



Marine Services

World Class Degassing Solutions offering Higher Profits through Considerable Time Savings

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Vapors can be Managed

New Technologies offer alternative solutions to destructive control devices with immediate benefits to the end users.

NanoVapor Fuels Group (NFG) offers a combination of systems to manage Volatile Organic Compound (VOC) gases generated during unloading and loading operations. NanoVapor offers two technologies that may be utilized separately or in series, dependent upon client needs. NanoVapor's two product offerings are designed to create specific advantages to address the key market drivers of chief asset downtime and regulatory compliance. Our suppression technology takes a unique approach, virtually eliminating vapor creation before it starts – no vapors, no problem. NanoVapor offers maximum removal using technologies to allow man entry in a fraction of the time currently required. Our absorption technology acts as a control device, capturing >99% of all vapors routed through the system.



The Problem

VOC emissions might be regulated by local, state, and federal law. The release of CO, CO₂, SO₂, NO_x and other hazardous byproducts resulting from current technologies is becoming an ever-growing concern, subject to potential regulations. Existing technologies (stack flares, ICE machines, etc.) may meet requirements today, but regulators will continue to tighten regulations, putting added pressure on operators to find alternative solutions.



The Solution

NanoVapor technologies offer cost effective, solutions to VOC remediation. Though the two technologies approach the situation from entirely different directions, both are highly effective and offer a multitude of benefits to the end user. By eliminating the use of heat and flames, we offer safer, faster VOC degassing technology with significant financial and environmental benefits.

Vapor Creation can be Slowed or Stopped

Technological Description

Connected as an on-board control device or from the dock, the VSS system is designed for ease of use. The atomization system injects a proprietary chemical into the void tank space. The chemistry absorbs hydrocarbons from the vapor space. The combination forms relatively heavy molecules which settle, forming a barrier several molecules thick. This barrier suppresses the formation of further VOCs.

Compared to existing solutions, this process reduces the risk of explosion, while significantly reducing costs & time (lengthy degassing operations).

Client Benefits

The NanoVapor Suppression System is fast, reducing time requirements for degassing operations by as much as 80% or more. This time savings equates to greater potential throughput, and the opportunity for increased revenue and reduced expenses. The chemistry is safe for use, with no negative effects on the stored product or the systems in place.

The client will also see a reduction in product loss, due to reduced evaporation. This reduction in losses again translates to increased revenue, as the product remains in a sellable state.



NanoVapor Vapor Suppression System

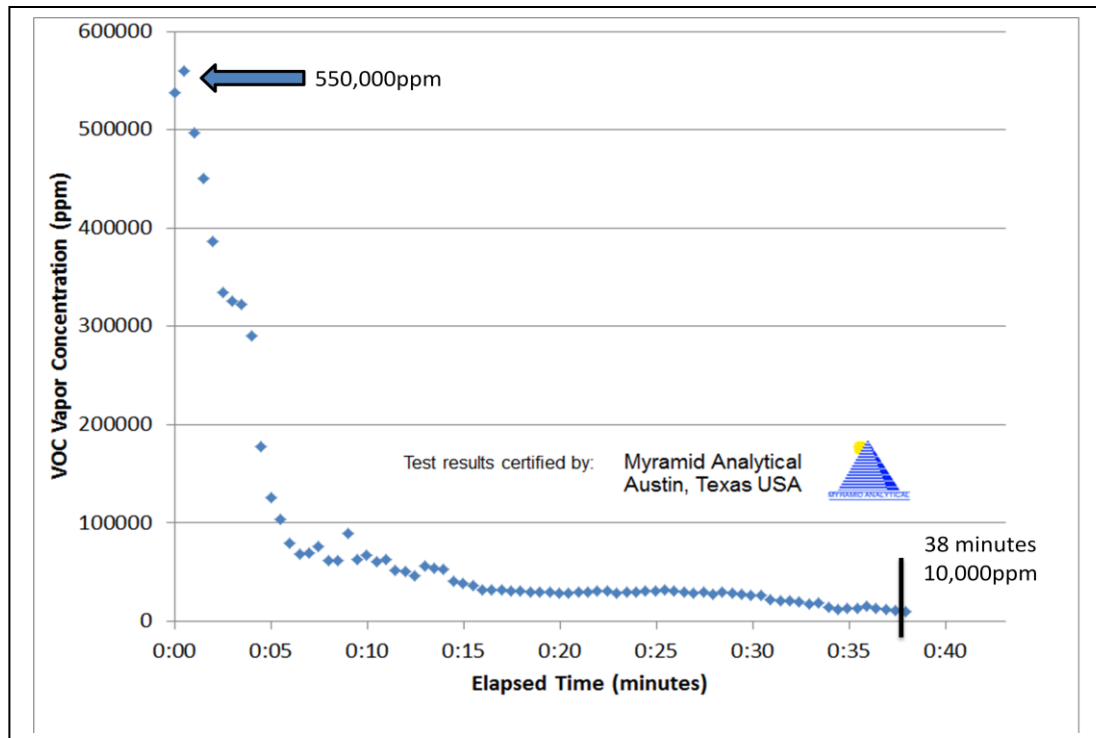
- New system deployable in barges and vessels
- VSS chemistry suppresses VOC vapors
- Suppresses vapor generation for C4-C20
- If barrier is broken, a new barrier immediately forms as it repairs itself
- By reducing vapor growth, less product is lost to vapors and less of a VOC problem with which to deal
- Maintains barrier for long periods of time

