



VESTA® 5100 Storage and Handling Safety Guide

DISCLAIMER

This general safety manual is a product of California Fueling and serves as an instructional effort to help customers understand how to safely store and handle VESTA®. California Fueling has compiled information from standard industry usage guides. Accordingly, California Fueling, its members, employees and agents expressly disclaim any responsibility whatsoever for damages and injuries that may arise. Each customer is different; therefore, it is the customer's responsibility to tailor storage and handling procedures to their needs, based on the recommendations made in this safety manual. This manual is made by evaluation of all factors pertaining to potential hazards at a particular worksite with respect to employee safety and health. This manual should not be considered a substitute for any provision of federal, state or local regulations. California Fueling, its members, employees and agents expressly disclaim any responsibility whatsoever for damages arising from the use, application or reliance on the recommendations and information contained in this generic safety manual.

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1

Table of Contents

Product Summary	3
Technical Data Sheet	4
CARB Approved Treat Rates	5
Physical Property Data	6
Precautionary Statements	7
Potential Hazards and First Aid	8
Handling	9
Storage	10
Storage Tank Overview	12
Pumping and Unloading	13
Spills, Disposal and Environmental Awareness	16
Contact Information	16
Glossary	17

California Fueling and its member companies believe the information and suggestions contained in this manual to be accurate and reliable as of the date of issue of this document, August 2018.

Product Summary

VESTA® 5100 is a NOx mitigant used in diesel fuel in order to constitute a reduction in emissions, specifically NOx, as well as carbon monoxide, total hydrocarbons and particulate matter. It is our goal to provide end users with the highest quality NOx mitigant while remaining environmentally friendly.

VESTA® 5100 contains trade secret constituents. Due to its chemical composition, the additive has the ability to decompose at a far lower temperature than diesel fuel alone. The exothermic combustion of VESTA® catalyzes a reaction within a biodiesel/diesel fuel blend, reducing the injection-to-ignition delay and thus favorably impacting combustion products.

VESTA® 5100 is a combustible accelerant that is meant to decompose within a controlled environment; however, it is possible that the unintentional combustion of VESTA® can occur under unregulated temperatures and pressures. This unwarranted reaction can cause a violent explosion if precautionary measures are not taken to avoid such hazards.

It is under these potential hazards that California Fueling provides you with this guide containing our recommendations on how to safely and effectively use our product. These recommendations should be reviewed thoroughly for maximum safety by all parties handling VESTA® .





VESTA[®] 5100

TECHNICAL DATA SHEET

Product Description:

VESTA™ 5100 IS A CALIFORNIA AIR RESOURCES BOARD (CARB) APPROVED EMISSIONS EQUIVALENT ADDITIVE PER APPENDIX 1 OF SUBARTICLE 2. “IN-USE REQUIREMENTS FOR POLLUTANT EMISSIONS CONTROL” SECTION (A)(1)(A), OF THE REGULATION ON COMMERCIALIZATION OF ALTERNATIVE DIESEL FUELS. AS SUCH, VESTA™ 5100 REDUCES ALL CRITERIA POLLUTANTS. SEE PAGE TWO FOR MORE INFORMATION ON CARB APPROVED TREAT RATES.

Product Benefits:

- ENABLES BIODIESEL USE AT LEVELS UP TO B20
- EXPANDS BIODIESEL GROWTH OPPORTUNITIES IN CALIFORNIA AND AIDS IN COMPLIANCE WITH THE LOW CARBON FUEL STANDARD (LCFS)
- SIGNIFICANTLY REDUCES ALL CRITERIA POLLUTANTS INCLUDING NOX AND PARTICULATE MATTER

Safety & Handling

- DO NOT STORE ABOVE 140°F
- VESTA™ 5100 HAS A SIGNIFICANT SHELF LIFE - >12 MONTHS



CARB APPROVED TREAT RATES¹

VESTA® 5100 Concentrations for Biodiesel Blends B20 and Below

Biodiesel Saturation Level²	Biodiesel Blend Level	Volume percent, minimum
Low Saturation	>B5 to <B10	0.050
	B10 to <B15	0.075
	B15 to B20	0.100
High Saturation	B10 to <B15	0.025
	B15 to B20	0.050

VESTA® 5100 Concentrations for Biodiesel Blendstock B100 or B99

Biodiesel Saturation Level²	Biodiesel Blendstock	Volume percent, minimum
Low Saturation	B100 or B99	0.500
High Saturation	B100 or B99	0.250

¹Per Executive Order G-714-ADF07, 7th of June 2018

² Low saturation refers to biodiesel Cetane Number of below 56; High saturation refers to biodiesel with Cetane Number of 56 and above by the test methods specified in the Alternative Diesel Fuels Regulation.

