Pennz Suppress®

The Effective PRIME COAT

Alternative to Solvent Cut-back Asphalt

PennzSuppress® D, a water-based petroleum resin emulsion, contains no ground level ozone producing volatile organic compounds (VOCs) or solvents in its formulation. Independent testing confirms that PennzSuppress D provides performance characteristics that are comparable to or exceed solvent cut-back asphalt. Extensive research and state certifications have also demonstrated that PennzSuppress D is safe for the environment and the workers who apply it.

Clean Air Act mandated restrictions prohibit or limit the use of solvent cut-back asphalts as prime coats. With PennzSuppress D, contractors no longer have to compromise construction standards for environmental safety. One gallon of PennzSuppress D concentrate can treat five times the area of a typical solvent cut-back asphalt, From performance on the road to safety for the environment and workers - PennzSuppress D does the job!

Promotes adhesion

Superior penetration

Provides a dust-free surface

Reduces moisture susceptibility

Safe, stable and requires no heating

PENNZSUPPRESS® D

SOLVENT FREE & SAFE FOR WORKERS

ENVIRONMENTALLY Pennz Suppress SAFE

Independent Testing conducted by the Texas Transportation Institute.

See back.

PennzSuppress ® D

Laboratory testing* confirms that deeper penetration, stronger cohesion, environmental performance and worker safety make PennzSuppress D the effective alternative to solvent cut-back asphalt.

Improves Road Base Strength

Using a modified cohesion tester, test data indicate that PennzSuppress D improves the cohesive resistance of the road base material. Cohesive resistance of PennzSuppress D treated samples were 43% stronger than the unprimed limestone, 12% stronger than MC30 (solvent cut-back asphalt), and 31% stronger than a generic asphalt emulsion. The improved cohesion of the PennzSuppress D primed surface promotes a better bond between the asphalt pavement and the underlying base course. Additionally, measurements of the shear properties of the interface between the PennzSuppress D primed base and hot mix asphalt, indicates that PennzSuppress D can improve shear strength by as much as 14%.

Penetrates the Road Base

Deeper penetration supports a better bond with the asphalt pavement. Laboratory test data illustrate that within one hour of application, PennzSuppress D penetrates deeper than solvent cut-back asphalt and generic asphalt emulsions. The superior penetration provided by PennzSuppress D minimizes tracking and helps provide a thicker bonding layer.

Dust Control

Testing conducted by the Midwest Research Institute indicates that PennzSuppress D provides a high level of efficiency in suppressing dust after several thousand vehicle passes. Measurement of dust particle sizes of 10 microns in diameter and smaller (also known as PM_{10}) indicate that dust levels were reduced by 86% after 7,000 vehicle passes.

Reduces Moisture Susceptibility

PennzSuppress D reduces the moisture susceptibility by coating aggregate grains and plugging pore throats isolating pore spaces from one another. The photo to the right illustrates the isolated pore space in blue. The pore throat plugging benefit of PennzSuppress D eliminates capillary voids that connect pore spaces which significantly reduces or eliminates avenues for moisture migration.

Economical

PennzSuppress D is sold as a concentrate and diluted with water prior to application whereas solvent cut-back asphalts are applied neat. One gallon of PennzSuppress D will cover five times more surface area than one gallon of a typical solvent cut-back asphalt prime coat application.

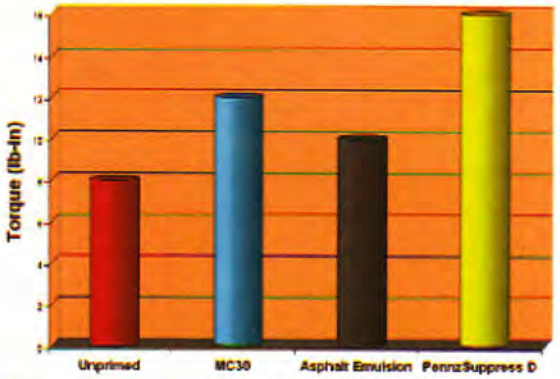
PennzSuppress

Prime Coat
Dust Suppressant
Soil Stabilizer

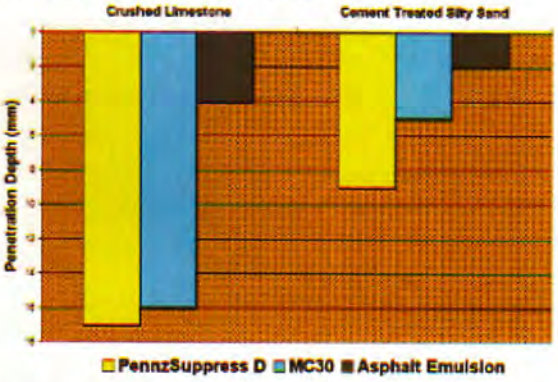
pennzsuppress.com

*Independent testing conducted by the Texas Transportation Institute using manufacturers recommended application of four parts water to one part product (4:1) applied at 0.25 gal/yd².

Cohesion Test Results



Penetration Test Results



PennzSuppress D PM_{10} Dust Control Efficiency Values after Treatment

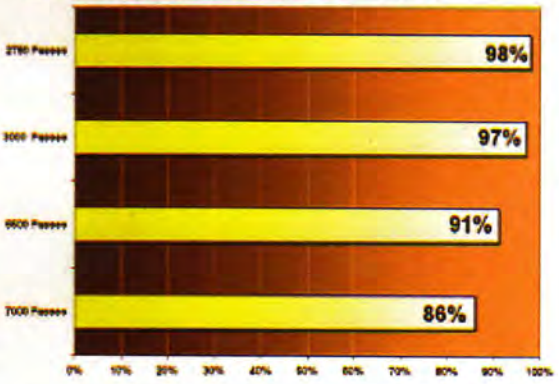
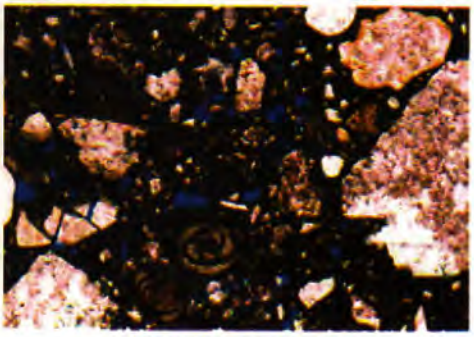


Photo Micrograph
Aggregate Treated with PennzSuppress D



Isolated pore space shown in blue.