Vapor Concentration - Less Time Combustion Zone

The effectiveness of the VSS technology is illustrated in the graph below.

The vapor concentration rapidly passes through the combustion zone, minimizing the associated risk. The vapor concentration remains low as the molecular barrier develops over the fuel.

GRAPH 1: Gasoline Vapor Suppression Test



High Performance: In a vessel containing refined gasoline, a reduction in VOC concentration from 550,000ppm to roughly 10,000ppm was achieved over a period of 40 minutes, at a temperature of 39C°. A longer period of exposure shows ppm concentrations continue to decline.

Goal is to stop Vapor Growth before it becomes a problem

Vapor Handling Time Significantly Reduced

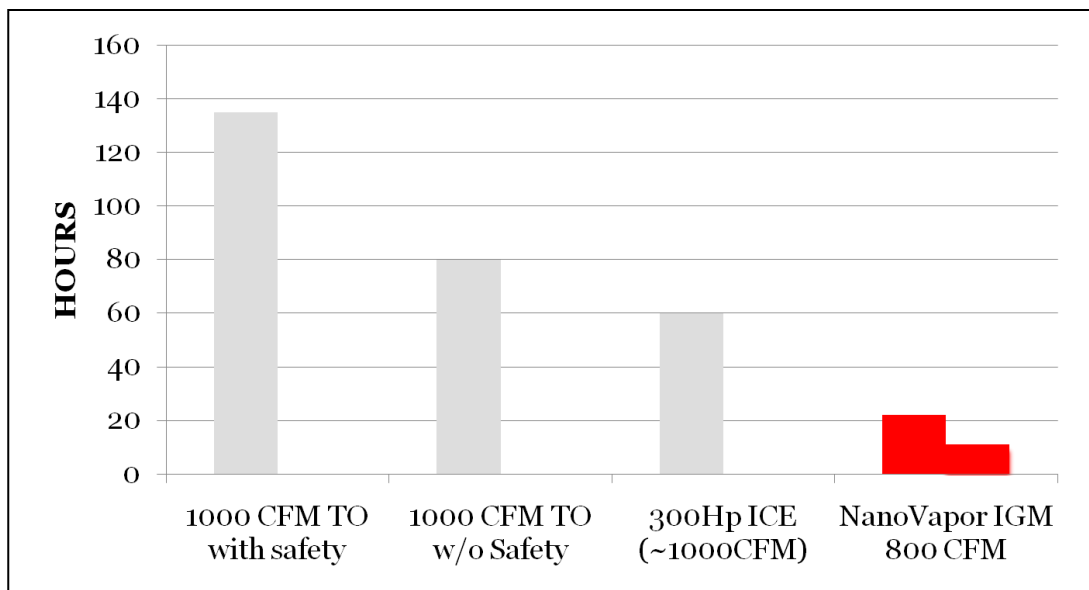
VAS Technological Description:

Installed on-shore, NanoVapor's Vapor Absorption System utilizes a patented contact tower to safely and efficiently remove greater than 90% of VOC vapors routed through its chemistry. The system is designed to allow for closed loop operations, whereby >99% of all vapors are captured. The chemistry is readily available, and once used, is returned into the market.

