

## FREQUENTLY ASKED QUESTIONS

### WHAT IS NANO VAPOR?

NanoVapor Inc. offers breakthrough technologies in the industrial management of vapors from Volatile Organic Compounds (VOCs). Their patented VOC suppression systems use nanotechnology to dramatically improve workplace health and safety, and reduce environmental pollution related to the Gas Freeing ("degassing") of fuel and cargo tanks. By working at a molecular level, NanoVapor systems have been proven to be safer, much faster, less costly, and a greener method of purging VOCs than conventional methods.

For the marine industry, NanoVapor's Vapor Suppression System can be used to quickly reduce the VOC concentrations to safe levels in bunker and cargo tanks containing liquid fuels or petrochemicals. Some examples of NanoVapor use are:

1. Planned and unplanned tank inspections for maintenance and repair
2. Tank cleaning and gas freeing of cargo oil tanks for barges and tankers
3. Bunker tanks cleaning operations for fuel switching (IMO 2020)
4. Reducing inert gas system purging time during cleaning operations

### WHY IS NANO VAPOR A BETTER ALTERNATIVE?

Because NanoVapor is very fast, non-toxic, non-reactive, and biodegradable, it eliminates the main disadvantages of conventional VOC purging and gas freeing, which can be deadly, unhealthful, time consuming, and environmentally destructive.

### HOW DOES THE SYSTEM WORK?

NanoVapor's system consists of two components: a proprietary liquid nano-suppressant (TankSafe) and a hardware delivery unit (Model ST-1000) that are specially designed to work together to produce tiny nano-droplets of suppressant molecules. The delivery unit uses a compressed air source to create a high-flow air stream which is used to inject these molecules directly into an enclosed tank. The molecules work microscopically to quickly suppress VOC evaporation from all liquid fuel throughout the entire tank, including any sludge heel.

### HOW MUCH FASTER IS MOLECULAR SUPPRESSION OVER CONVENTIONAL GAS FREEING WITH AIR PURGING?

NanoVapor's suppression systems have been demonstrated\* to be over 90% faster than conventional air purging. Actual time savings will vary depending on tank size, geometry, and condition.

(\* ) Actual results from using NanoVapor to gas free commercial aircraft jet fuel tanks.

### HOW LONG WILL NANO VAPOR'S MOLECULAR SUPPRESSION LAST?

If left undisturbed, the molecular suppression can last for days, or even weeks, depending on many factors, such as specific fuel type, the quantity of remaining fuel, sludge heel, tank condition, etc.

### ONCE THE TANK IS GAS FREE, HOW DO YOU ENSURE THE ATMOSPHERE INSIDE THE TANK IS STILL SAFE?

Since NanoVapor only suppresses VOC's, normal ambient oxygen levels are maintained throughout its use. Although molecular suppression can last a long time, standard confined entry safety precautions, including continuous monitoring, should always be followed to ensure the LEL and oxygen levels are kept within safe working ranges.

### IS TANKSAFE HARMFUL TO TANK SURFACES OR COATINGS?

Molecular suppression using nanotechnology is not a chemical reaction, and TankSafe is a completely non-reactive material. In

addition, the tiny amount of TankSafe needed for suppression is de minimis (a small fraction of one part per million) and is readily and completely removed with a normal tank cleaning process.

## **IS EXPOSURE TO TANKSAFE SAFE FOR HUMANS?**

NanoVapor is non-toxic and is completely safe for human contact. The system quickly suppresses toxic hydrocarbon vapors without removing oxygen from the ambient air in a confined space. This eliminates the risks related to toxic vapor buildup, asphyxiation and explosion from oxygen re-introduction, and environmental impact from hazardous waste disposal, or water contamination.

## **DOES THE TANKSAFE NANO-SUPPRESSANT HAVE AN EXPIRATION DATE?**

TankSafe is provided “ready to use” with a one (1) year shelf life.

## **IS THERE A SAFETY DATA SHEET (SDS-MSDS-PSDS)?**

Yes. The SDS is provided with each shipment of TankSafe suppressant.

## **IS TANK SAFE A HAZARDOUS PRODUCT? ARE THERE SPECIFIC INSTRUCTIONS ON HOW TO HANDLE IT?**

TankSafe is not a hazardous product, and is non-toxic, non-flammable, non-reactive, and biodegradable. The SDS provides standard safe handling guidance, and NanoVapor’s training manuals provide all the necessary details for safe handling practices.

## **HOW MUCH SUPPRESSANT IS REQUIRED FOR A COMPLETE TANK DEGAS (PER M3)?**

The suppressant needed varies depending upon the fuel or product volatility, the tank temperature, the tank surface area to volume ratio, the quantity of fuel and sludge remaining, and the condition of the tank itself.

## **CAN THE CHEMICAL COMPOSITIONS FROM DIVERSE LIQUID PRODUCTS INSIDE THE TANKS (HFO-IFO- MDO-MGO-JET) AFFECT THE TIME SAVINGS?**

The amount TankSafe needed can increase with higher vapor pressure. However, the fuels listed have similar vapor pressure properties, so there would be no substantive time difference.

## **AFTER A GAS FREEING OPERATION IS CONCLUDED AND THE TANK IS SAFE FOR ENTRY, WILL MANUAL CLEANING AND/OR REMOVAL OF PRODUCT RESIDUALS (SLUDGE HEEL) DISTURB THE GAS FREE CONDITION?**

During sludge removal and any subsequent work, continuous air ventilation is normally a standard procedure with the workers using correct PPE and RPE. This continuous air ventilation should be sufficient to remove any vapors formed. However, NanoVapor may be continuously applied to continuously knock down any vapor formation during the cleaning process.

## **AFTER A GAS FREE EVENT, HOW IS TANK SAFE RECOVERED? DOES TANK SAFE LEAVE ANY RESIDUALS INSIDE THE TANK? IS THERE A NEED TO DISPOSE/REMOVE IT?**

Recovery is not required because no detectable quantity of TankSafe would remain, and any trace would be readily removed during any typical tank cleaning process.

## **HAVE NANOVAPOUR’S VAPOR SUPPRESSION SYSTEM BEEN USED IN OTHER INDUSTRIES?**

NanoVapor’s Vapor Suppression Systems have been successfully applied across the transportation industry, including commercial aviation, retail underground tanks, and ocean/inland marine. It has been formally designated as a global Best Practice standard by Shell Oil for degassing of underground petrol tanks for maintenance and inspection.

## **WHAT AIR COMPRESSOR CAPACITY IS REQUIRED FOR OPTIMAL EFFICIENCY OF THE SYSTEM?**

The ST-1000 is designed to be supplied from a compressed air source capable of supplying 150 CFM (260 m3/hr) at 100 PSIG (7 bar).