Table 1 – Typical Physical Properties of VESTA®

Assay, Weight %	99
Appearance	Clear, pale yellow
Odor	Fruity, pungent, ester, characteristic
Color, ASTM D-1500	1.0
Water, Weight %	0.05
Maximum Acid as HNO ₃ , %	0.003
Molecular Weight, g/mol	175.2
Vapor Pressure, mm Hg @ -10°C @ 20°C @ 80°C	0.05 0.4 9.0
Flash Point (TCC), °C	72
Freezing Point, °C	<-45
Density @ 20°C, g/ml	0.96
Density-Temperature Correction Factor g/ml °C	0.000093
Viscosity, cSt @ -29°C @ 0°C @ 20°C	7.7 2.7 1.8
Solubility in Diesel Fuel @ 20°C	Miscible
Solubility of Water in VESTA™	12.6 mg/L @ 20°C
Heat of Vaporization	158 BTU/lb (368 kJ/kg)
Heat of Decomposition	2100 J/g
Thermal Stability	May Decompose Above 100°C
Dielectric Constant	9.04 @ 21-23°C

VESTA® 5100 Precautionary Statements:

Keep away from heat, open flames and hot surfaces. - No smoking. Do not eat, drink or smoke when using this product.

Avoid breathing mist or vapor.

Use only outdoors or in well-ventilated areas.

Wear protective gloves and eye/face protection.

If swallowed: Call a poison center/doctor if victim feels unwell. Do NOT induce vomiting. Rinse mouth.

If inhaled: Remove victim to fresh air and keep comfortable for breathing. Call a poison center/doctor if victim feels unwell.

In case of fire: Use water fog, dry chemical, CO2 or 'alcohol' foam to extinguish.

Store in a well-ventilated place. Keep container tightly closed. Keep cool.

Dispose of contents/container in accordance with local regulations.

Other hazards:

Burning produces obnoxious and toxic fumes. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Direct skin contact may cause slight or mild, transient irritation. Inhalation of high concentrations may cause dizziness, disorientation, incoordination, narcosis, nausea or narcotic effects. Direct eye contact may cause slight or mild, transient irritation. Inhalation of vapors in high concentration may cause irritation of respiratory system.

Potential Hazards and First Aid

Fire Hazards

The unintentional combustion of VESTA® 5100 can cause a violent explosion.

VESTA® 5100 should be kept isolated from any potential fire hazard including sources of heat, spark, and open flames.

Temperature should be properly monitored at intervals. A water deluge system can be used to keep VESTA® 5100 below its self-accelerating temperature in the case of a nearby fire. Alternatively, a fire monitor could be used to do the same. If VESTA® 5100 approaches its decomposition temperature of 212°F (100°C), a fire or explosion should be anticipated.

Compression of VESTA® 5100 allows sufficient energy to initiate a reaction. VESTA® 5100 should never be stored in a tank with a design pressure exceeding 14.7 psig. The storage tank should be placed a generous distance from all electrical equipment and steam lines as these also have sufficient energy to initiate thermal decomposition. Storage tanks should be grounded properly as an electrical charge can build up.

Fire Fighting

In the case of a fire, emergency extinguishing methods should be readily available for use on site. Carbon dioxide (CO₂), dry chemical, alcohol resistant foam or water fog are all suitable extinguishing measures. Do not use a water jet to control fire, as VESTA®'s solubility in water can result in the formation of a weak nitric acid and may also scatter and spread the fire.

Protective equipment for firefighters: Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode.

Special fire-fighting procedures: Do not breathe fumes or vapors. Move containers from fire area if safe to do so. Cool closed containers exposed to fire with water spray. Do not allow run-off from firefighting to enter drains or water courses. Dike for water control.

Health Hazards

VESTA® 5100 is harmful if swallowed or inhaled. Inhalation of high concentrations of vapors may cause respiratory irritation with throat discomfort, coughing or difficulty breathing. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Direct skin contact may cause slight or mild, transient irritation. Inhalation of high concentrations may cause dizziness, disorientation, incoordination, narcosis, nausea or narcotic effects. Direct eye contact may cause slight or mild, transient irritation.

First-Aid

For any type of exposure call poison control or a medical professional immediately.