Client Benefits:

Through the implementation of these systems, clients see financial, safety, and environmental gains. As indicated in the graph below, the client will also experience significant time savings through the use of this system. This time savings translates into opportunities in capacity and reduced expenses. The client will benefit from the elimination of flares and combustion devices. The client will see significant reductions in VOC, NO_x, CO, and other emissions.

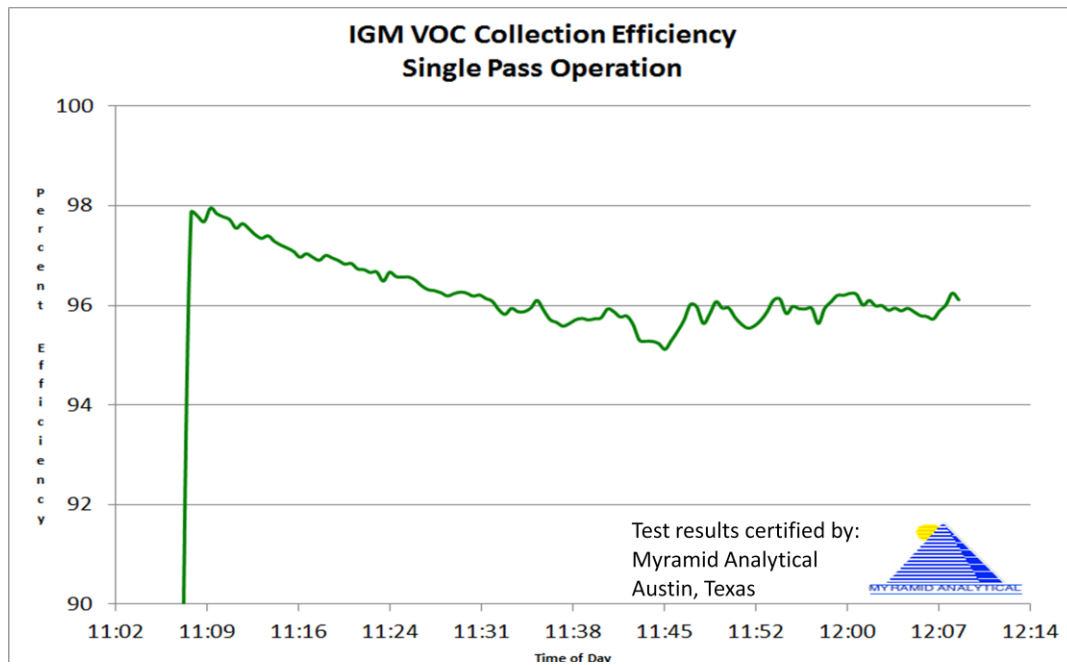
GRAPH 2: Time Required to Process 6,000 lbs of VOC Vapors – Assumes 150,000 Cubic Feet of Vapor Space Previously holding Gasoline.



This graph shows the time spent to degas a large vessel. A Thermal Oxidizer would take nearly 140 hours, where an internal combustion engine would take 60 hours. Nanovapor has tested at a 21 hours rate and believes with recent improvements can attain 10 hours to degas this tank.

Vapor Elimination Does Not Need to Pollute

GRAPH 3: VAS Test Results



Graph 3 illustrates vapor capture as a percent of inlet concentration during a 60 minute test. This test was monitored by Myramid Analytical, Austin, TX. Detailed reports of this test are available upon request. Not only does this process save time, it holds the captured vapors in liquid form for later use.

GRAPH 4: Competitive Comparison

	NanoVapor	Flares	Internal Combustion Engines	Thermal Oxidation
Rapid Asset Recovery	YES	NO	NO	NO
VOC, NOX, SOX, CO ₂ Emissions	NO	YES	YES	YES
Generates Heat	NO	YES	YES	YES
Destructive	NO	YES	YES	YES
Requires use of activated Carbon	NO	NO	YES	NO
Additional Fuel	NO	YES	YES	YES
Recovers Product	YES	NO	NO	NO

NanoVapor Fuels Groups technology is superior by all measures.