Our Work Begins Where the Pavement Ends™

PennzSuppress® D Executive Summary

Product Overview

PennzSuppress® D is a uniquely formulated, patented, very effective dust control agent for treatment of aggregates, soils and ores. It is sold in a concentrate form, and is diluted with water for application to roads and other surfaces where airborne dust is undesirable. Our standard dilution rate is four parts water to one part product (4:1 dilution), however, in arid environments, greater amounts of water may be used to lower the viscosity and improve the product penetration into the road surface.

The water acts as a carrying agent allowing PennzSuppress to penetrate into the road surface. As the dilution penetrates the water evaporates allowing the active ingredients within the PennzSuppress formulation to agglomerate the fine dust producing particles and bind the aggregate to build a durable cohesive surface. The active ingredient, consisting of a non-water soluble petroleum resin, remains in the road surface improving the water repellency of the road while creating a more predictable driving surface in wet conditions and helping to minimize the detrimental effects of spring season freeze/ thaw cycles.

Product Composition

PennzSuppress is formulated with source specific ingredients and is manufactured in an ISO 9001 certified facility. The primary active ingredient is a petroleum resin that is derived from Pennsylvania crude oils, also known as Penn Grade Crude Oils. The resin produced by Penn Grade Crude Oils is deficient in asphaltenes which may contain many carcinogenic compounds. The lack of asphaltenes in PennzSuppress contributes to the non-carcinogenic properties of PennzSuppress making it safe for the workers that apply the product. In addition to being non-carcinogenic, the petroleum resin is also non-water soluble. This allows for a durable dust control agent that does not wash away during precipitation events.

Since oil and water do not mix, PennzSuppress contains emulsifiers that are used to emulsify the petroleum resin and allow it to stay in suspension for long periods of time prior to use. The emulsifiers also contain components that aid in the binding properties of the product once applied. In the manufacturing of PennzSuppress, considerable energy is used to shear the resin into small microscopic sized globules so that the emulsifiers can be mixed in to coat the resin globules and allow them to stay in suspension when mixed with water. Once the product is applied to the road, the resin globules attach to the soil particles and separate from the water in an irreversible process.

Product Benefits

The unique properties and ingredients of PennzSuppress allow for an effective dust suppressant that is safe for workers and the environment. All testing done to determine product safety, health, and environmental attributes has been done by third party laboratories. Human health and safety benefits of the product include the following:

- Non-toxic
- Non-carcinogenic
- Non-flammable
- Non-mutagenic
- Non-irritating to eyes
- Non-corrosive to metal

Although no one should ingest PennzSuppress due to the laxative properties that are inherent in the petroleum resin, toxicity test results on PennzSuppress indicate it is less toxic than table sugar. In addition to the non-carcinogenic properties that were previously mentioned, PennzSuppress is also non-mutagenic. Animal test data also indicate that PennzSuppress is non-irritating to the eyes. Water used in the product formulation also contributes to the non-flammable characteristics of the product. Testing of the corrosive properties of PennzSuppress indicate it is non-corrosive to metal.

The fate of PennzSuppress within the environment has been a principle point of focus on PennzSuppress which prompted extensive testing. In fact, PennzSuppress is the first dust suppressant to be certified by the California Environmental Protection Agency for various claims relating to the water quality and air quality benefits provided by the product. Environmental attributes of PennzSuppress include the following:

- Not a hazard to Ground Water
- Low Aquatic Toxicity
- Non-Hazardous Waste
- Non-inhibiting to Plant Growth
- Non-Toxic to Aquatic Sediment
- Effective in Reducing Dust

The non-water soluble characteristics of the petroleum resin allow PennzSuppress to be used safely without contributing any constituents that would adversely impact ground water. Testing conducted on the product to determine its toxicity to vegetation was also used to confirm that PennzSuppress is an effective erosion control agent which helped gain additional certification by the Texas Transportation Institute at Texas A&M University. Although PennzSuppress is not designed to enter an aquatic environment, testing indicates it has a low aquatic toxicity. Additionally, data indicate that sediment that has been treated with PennzSuppress poses no toxicity to aquatic organisms. This useful information indicates that there is no risk to aquatic environments in the event that treated sections of the road way are eroded and become sediment in a stream bed, lake or pond. PennzSuppress is not a waste and is not composed of waste products; however, if waste quantities of PennzSuppress are generated from a spill, the resulting material is not a hazardous waste. Lastly, field testing of PennzSuppress in mines, quarries, and public roads, indicates it is very effective in reducing dust that the EPA classifies as PM_{10} (particulate material 10 microns or less).

Dust Control Performance

To assess the performance of PennzSuppress in controlling PM_{10} and $PM_{2.5}$ emissions ($PM_{2.5}$ represents a new evolving EPA dust standard for particulate material that is 2.5 microns diameter or less), the independent not-for-profit Midwest Research Institute (MRI), completed a series of field tests on unpaved roads that were treated with PennzSuppress. MRI applied the same sampling methods that the Institute had used during the 1980's to evaluate dust palliatives for US EPA. Dust emissions were measured at two different test roads and two different types of surface treatment were examined – surface stabilization and topical application. Field testing spanned a period

of up to approximately 120 days. The number of vehicle passes ranged from 35 to 200 vehicles per day with cumulative vehicle traffic totaling up to 7,000 passes. Using specially-designed dust sampling equipment, MRI quantified the amount of PM_{10} and $PM_{2.5}$ dust particles generated by vehicle traffic on both the treated and untreated road surfaces. The control efficiency of PennzSuppress was calculated by comparing dust emission measurements from the treated roads to the untreated roads.