- Ingestion:* Rinse mouth. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention if symptoms persist. If vomiting occurs spontaneously, keep victim's head lowered (forward) to reduce the risk of aspiration.
- Inhalation:* If inhaled: Remove person to fresh air and keep comfortable for breathing. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen by qualified medical personnel only. Call a physician or poison control center immediately.
- Skin Contact:* Flush contaminated area with lukewarm, gently running water for at least five to 10 minutes or until the chemical is removed. Wash contaminated clothing before reuse. Call a physician if irritation persists.
- Eye Contact:* For eye contact, flush with running water for at least 15 minutes. If eye irritation persists, seek medical advice/attention.

Material Compatibility

VESTA 5100™ is compatible with most equipment normally used in the refinery process. However, VESTA® is NOT compatible with oxidizing agents.

Stability and Reactivity

VESTA® 5100 has the ability to combust at temperatures exceeding 161°F (72°C) in a closed container. VESTA® 5100 has an auto-ignition temperature of 266°F (130°C).

VESTA 5100™ is unstable at pressures exceeding 14.7 psig.

Handling

The unintentional combustion of VESTA® 5100 can occur in an improperly maintained environment. Maximal recommended handling temperature is 140°F (60 °C).

VESTA® 5100 should be kept isolated from potential fire hazards such as sources of heat, spark, and open flames. Welding, soldering, steam cleaning, equipment repair, sanding, drilling and electrical repair are a few examples of work prohibited in close proximity to VESTA® 5100 . VESTA® 5100 should be removed to a safe site and decontaminated if necessary whenever utility equipment or building maintenance is required.

Materials for handling are to be designated specifically for VESTA® 5100 alone; measuring equipment and tools used for VESTA® 5100 should never be used for other chemicals. We

recommend you diligently prepare for the delivery of our product to ensure it does not come in contact with another chemical or get pumped into the incorrect storage tank.

VESTA[®] 5100 is compatible with all metals normally used in refinery processing, except for oxidizing agents. After use, materials and equipment used should be cleansed of all residue. Soap and water is adequate for cleansing.

Avoid breathing dust/fumes/vapors/spray. Preventing exposure minimizes the risk involved in handling this combustible liquid. We strongly suggest that direct skin contact, inhalation, and ingestion of VESTA[®] 5100 be avoided.

Wear protective clothing, goggles and rubber gloves at all times while handling this product.

Skin that comes in contact with VESTA[®] 5100 should be washed immediately and thoroughly with soap and water. Call a poison center and contact a medical professional. Contaminated clothes should be disposed of using proper disposal etiquette of hazardous materials.

If eye contact occurs, eyes should be flushed. A healthcare professional should be contacted.

Inhalation of VESTA[®] 5100 is likely to cause irritation of the throat and lungs. If inhaled, remove person to fresh air and keep comfortable for breathing. If the person is not breathing, artificial respiration methods, such as mouth-to-mouth, are to be taken immediately. Call a poison center and contact a medical professional.

Only authorized personnel, educated on proper safety etiquette, should handle this product.

Storage

VESTA[®] 5100 is a combustible liquid and should be stored under regulated temperatures and pressures. It is under these circumstances that we remind our customers that determining an appropriate location for VESTA[®] 5100 requires the diligent consideration of several factors. Failure to do so can result in an explosion hazard.

As a precautionary measure, storage tanks containing VESTA[®] 5100 should be in an open area, isolated from inhabited areas to reduce associated risk.

Storage tanks should be isolated from potential fire hazards.

Storage tanks should be composed of carbon or stainless steel with maximum ventilation and sun reflection. We recommend an emergency ventilation system, such as a frangible roof, to account for internal pressure build up. The decomposition of VESTA[®] triggers a rise in temperature and pressure; therefore, it is imperative that VESTA[®] is not allowed to reach accidental decomposition. VESTA[®] should be stored safely below its self-decomposition

temperature of 212°F (100°C) as any temperature approaching this number requires the anticipation of a fire or an explosion. Compression of VESTA® 5100 allows sufficient energy to initiate a reaction. VESTA® should never be stored in a tank with a design pressure exceeding 14.7 psig.

The storage tank should be placed a generous distance from all electrical equipment and steam lines as these also have sufficient energy to initiate thermal decomposition. Further, the electrical equipment must be void of any possible ignition hazards. For maximum protection against flammable vapors and dusts, we suggest explosion proof electrical equipment and fittings.

Storage tanks should be properly grounded as an electrical charge can build up inside the tank.