Vapor Loss – An Untapped Asset

Summary

NanoVapor Fuels Group, Inc. now offers first-of-its-kind technologies to deliver marine transport operators the immediate competitive ability to save money, improve safety, and mitigate VOC Impact. Results are delivered with positive environmental impact, lower health and safety risks, new revenue opportunities, and reduced expenses as well as significant time savings. NanoVapor solutions offer our customers multiple operational and financial benefits.

Direct Benefits:

Time Savings – Our Vapor Suppression Systems result in significant time savings over the competition, reducing petroleum transport vessel degassing operations by as much as 80% or more.

Asset Utilization – Ships require less down time, providing opportunities for higher throughput. Dock time is also reduced, allowing for increased throughput.

Increased Revenue – Both systems reduce product loss, providing an immediate increase in revenue. Our clients will also see an increase in capacity through asset efficiencies that provide potential for additional revenues.

Vapor Removal – While our suppression technology reduces the vapor presence over a short period of time, our absorption systems are designed to eliminate vapor presence entirely.

Indirect Benefits:

Cost Savings – By utilizing NanoVapor's Suppression Systems during product transfer, dock time, personnel requirements, and asset downtime are all greatly reduced.

Environment / Health – Benefits from the reduction in pollution levels are expected to resonate throughout the local community, from neighbors to employees and regulatory agencies. These benefits will headline annual reports that strive to portray the clients' green initiatives.

Safety – Reduces the chance of fire or explosion. May reduce insurance costs.

Press Room/Annual Report – Bragging rights on being a green company.

Call NanoVapor Fuels Group to learn more about our technology and the benefits to your company. 832-220-6211

Frequently Asked Questions

Does the product require permits or licensing for transportation?

The chemistries are non-hazardous liquids that require no licensing or permits. NanoVapor is currently exploring new alternative chemistries, and will relay any permitting changes, should any arise, if the customer chooses to use these new chemistries.

What products can the system degas?

The technologies are known to be successful when degassing fuel vapors C4-C20. NanoVapor is now testing compounds with a wider range of carbon chains.

How does the system work?

Our Vapor Suppression System works by accompanying the chemistry into the fuel cell vapor space through specialized insertion techniques. The chemistry then settles above the liquid product level, forming a molecular barrier between the product and the vapor space above.

The Vapor Absorption Scrubber routes VOC vapors to a control device, whereby these vapors are routed through proprietary fluidizing materials to maximize surface area within the absorptive liquid. This liquid captures the vapors, removing them from the passing stream.

How is the "Value Generation" calculated?

Value Generation has been calculated based on time savings and a number of affected factors. These factors include, but are not limited to; reduced expenses (dock time, maintenance crew downtime, and chief asset downtime) as well as opportunity for increased revenue by getting the asset online faster. Further value may be generated in large carriers, where time savings may translate to the need for fewer vessels. For further details of value generation please contact our management team. We will work with you to calculate your specific value generated.

Vapor Loss is NOT a Rounding Error

Our History

NanoVapor Fuels Group has had its suppression technology validated and available for the past decade, refining and improving the delivery system and chemistries for different client needs. NanoVapor has received approval from the Aircraft Certification office, as well as documentation for No Technical Objections (NTOs) from both the FAA and DOT. Our technologies have been used in operation by the Ministry of Defense and others, degassing fuel bladders and airplane fuel cells. A technical video of the NanoVapor system in use can be seen here –

<http://www.nanovapor.com/aviationvideo/php>

New breakthroughs have reduced costs, allowing for entry into marine applications.

NanoVapor has developed additional solutions for VOC remediation through the use of patented absorption technology. This technology has been in development for several years, with our first live demonstration, in front of an audience including industry veterans and members of the TCEQ, considered a resounding success. NanoVapor maintained single pass capture rates of >95%, greatly exceeding requirements set forth by the TCEQ, as evidenced by Graph 3 on Page 6.

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