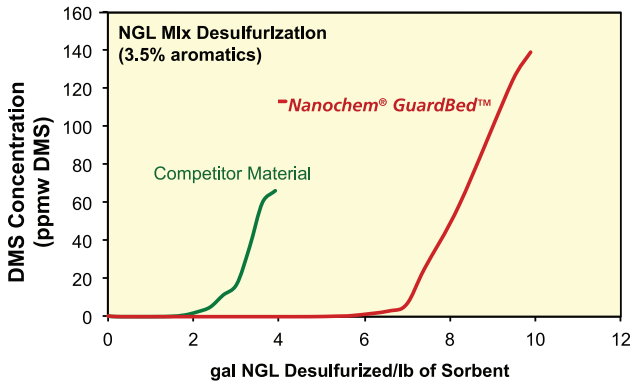
NGL Mix: Dimethyl Sulfide Removal

Nanochem® GuardBed™ provides robust desulfurization for Natural Gas Liquids (NGLs) in the presence of aromatics, with twice the adsorption capacity of a competitor material.

Nanochem® GuardBed™ achieves ~1.5% wt. sulfur capacity vs. 0.7% wt. of competitor material at 50 ppm breakthrough.

Conditions

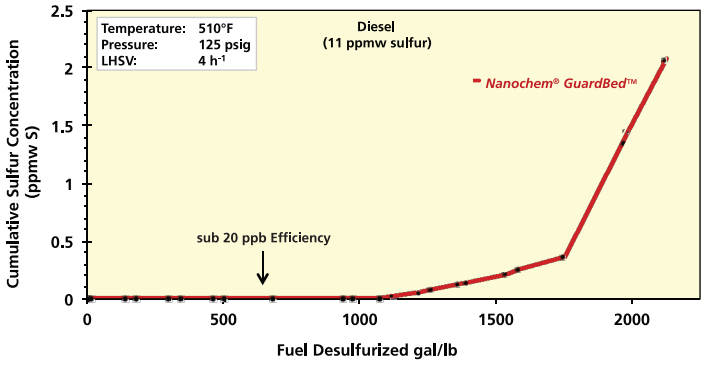
Temperature: 104°F; Pressure: 150 psig; LHSV: 4 h^{-1}

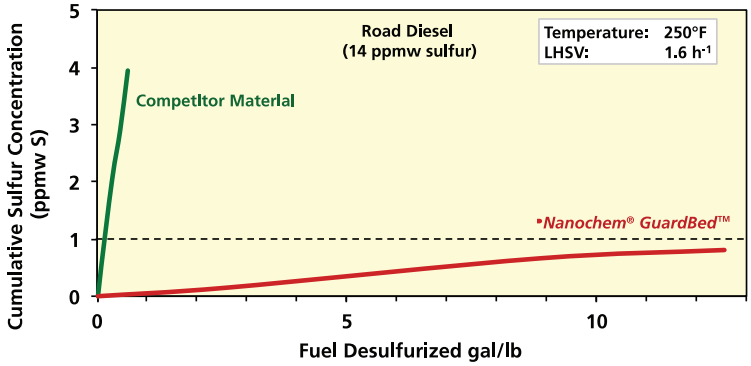


Nanochem® GuardBed™ **Has Twice The Capacity Of Competitor Material Even In The Presence Of Aromatics!**

Ultra Low Sulfur Diesel Fuel (ULSD): Removal Efficiency for Sulfur Species

Nanochem® GuardBed™ reduces sulfur content of ULSD to less than 1 ppmw and shows significantly better performance at higher temperatures versus other materials.





Our core competency is the supply, delivery, and management of gases and gas production sub-systems and plants.

Your core competency is putting those gases to work to make your process safer, more efficient, and more profitable.

Our Mission is to focus on our core competency so you can focus on yours.

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NIPPON SANSO

www.us.nipponsanso.com
Tel: 800-416-2505
email: mathesonsales@us.nipponsanso.com