Storage tanks should have a pressure gauge that is monitored at reasonable intervals.

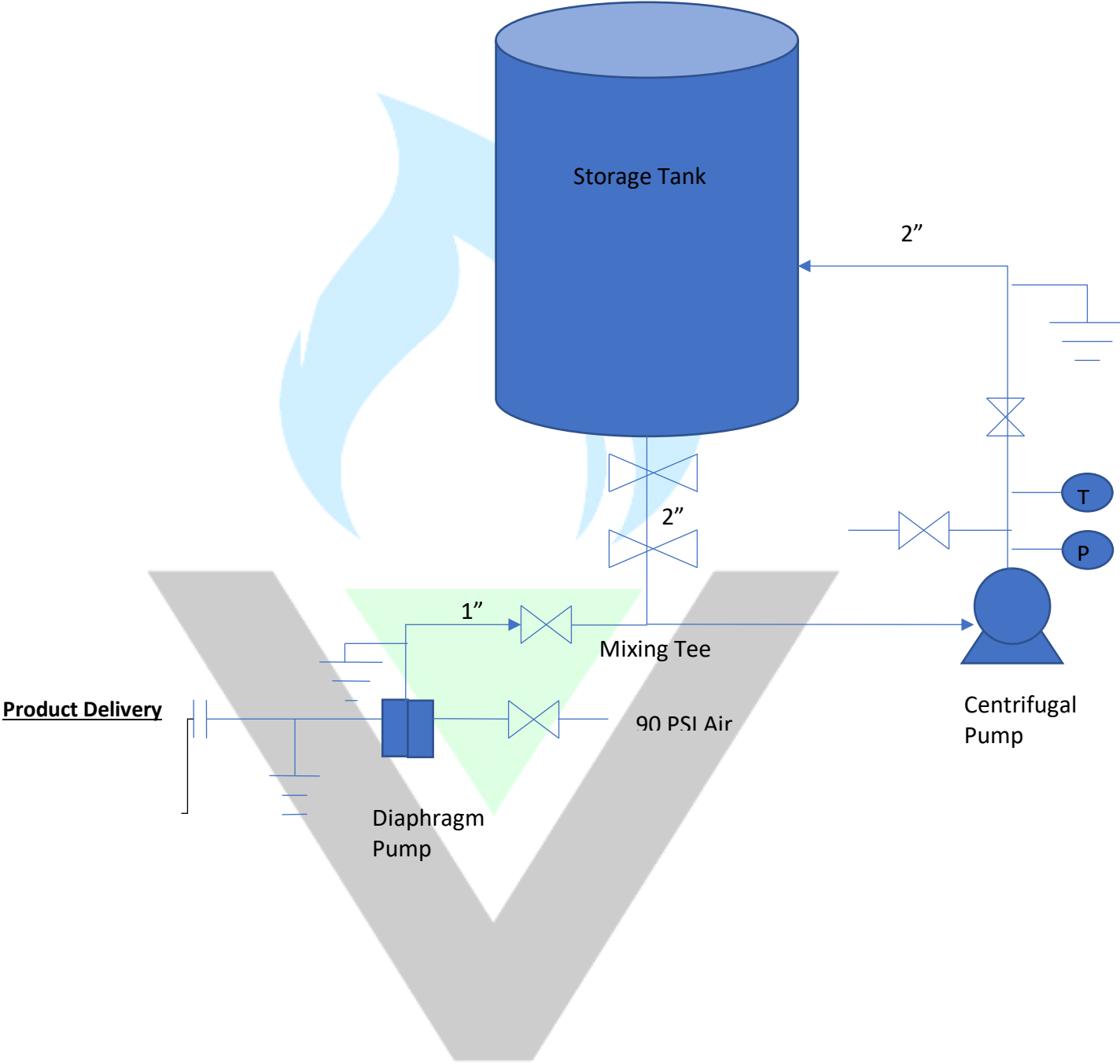
VESTA® should not be stored in a tightly closed container as pressure buildup can lead to bursting of the container.

A water deluge or sprinkler system can be used above or next to the storage tank. In the chance of a fire nearby, ample water supply must be readily available to keep VESTA® below its decomposition temperature.

In anticipation of a spill, absorbent materials to soak up the spill should be readily available (*see "Spills, Disposal and Environmental Awareness"*).

It is your responsibility to design storage tanks according to local city, state and/or federal codes.