The results were quite impressive. At the end of 5,500 to 7,000 vehicle passes, PennzSuppress still controlled PM_{10} emissions in the range of 86 to 98% and controlled $PM_{2.5}$ emissions in the range of 83 to 97%. The field data indicates that $PM_{2.5}$ control efficiency was typically within ±4% of the PM_{10} control efficiency. MRI's comparison results from a topical versus a surface stabilization treatment found essentially no difference in PM_{10} control efficiencies. After approximately 6,000 vehicle passes, both treatments provided roughly 90% control for PM_{10} emissions.

Comparison of PennzSuppress to Magnesium Chloride

When compared to magnesium chloride (MgCl), PennzSuppress offers several important advantages. First, magnesium chloride can exhibit corrosive characteristics while PennzSuppress is non-corrosive to metal. The hygroscopic properties of magnesium chloride mandate that atmospheric humidity levels be sufficient enough to allow the treated road to absorb the humidity from the air. In arid and semi-arid environments, the ambient atmospheric humidity is often times insufficient to allow magnesium chloride to work. Since PennzSuppress works by agglomerating the fine dust producing particles in the aggregate, it does not require high levels of humidity to make it work. The hygroscopic properties of magnesium chloride also cause it to be soluble in water, consequently allowing the product to leach away from the road surface and impact vegetation and water resources. PennzSuppress remains in the road resistant to precipitation induced leaching providing ongoing protection regardless of relative humidity levels or weather changes.

Recent field testing of a PennzSuppress treated road adjacent to magnesium chloride treated road at a semi-arid Rocky Mountain region locale helped illustrate the superior dust suppression characteristics of PennzSuppress when compared to the magnesium chloride treatment for light duty pickup truck traffic. The results of this testing are summarized in the table below:

Category	PennzSuppress	MgCl Treatment	Untreated Road
Average Dust Emissions (mg/m^3)	**0.0073**	0.0144	0.04875
Frequency of Dust Emissions	**10%**	60%	100%
Magnitude Reduction	**Factor of 6**	Factor of 3	N/A
Dust Control Efficiency	**85%**	70%	N/A

As the table illustrates, PennzSuppress was clearly more effective than magnesium chloride in terms of reducing the dust generating frequency, magnitude reduction of dust emissions, and overall dust control efficiency. In terms of frequency of emissions, only 10% of the vehicles that traversed the PennzSuppress treated road produced detectable dust emissions contrasting to 60% of the vehicles traveling on the magnesium chloride

treated road. PennzSuppress reduced dust by a factor of six over the untreated road representing a 50% improvement of the dust control properties of Magnesium Chloride. Follow-up testing two days later yielded even more intriguing data.

Two days after the initial data was obtained, additional dust measurements were made of the magnesium chloride road. *Comparative data were not collected on the PennzSuppress road because it was still moist from the second of the two initial base applications and one could not assess if the lack of dust was due to product performance or the wet state of the road from the freshly applied PennzSuppress.* Regardless, the average dust emissions on the magnesium chloride road increased 76% to 0.064 mg/m^3 and the frequency of emissions increased to 100%, meaning that every vehicle that passed on the magnesium chloride treated road generated dust that was both visible and measurable by the test instrument. In two days time, the average dust levels on the magnesium chloride treated road section increased to levels that exceeded the untreated road section two days earlier. Factors that contribute to this rapid deterioration of the magnesium chloride treatment include a precipitation event between the two days test measurements, the lack of sufficient relative humidity in the semi-arid environment, and/or the lack of supplemental road watering on the second measurement event which may have artificially biased the first days test measurement data from the magnesium chloride test section. At any rate, these data clearly indicate superior dust control performance by PennzSuppress when compared to magnesium chloride in a semi-arid environment. PennzSuppress works on its own and does not require supplemental high humidity or road watering to provide dust control on unpaved roads.

For additional information, see our web site at

www.pennzsuppress.com

OUR WORK BEGINS WHERE THE PAVEMENT ENDS™

PENNZSUPPRESS® D

"Emulsified Petroleum Resin Road Dust Suppressant"

PRODUCT DESCRIPTION

PennzSuppress® D is a specially formulated, very effective dust control agent for treatment of aggregates, soils and ores. It is sold in a concentrate form, and is diluted with water for application to roads and other surfaces where airborne dust is undesirable. **PennzSuppress D** is typically applied in a 4:1 dilution (80% water, 20% PennzSuppress D concentrate). In addition to suppressing the irritating effects of airborne dust itself, **PennzSuppress D** is effective in reducing soil erosion and protecting vegetation from destruction by wind and water erosion.

PennzSuppress D contains effective binding agents to hold soil particles together and prevent them from being dispersed into the air. It is further formulated with an optimum blend of wetting agents, emulsifiers and dispersants to allow for ready penetration of the binding agents into the soil, easy emulsification with water and increased spreading power of the diluted mixture. **PennzSuppress D** readily emulsifies with all types of water and remains highly stable in its dilute form.

Formulated from a water emulsified resin base, **PennzSuppress D** contains no asphalt or solvent, as can be commonly found in other road dust suppressants. The binding agents in **PennzSuppress D** are non-volatile, offering a lasting effect, unlike the results obtained on roads treated with water alone. Concerns over the corrosive effects of road salts to vehicle underbodies will be eliminated with the use of **PennzSuppress D**, as it is non-corrosive to metal. Because this product contains water, it is non-flammable and safe during use. **PennzSuppress D** is classified as "non-hazardous," "non-toxic," and "non-carcinogenic" according to Federal OSHA regulations. It will not harm aquatic life.