Typical Storage Tank Delivery Overview



Pumping and Unloading

Upon delivery of VESTA® 5100, all paperwork should be reviewed and verified. Diligent planning beforehand is required to ensure VESTA® 5100 is pumped into the correct storage tank.

Personnel present must be fully briefed on unloading procedures and safety etiquette.

Personnel must be wearing protective equipment, including rubber gloves, goggles and protective clothing. Emergency equipment must be available during unloading. Some of this emergency equipment includes absorbent material and a non-spark dust pan, a safety shower with an eye flush, a fire extinguisher, and an ample amount of water.

Electrical charges that form within flowing liquid can reach high voltages. As a precautionary measure, all equipment used in the pumping or transportation of VESTA® 5100 should be grounded properly. Flow rates should be monitored regularly and should proceed at a slow rate to avoid static buildup.

Centrifugal pumps are commonly used for transfer; however, if they are used to transfer VESTA® 5100, they should be equipped with a low-flow cut off switch. Outside these controlled conditions, air-driven diaphragm pumps are recommended for transfer.

The procedure below can be used during a tank-to-tank transfer. Note: Never pump VESTA®5100 against a closed valve.

Required Equipment

- Protective Clothing
- Goggles
- Full face canister respirator (for organic vapours)
- Neoprene/nitrile or PVC Gloves
- Flexible hose embedded with reinforced wire
- Nitrile oil-resistant hose with gunmetal or stainless steel
- Camlock fitting (male and female for each end of hose)
- Diaphragm air-driven pump flap valves in Viton with “Camlock” male/female fittings with isolating valve on the delivery side.
- Two-inch ball valve
- Compressed air supply for pump (**should not exceed 120 psi**)
- Air hose with couplings for pump and air supply connection
- Hose caps

- Bucket or drip tray
- Emergency spill equipment
- First-aid equipment

Typical Unloading Procedures

1. **Prepare for Arrival of Product:** Ensure personnel is briefed on unloading procedures and proper safety etiquette to prepare for an accident or spill. Inspect the tank intended for the storage of VESTA® 5100 to confirm that it is in accordance with our storage recommendations (proper ventilation, sun reflection, location, etc.). The storage tank should be clean and free of contaminant. Verify that the tank is large enough to fit the entire contents of the shipment.
2. **Obtain Necessary Safety Equipment:** The unloading area should be supplied with safety equipment in the event of an accident or of a spill. This includes absorbent material, a non-spark dustpan or vacuum, a safety shower with an eye flush, a fire extinguisher, and an ample amount of water. Personnel on site must obtain personal safety equipment like protective clothing, rubber gloves and chemical goggles.
3. **Verify Product:** Paperwork should be verified to confirm that the product is in fact VESTA® 5100. Verify matching numbers on the bill of lading. Obtain a small sample of the product to verify contents.
4. **Prepare for Unloading:** The delivery tank should be as close to the intended storage tank as possible. Ensure that the container is secure and cannot be moved. Ensure hose is connected to tank designated specifically for VESTA® to avoid accidentally pumping into the incorrect tank. Record inventory. Make sure all required personnel are present.
5. **Ground Cables:** An electrical grounding cable should be secured to the container to account for any static electricity formed by the flow of the combustible liquid.
6. **Ensure Proper Ventilation and Pressure:** Both tanks must be at atmospheric pressure in order to proceed. Vent both tanks to atmosphere by slowly opening the vent valve on each tank. Leave vent valves open.
7. **Connect Hose:** Open the manlid on intended storage tank and check again that it is empty and clean. Assemble pumps, hoses and connections. Place drip trays under connections to collect any spillage. Connect the pump to the air supply and confirm that it is operating. Isolate air supply to the pump. Connect the suction hose of the pump to the three-inch BSP/two-inch camlock female connector of the bottom discharge connection of the delivery tank. Place drip trays under the connections. Place the delivery end of the hose in the manway positioning the end of the hose about 12 inches

from the bottom of the tank. Secure the hose to intended storage tank and close the lid resting on the hose.