APPLICATION

PennzSuppress D is a dust suppressant concentrate which can be diluted with all types of water. It is typically recommended for use at a concentration of 4:1 (water: concentrate), however, this product is versatile enough for use at other dilution ratios depending on soil conditions and application methods.

PennzSuppress D is applied by spraying the prepared area to be treated with the diluted concentrate in sufficient amounts to penetrate the layer of soil to the required depth. Application is accomplished through the use of water trucks or specially equipped spreader trucks designed for use with emulsified resin products.

The thickness of the **PennzSuppress D** resinous coating and depth of its penetration into soil can be readily controlled by varying the water:concentrate ratio, as well as the total volume of fluid used. The versatility of this product allows the applicator to design the application to provide highest efficiency depending on prevailing dust conditions, anticipated traffic and type of soil, as well as obtaining the greatest possible economy. Some soil types may be best treated with a one-time heavy application of product, whereas others may require several light applications. As a general rule, the depth of penetration of **PennzSuppress D** is deeper in sandy soil, moderate in silty soil and less in clay containing soil.

PennzSuppress D will find use in the treatment of soils on roads, parking lots, parks, and similar high dust areas. It can also be used to suppress dust from stationary piles of ores and coal. Because **PennzSuppress D** combines smaller particles into larger ones, it is useful as a soil compacting agent.

NOTE: **PennzSuppress D** should be kept from freezing or boiling. If the concentrate is stored for extended periods, the product should be agitated before use.

BENEFITS

- Provides excellent dust cohesion and suppression
- Excellent stability
- Emulsifies readily with all types of water
- Reduces soil erosion
- Non-flammable
- Effective under a variety of dust conditions
- Non-toxic, non-hazardous, non-carcinogenic
- Will not harm aquatic life

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES
PENNZSUPPRESS® D

PROPERTY	TEST METHOD	TYPICAL RESULTS
Specific Gravity @ 60°F (15.6°C)	ASTM D-1298	1.0254
API Gravity @ 60°F (15.6°C)	ASTM D-287	6.5
Viscosity @ 77°F (25°C)	ASTM D-244	188
Residue by Evaporation, wt.%	ASTM D-244	68
Water by Distillation, wt.%	ASTM D-244	32
Sieve Test, wt.% retained	ASTM D-244	0
Viscosity, cSt @ 40°C (within 24 hours)*	ASTM D-445	532
Flash Point, °F (°C)	ASTM D-92	None
Pour Point, °F (°C)	ASTM D-97	45 (9)
Emulsion Stability, ml cuff after 1 month, 4:1 (80%/20%) dilution (water: concentrate)	Calculated	<10
Product Code		**5000**

*Viscosities of this type of emulsion fluctuate with time, therefore viscosities must be run within the specified time after original manufacturing, or they will be different.

Typically, ¼ gallon of diluted PennzSuppress D per square yard is applied twice, in separate treatments, one after the other. The dilution ratio of PennzSuppress D concentrate to water and the frequency of treatments will vary depending upon soil conditions, porosity, anticipated traffic, etc. To aid in determining the approximate square yardage of the area to be treated, and the approximate volume of diluted PennzSuppress D to be applied, please refer to the chart below:

Approximate Size Of Treatment Area	Conversion To Square Feet	Conversion To Square Yards
1 mile x 20 feet	105,600	11,733
1 mile x 16 feet	84,480	9,387
1 mile x 12 feet	63,360	7,040
1 mile x 10 feet	52,800	5,867
1 mile x 8 feet	42,240	4,693
1 acre	43,560	4,840

OUR WORK BEGINS WHERE THE PAVEMENT ENDS™

PENNZSUPPRESS® D

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

PennzSuppress® D Road Dust Suppressant is a unique, patented product designed to "safely" control dust, stabilize soil and control silt run-off from unpaved roads, parking lots, and surfaces. With the continued trend toward stricter enforcement of health, safety, and environmental regulations, PennzSuppress D provides a cost-effective way to reduce dust-related health and environmental concerns, and aids in complying with clean air and water requirements.

PennzSuppress D was developed to address the concerns of air and water quality management agencies to provide safe and effective control of dust and silt run-off. Many dust suppressants of the past were made with inadequately refined, potentially carcinogenic petroleum oils that are diluted with flammable, highly volatile solvents. Other suppressants contain chemicals that reduce dust, but are reported to be corrosive to metal on vehicles and other equipment which come in contact with treated areas.

The patented formula for PennzSuppress D replaces solvent diluted carcinogenic oils and other chemicals with water-emulsified petroleum resin and binding agents, wetting agents and emulsifiers. **PennzSuppress D imposes neither physical nor health hazards, and is therefore considered non-hazardous** according to the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard. In detail, the unique characteristics of this product mean that PennzSuppress D is:

- **EFFECTIVE IN REDUCING DUST FROM UNPAVED ROADS,**
- **NOT A HAZARD TO GROUNDWATER,**
- **NON-TOXIC TO ANIMAL LIFE,**
- **NON-IRRITATING TO EYES,**
- **NON-CARCINOGENIC,**
- **NON-MUTAGENIC,**
- **NON-FLAMMABLE,**
- **NON-CORROSIVE TO METAL,**
- **NON-HAZARDOUS WASTE/"TCLP-SAFE"** (Toxicity Characteristic Leaching Procedure),
- **NON INHIBITING TO PLANT GROWTH, and**
- **LOW IN TOXICITY TOWARD FISH.**

The word "hazardous" is a broad term that can be applied to many different properties of a product or its handling, and may be regulated by many different agencies. Materials can present "hazards" due to concerns over health, fire, environment, disposal, shipping, packaging, and numerous others. In support of the claims made above, the following sections provide details, about health, safety and environmental testing that have been performed on PennzSuppress D.

EFFECTIVELY REDUCES AIRBORNE DUST FROM UNPAVED ROADS

According to a recent United States Environmental Protection Agency (US EPA) survey, unpaved roads account for 28% of the nationwide dust emissions known as PM-10 (particulate matter with diameters of 10 microns or less). Recently, US EPA revised the National Ambient Air Quality Standards by adding a new particulate size to its emission limits by using a PM-2.5 standard (particulate matter with diameters of 2.5 microns or less). US EPA also added tighter restrictions for PM-10.

To assess the performance of PennzSuppress D in controlling PM-10 and PM-2.5 emissions, the independent, not-for-profit Midwest Research Institute (MRI), completed a series of field tests on unpaved roads that were treated with PennzSuppress D. MRI applied the same sampling methods that the Institute used during the 1980's to evaluate dust palliatives for US EPA. Dust emissions were measured at two different test roads and two different types of surface treatments were examined – surface stabilization and topical application. Field testing spanned a period of up to approximately 120 days. The number of vehicle passes ranged from 35 to 200 vehicles per day with cumulative vehicle traffic totaling up to 7,000 passes. Using specially-designed dust sampling equipment, MRI quantified the amount of PM-10 and PM-2.5 dust particles generated by vehicle traffic on both the treated and untreated road surfaces. The control efficiency of PennzSuppress D was calculated by comparing dust emission measurements from the treated roads to the untreated roads.

The results were quite impressive. At the end of 5,500 to 7,000 vehicle passes, PennzSuppress D still controlled PM-10 emissions in the range of 86 to 98% and controlled PM-2.5 emissions in the range of 83 to 97%. The field data indicates that PM-2.5 control efficiency was typically within ±4% of the PM-10 control efficiency. MRI's comparison results from a topical versus a surface stabilization treatment found essentially no difference in PM-10 control efficiencies. After approximately 6,000 vehicle passes, both treatments provided roughly 90% control for PM-10 emissions.

Control efficiency data generated by MRI confirm that PennzSuppress is highly effective in controlling dust generated by vehicle traffic on unpaved road surfaces.

NOT A HAZARD TO GROUNDWATER

Based on analytical testing results, PennzSuppress D does not pose a hazard of adversely impacting groundwater from the leaching of water-soluble constituents. Samples of roadbed aggregate were treated with PennzSuppress D and tested using the synthetic precipitation leaching procedure (SPLP), developed by the United States Environmental Protection Agency. This testing was conducted to determine the potential for soluble constituents to leach or dissolve due to acid rain. The SPLP testing indicates that no harmful leachable constituents are present in the product.

NON-TOXIC TO ANIMAL LIFE

When a dust control agent is applied to roadways, or other dusty areas, there is often a concern about its effect on the wildlife in the vicinity, as well as on humans applying and working with the material. This is a fundamental concern that was considered when the PennzSuppress D formula was designed.

The toxicity of a substance when ingested is known as its oral toxicity, which is expressed in terms of its LD_{50} value. "LD_{50}," which stands for lethal dose 50%, indicates the amount of a material that must be consumed to kill 50% of the test animal population in a controlled study. The higher the LD_{50} value, the greater the amount of material the test animals can tolerate, hence the lower toxicity of the test material.

To estimate the effect of consumption of PennzSuppress D by humans applying the product or animals living near a treated area, an acute oral toxicity test was performed by feeding the concentrate product (a "worst-case" scenario) to white rats. **An LD_{50} value of >30,000 mg/kg was obtained, indicating that the road dust suppressant is essentially non-toxic.** Since the product is not used in its concentrated form, water dilutions would be even less of a concern. To put this in perspective, the oral LD_{50} of several common materials are listed below, along with the result of the PennzSuppress D concentrate (remember - the higher the value, the lower the toxicity):

SUBSTANCE	LD_{50} (mg/kg)
Aspirin	1,000
Table Salt	3,000
Ethyl Alcohol	7,060
Sugar	29,700
PennzSuppress D	>30,000

NON-IRRITATING TO EYES

To estimate the effect of spraying PennzSuppress D into the eyes of humans applying the product, or animals in the area, a Primary Eye Irritation Test was performed using the concentrated product. The dust suppressant was evaluated as having a Toxicity Category of "IV," and no adverse eye reactions were noted at any time during the study. **This indicates that PennzSuppress D is essentially non-irritating to the eye.** Since the product is not applied in its concentrated form, but is diluted significantly with water, the diluted product is less of a concern.

NON-CARCINOGENIC

None of the components of PennzSuppress D are classified as carcinogens according to OSHA, IARC, or NTP, therefore the road dust suppressant is considered to be non-carcinogenic.

PennzSuppress D is partially composed of a residuum. Since some residua contain asphaltenes, which are often the subject of concern as to potential carcinogenicity, further

discussion is warranted. It is important to note that residuum produced by American Refining Group, Inc.'s (ARG) Bradford refinery is different from other residua, in that it does not contain asphaltenes, due to the unique characteristics of its originating crude. To determine carcinogenic potential of residua, the American Petroleum Institute (API) conducted lifetime skin painting studies and short-term tumor initiation/promotion assays in mice. This testing showed negative activity in both assays, therefore it was concluded that the residuum partially composing PennzSuppress D is not carcinogenic.