8. **Begin Transfer:** Open the isolation valve on the bottom discharge connection of the delivery tank. Check for leaks. Slowly open the air supply to the pump. Check for leaks again.
9. **Check for Delivery:** Check the intended storage tank to verify liquid transfer. If no delivery, immediately stop the pump and investigate the cause. Under no circumstances pump against a closed valve or obstruction.
10. **Terminate Transfer:** When loss of suction is reached, close the valve on the delivery side of the pump. Close the air supply to the pump. Check that the delivery tank is empty. Close the delivery valve on delivery tank.
11. **Remove Hoses and Release Container:** Disconnect the valve at the discharge side of the pump. Drain the hose by lifting it higher than the tank manway of storage tank and open the valve previously connected to the delivery side of the pump. Disconnect the hose from the delivery tank.
12. **Prepare for Return of Container:** Secure both tanks by ensuring all valves are closed and lids closed. Ensure all hoses are disconnected and all equipment used is collected.
13. **Check for Spillage:** If there is a spill, see “Spill and Disposal” and follow steps deemed necessary.
14. **Clean Equipment:** Properly clean all equipment used in the transfer.
15. **Monitor:** After successful transfer of VESTA[®], review proper storage temperatures and pressures. Construct a plan on how to avoid fire and explosion hazards.
16. **Brief Personnel on Storage Guidelines:** Review handling safety guidelines and make sure personnel is educated on potential hazards and damage control in case of an accident.

Additive Injection Systems

For typical additive metering systems, the VESTA[™] 5100 injection rate is controlled by the diesel flow rate, the predetermined treat rate and the variable flow adjustment of the pump. VESTA[™] 5100 can be metered into a diesel blending header with positive displacement pumps (eg. Diaphragm and plunger pumps).

For batch blending operations, low cetane diesel is pumped into the blending tank. Centrifugal (or gear type pumps) are used to deliver the appropriate treatment rate of VESTA into the blending tank. The volume of the additive in the delivery tank will be predetermined to match the desired treat rate for the end tank.

Spills, Disposal and Environmental Awareness

VESTA[®] is a combustible liquid and is to be treated as hazardous waste. Local environmental codes may dictate special provisions concerning the containment of this NOx mitigant. We suggest proper familiarization of these codes as well as federal hazardous waste regulations. Disposal of VESTA[®] must be made in accordance with these local and federal regulations.

Emergency spill equipment should be available near any unloading, storage and handling locations.

If spillage occurs, it is to be contained immediately and should not be allowed to enter sewage systems as VESTA[®] is toxic to aquatic environments. Any nearby sources of ignition are to be eliminated promptly and completely in order to prevent fire hazard.

Slight vapor evaporation may occur following spill. In order to reduce evaporation, the use of a fine water spray is sufficient.

Vacuuming or laying down dry absorbent material have both been proven to be effective collection measures for the accidental release of VESTA[®]. Collected spill materials should then be discarded in a manner consistent with good waste management as well as proper consideration for environmental regulations and product handling guidelines.

Contaminated clothes and materials are to be disposed of and not to be reused.

Smooth concrete areas and metal trays may be decontaminated with soap and water and reused.

After spill has been contained and collected, it is crucial to decontaminate the area. The accidental release of another chemical in the future could react with remaining residue of VESTA[®].

Contaminated soil should be removed from site and disposed of in accordance to local and federal regulations.

Contact Information

Assistance

For additional information regarding the unloading, storage or handling of VESTA[®] 5100, contact 747-224-0247.

VESTA[®] 5100 is only to be obtained directly through California Fueling. To order product samples or additional literature, call 747-224-0247.

Glossary

Air Driven Diaphragm Pump : air-operated, double diaphragm pump used to pump solvents
Boiling Point : The temperature at which a given material undergoes a state change from liquid to gas.
Centrifugal Pump : a pump that uses an impeller to move water or other fluids.
Combustion : the process of burning something
Contaminate : make something impure by exposure to or addition of a polluting substance.
Density : a measure of mass per volume.
Electrical Conductivity : a materials ability to conduct an electric current.
Emission : the production and discharge of something.
Exothermic : A chemical reaction that releases heat.
Flash Point : the minimum temperature at which vapors of the material will ignite.
Frangible Roof : a joint between the roof and the shell of a storage tank designed to fail at relatively low pressures.
Freeze Point : the temperature at which a given material undergoes a stage change from liquid to solid.
Nitrogen Blanket : is a process of introducing an inert gas, such as nitrogen to a storage tank to counter the effects of oxygen on the storage material.
Oxidizing Agent : a substance that facilitates oxidation by being reduced and gaining electrons.
Pressure : The force per unit area exerted by a fluid against a surface with which it is in contact
Reactivity : the tendency of a material to undergo a chemical reaction.
Thermal Decomposition : the temperature at which the substance chemically decomposes
Viscosity : the state of being thick, sticky, and semifluid in consistency, due to internal friction.
Water Deluge : a sprinkler system connected to a water supply through a deluge valve that is opened by the operation of a smoke or heat detection system