NON-MUTAGENIC

The term "mutagen" generally refers to a substance that causes mutations, or a change in the genetic material of cells. Unlike carcinogens, mutagens can be detected in short-term tests that can be run in either bacteria, cultured cells (*in vitro*) or in whole animals (*in vivo*). When the API tested residua in the *in vivo* bone marrow cytogenetics assay in rats, the residua were non-mutagenic. In this test, animals are dosed with the test substance, and their bone marrow cells are examined for chromosomal damage. Similarly, residua were non-mutagenic in the *in vitro* mouse lymphoma assay. In this assay, the test material is mixed directly with mouse lymphoma cells in culture, and mutations are scored. If the residuum was first digested with rat liver enzymes, and then mixed with mouse lymphoma cells in culture, it was weakly mutagenic. **When the results of all tests are evaluated collectively, the residuum, such as that used in the formulation of PennzSuppress D, is considered non-mutagenic.**

NON-FLAMMABLE

The unique formulation of PennzSuppress D utilizes water as a diluent, and contains no flammable components. Because the emulsified resin contains water, it is basically "self-extinguishing" in its concentrated form. In use, the product is diluted with more water for the purpose of application, which serves to further reduce any concerns over flammability. **PennzSuppress D is not classified as flammable or combustible, and therefore is not regulated by the U.S. Department of Transportation (DOT) during transportation, nor does the National Fire Protection Agency (NFPA) recommend specific conditions for its storage or use.**

NON-CORROSIVE TO METAL

There is often a concern about possible damage to vehicles and equipment operated on roads that have been treated with dust suppressants. To evaluate the corrosivity, or potential corrosivity, of a dust suppressant toward metal, corrosion rate tests can be conducted. **When tested as a concentrate in the presence of carbon steel, PennzSuppress D yields a corrosion rate of 3.5 mm/year, which indicates very low corrosive tendencies.** When diluted for actual use on a road, the corrosion rate is even lower. Magnesium chloride and calcium chloride, both of which have been used for many years as road dust suppressants, yield far greater corrosion rates to carbon steel, and have been known to cause metal pitting and stress cracking, with prolonged exposure. The DOT classifies materials with corrosion rates of < 6.5 mm/year as non-corrosive. When PennzSuppress D is used to treat roads and dusty areas, premature corrosion of vehicles and equipment need not be a concern.

NON-HAZARDOUS WASTE / TCLP – SAFE

PennzSuppress D is manufactured with source specific quality ingredients, utilizing no waste products in its formulation, and is not considered a waste. This testing was completed to assess the waste characteristics of PennzSuppress D in the event waste materials are generated from an accidental spill of PennzSuppress that must be cleaned up. PennzSuppress D passes the Toxicity Characteristics Leaching Procedure (TCLP) test, which is EPA's hazardous waste test for determining toxicity. The phrase "TCLP-safe" is sometimes used in the industry to refer to the absence of regulated chemicals in a waste material, when tested according to the TCLP method.

PennzSuppress D was tested in its concentrated form and does not contain any TCLP regulated chemicals, therefore it is not subject to this testing procedure at the time of disposal and need not be handled as a hazardous waste. Furthermore, PennzSuppress D does not contained any listed components or meet any of the other EPA criteria for classification as "hazardous" with regard to federal solid waste disposal regulations.

DOES NOT INHIBIT PLANT GROWTH

When a substance is applied to roadways, there are often concerns about harming plants that grow in the area. To evaluate the effect on plant growth in soil exposed to PennzSuppress D, an acute toxicity test for root elongation was performed on lettuce seeds (*Lactuca sativa*). This EPA test method is used to screen soil at hazardous waste sites to determine if materials dumped in the area are adversely affecting plant life. An 80/20 dilution of water/PennzSuppress D, which is the concentration of product most commonly applied, was used in water to determine the EC_{50}. "EC_{50}," which stands for effective concentration 50%, represents the inhibit root elongation in 50% of the test seeds. Again, the higher the EC_{50}, the lower the toxicity of the product.

The EC_{50} for the diluted PennzSuppress was determined to be 128,000 mg/kg. Based on the EPA's assessment of a "low concern" for EC_{50} values > mg/kg, PennzSuppress D is not considered harmful to plant growth. PennzSuppress D can be used to effectively control dust on roads near vegetation, without leaching of damaging chemicals into surrounding soil. Also, by holding fine dirt particles on seeded slopes, PennzSuppress D can temporarily bind soils to allow seed germination.

LOW TOXICITY TOWARD FISH

When areas near waterways are treated for dust control and silt run-off, there is a concern that the material applied may be washed into waterways by rain that follows application. Pollution of water and its effects on aquatic life are of increasing concern to the public and to regulatory agencies.

Chronic aquatic toxicity tests were conducted to assess the lethal affect on fish in streams, lakes or rivers, into which stormwater runoff from roads treated with PennzSuppress D

may flow. These tests were run under static conditions on both fathead minnow larvae (*Pemephales promelas*) and rainbow trout (*Oncorhynchus mykiss*). The endpoints studied included hatchability, survival, growth and reproduction. An 80/20 dilution of water/PennzSuppress D was used for the tests, which is the concentration of the product most commonly applied. The actual amount of PennzSuppress D, which would be washed off a road and into waterways by rain immediately following application, would be far less concentrated than the test dilution. Once PennzSuppress D has had adequate time to firmly set-up, it is resistant to deterioration and does not re-emulsify in rain.

The chronic values for the 96-hour test of the diluted PennzSuppress D were 130 mg/L for fathead minnow and 194 mg/L for rainbow trout. EPA assigns a rating of "low concern for Ch V's > 10 mg/L. From the results of these chronic tests, acute aquatic toxicity LC_{50} values were also calculated and found to be 510 mg/L for fathead minnow and 913 mg/L for rainbow trout. EPA rates LC_{50} values of > 100 mg/L as a "low concern." A U.S. Fish and Wildlife Research Information Bulletin #84-78 classified LC_{50} values of 100-1000 mg/L as "practically non-toxic." **Based on these results, PennzSuppress D exhibits a low level of toxicity toward the fish tested.**

REGULATORY INFORMATION

PennzSuppress D and its components are not regulated or classified as hazardous to health or the environment by any of the following agencies of legislation: EPA, OSHA, IARC, NTP, NFPA, DOT, CPSC, FIFRA, SARA Title III, Clean Air Act, or the Amended Clean Air Act.

There is one list on which it is a benefit to have all of the components of a given product – this is the Toxic Substances Control Act (TSCA) inventory. Appearance on this list indicates that a particular substance can be used in U.S. commerce. This means that if a material were to be released or spilled, information is readily available that will allow those dealing with the release to know how to handle it, and to know what effects it may or may not have on health and the environment. All components in PennzSuppress D are found on the TSCA inventory of chemical substances (1994).

MATERIAL SAFETY DATA SHEET
According to ANSI Z400.1-1998/ISO 11014-1:1994

PennzSuppress D

Revision Number 2, Revision Date May 10, 2011

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

Product Number 5000
Product Name PennzSuppress D
Synonyms Dust suppressant
Chemical characterization Liquid.
Manufacturer, importer, supplier PennzSuppress Inc.
360 Nueces Street, Ste.3609
Austin, Texas 78701
512-267-3553
EMERGENCY TELEPHONE NUMBER CHEMTREC: 1-800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

CAS	Chemical Name	% Weight	TSCA*	DSL - Canada*
T/S	Resins	50-60	Present	Present
7732-18-5	Water	10-30	Present	Present
T/S	Water soluble anionic surfactant	20-25	XU	Present
T/S	Non-ionic surfactant	1-5	XU	Present

* TSCA - United States - Section 8 (b) Inventory (TSCA)
* DSL - Canada - Domestic Substances List (DSL)

3. HAZARDS IDENTIFICATION

Emergency Overview:
- This product may be irritating to skin, eyes, nose, throat, and lungs. Use all necessary personal protection when handling this material.

Eye contact	• In concentrated form this product was evaluated as having a toxicity catagory of IV and no adverse eye reactions were noted at any time during the study. Since the product is not applied in concentrated form but is diluted significantly with water, the diluted product is even less of a concern.
Skin contact	• Prolonged or repeated exposure may cause irritation.
Inhalation	• Can cause respiratory tract irritation. • Avoid breathing vapors or mists
Ingestion	• Ingestion may cause nausea, vomiting, and diarrhea.
General advice	• As with any chemical, use caution when handling product.

4. FIRST AID MEASURES

General advice	• Immediate medical attention is not required • If exposure symptoms persist, seek medical attention. • Show this safety data sheet to the doctor in attendance
Skin contact	• Immediate medical attention is not required • Wash off immediately with soap and plenty of water. • Seek medical attention if effects persists.
Eye contact	• Immediately flush with plenty of water. After initial flushing, remove any

	contact lenses and continue flushing for at least 15 minutes ● Keep eye wide open while rinsing ● If exposure symptoms persist, seek medical attention.
Inhalation	● Immediate medical attention is not required ● Move to fresh air in case of accidental inhalation of vapours or decomposition products ● If exposure symptoms persist, seek medical attention.
Ingestion	● Do not swallow. Rinse mouth with water and afterwards drink plenty of water. ● Do not induce vomiting without medical advice ● Never give anything by mouth to an unconscious person ● Consult a physician
Notes to physician	● Treat symptomatically
Protection of first-aiders	● Use necessary personal protective equipment
Aggravated Medical Conditions	● Users with skin conditions (eczema, psoriasis, etc.,) respiratory conditions (asthma, bronchitis, emphysema, etc.,) or with chemical sensitivities should take protective precautions.

5. FIRE-FIGHTING MEASURES

Flash point	● Not applicable
Suitable extinguishing media	● carbon dioxide (CO2) ● water fog ● alcohol-resistant foam ● dry chemical
Specific hazards	● None
Extinguishing media which must not be used for safety reasons	● Water, except as fog
Special exposure hazards arising from the substance or preparation itself, its combustion products, or released gases	Keep product and empty container away from heat and sources of ignition.
Special protective equipment for firefighters	● As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear
Specific methods	● In the event of fire, cool tanks with water spray ● Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations
NFPA (National Fire Protection Association)	● Health=1, Fire=0, Reactivity=0, Special=0

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	● Evacuate personnel to safe areas ● Keep people away from and upwind of spill/leak ● Wear personal protective equipment
Environmental precautions	● Prevent further leakage or spillage if safe to do so ● Prevent product from entering drains
Methods for cleaning up	● Dam up ● Soak up with inert absorbent material ● Pick up and transfer to properly labelled container for disposal. ● Absorb spill with inert material (e.g. dry sand or earth), then place in a chemical waste container

7. HANDLING AND STORAGE

Handling

Technical measures/Precautions	● Use only in areas provided with adequate ventilation. ● Avoid contact with skin, eyes and clothing

Safe handling advice	• Wear personal protective equipment • Do not breathe vapours or spray mist. Ensure that ventilation is adequate before using this product. • Avoid contact with skin and eyes. Take necessary personal protective precautions before using this product.

Storage

Technical measures/Precautions	• Keep containers tightly closed; discard any material that may be contaminated or, which may have changed composition. • Keep away from heat • Protect from light • Keep in properly labelled containers.
Incompatible products	• No information available

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures	• Ensure adequate ventilation, especially in confined areas
Personal protective equipment	
Hand protection	• Impervious gloves
Eye protection	• Wear tightly fitting safety goggles or safety glasses with side-shields
Respiratory protection	• In case of insufficient ventilation, wear suitable respiratory equipment
Skin and body protection	• Long sleeved clothing
Hygiene measures	• Handle in accordance with good industrial hygiene and safety practice • Keep away from food, drink and animal feeding stuffs • When using, do not eat, drink or smoke
Environmental exposure controls	• No information available

9. PHYSICAL AND CHEMICAL PROPERTIES

General Information

Form	Liquid.
Colour	Brown.
Odour	Hydrocarbon oil.

Important Health Safety and Environmental Information

Boiling Point	>100°C / >212°F
Pour Point	6°C / 43°F
Melting point	-6°C / 21°F
Vapor Pressure	No information available.
Density	8.6 lbs/gallon
Vapour density	No information available.
Water solubility	Insoluble but emulsion can be suspended in water.
Specific Gravity	

10. STABILITY AND REACTIVITY

Stability	• Stable under normal conditions • Polymerization does not occur
Conditions to avoid	• Heat, flames and sparks • Strong oxidizing agents
Materials to avoid	• Incompatible with strong oxidizers, such as hydrogen peroxide, bromine, and chromic acid
Hazardous decomposition products	• When burned :carbon dioxide, carbon monoxide, hydrocarbons
Polymerization	• No information available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Component Information

The concentrated form of PennzSuppress D has an LD50 of > 30,000 mg/kg, indicating that this product is non-toxic. Since the product is not applied in concentrated form but is diluted significantly with water, the diluted product is even less of a concern.

Product Information

PennzSuppress D has been found to be non-toxic to animal life, non-irritating to eyes, non-carcinogenic, and non-mutegenic.

There are no data to indicate that PennzSuppress D is carcinogenic; however, the Heavy Resins component of PennzSuppress D shares a CAS number with other substances, "extracts of steam-refined and air-refined bitumens," that have been classified as possibly carcinogenic to humans (Group2B) by the International Agency for Research on Cancer (IARC). However, the heavy resins used in PennzSuppress are neither steam nor air refined; instead they fall in the IARC class, Bitumens-not classifiable as to their carcinogenicity (Group 3). Furthermore, manufacturer's product test data on the heavy resins are below the recognized levels that indicate carcinogenicity or mutagenicity. Further information on results of these screening tests (IP346 and modified Ames) are available from American Refining Group.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Non-hazardous to ground water and non-inhibiting to plant growth (EC50 of diluted product = 128,000 mg/kg)

Product Information

Aquatic toxicity Low toxicity toward fish. Fathead minnow (chronic 96-hour) 130 mg/L (acute LC50) mg/L. Rainbow trout (chronic 96-hour) 194 mg/L (acute LC50) 913

Other information:

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products	Dispose of in accordance with local regulations. This product is not characterized as hazardous according to federal regulations (TCLP-SAFE).
Contaminated packaging	Dispose of in accordance with local regulations.

14. TRANSPORT INFORMATION

DOT Not regulated.
UN-No
Proper shipping name
Hazard Class
Packing group

15. REGULATORY INFORMATION

U.S. Inventories

CAS	Chemical Name	% Weight	TSCA*
T/S	Resins	50-60	Present
7732-18-5	Water	10-30	Present
T/S	Water soluble anionic surfactant	20-25	XU
T/S	Non-ionic surfactant	1-5	XU

* TSCA - United States - Section 8 (b) Inventory (TSCA)

International Inventories

CAS	Chemical Name	% Weight	DSL - Canada *	EINECS *	ECL*	ENCS*	IECS – Inventory of Existing Chemical Substances*	AICS - Australia*	PICCS*
T/S	Resins	50-60	Present	T/S	KE-01954	T/S	Present	Present	Present
7732-18-5	Water	10-30	Present	231-791-2	KE-35400	N/A	Present	Present	Present
T/S	Water soluble anionic surfactant	20-25	Present	T/S	KE-04572	T/S	Present	Present	Present
T/S	Non-ionic surfactant	1-5	Present	T/S	KE-26244	T/S	Present	Present	Present

* DSL - Canada - Domestic Substances List (DSL)
* EINECS - European Inventory of Existing Commercial Substances (EINECS)
* ECL - Korea - Existing and Evaluated Chemical Substances (ECL)
* ENCS - Japan Existing and New Chemical Substances (ENCS)
* IECS – Inventory of Existing Chemical Substances - China
* AICS - Australia - Inventory of Chemical Substances (AICS)

16. OTHER INFORMATION

Prepared By Patrick Merrell, Consultant.

Notice We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

End of Safety Data

California Environmental Technology Certification

Pursuant to the provisions of Section 39620 of the California Health and Safety Code and Sections 71011 and 71031 of the Public Resources Code

Pennzoil-Quaker State Company

PennzSuppress® D

is hereby recognized as a

CERTIFIED TECHNOLOGY

PennzSuppress® D, when topically applied as a dust suppressant (0.15 gallons of concentrate per square yard of treated surface), reduces PM10 emissions by approximately 85% after 7,000 vehicle (predominantly light-duty) passes on an engineered unpaved road consisting of a well-graded aggregate. PennzSuppress® D does not contain concentrations of the metals listed in Title 22, Section 66261.24(a)(2)(A) of the California Code of Regulations (CCR) greater than their corresponding STLC and TTLC values with 95% confidence. The 96-hour LC50 of PennzSuppress® D (4:1 dilution in water) for fathead minnows, *Pimephales promelas,* is greater than 750 mg/L using the aquatic bioassay protocol found in Title 22, Section 66261.24(a)(6) of the CCR. PennzSuppress® D (4:1 dilution in water, applied to sediment) exhibits no toxicity to the freshwater amphidpod, *Hyalella azteca,* based on the Standard Test Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates (ASTM E 1706-95b). The acute toxicity (48-hr LC50) and chronic toxicity (7-day NOEC) of PennzSuppress® D (4:1 dilution in water) for water flea, *Ceriodaphnia dubia,* are 267 ppm (survival) and 32 ppm (reproduction), respectively. The acute toxicity (96-hr LC50) and chronic toxicity (10-day NOEC) of PennzSuppress® D (4:1 dilution in water) for rainbow trout, *Oncorhynchus mykiss,* are 913 mg/l (survival) and 135 mg/l (growth), respectively. The certification of PennzSuppress® D is based on its use as a dust suppressant in accordance with the manufacturer's instructions.

Certificate Number 00-08-001 is effective February 1, 2001, through August 15, 2003, unless revoked or modified for cause.

Winston H. Hickox, Agency Secretary
California Environmental Protection Agency

Joan E. Denton, Ph.D., Director
Office of Environmental Health Hazard Assessment

Alan C. Lloyd, Ph.D., Chairman
Air Resources Board

Arthur G. Baggett, Jr., Acting Chairman
State Water Resources Control Board