



- ✚ **Peat Sorb** is an environmentally friendly oil adsorbent product from Western Canada.
- ✚ **Zorbit** Pads and socks are natural unbleached cotton containers filled with PEAT SORB that can be used to contain oil spills and seepage.
- ✚ **Peat Sorb** is a modified peat product with a moisture content of 7%. When dried to this level it repels water and adsorbs oil on contact.
- ✚ **Peat Sorb** is equally effective on land and water.
- ✚ **Peat Sorb** is non-leaching. A hydrocarbon adsorbed into Peat Sorb is retained until it degrades.
- ✚ **Peat Sorb** is a humic mass that is already biodegraded: it will not break down further if disposed of in a landfill site.
- ✚ **Peat Sorb** is lightweight for easy handling and transportation.
- ✚ **Peat Sorb** is non-abrasive. It can be used around machinery without fear of damage to metal, plastic or rubber parts.
- ✚ **Peat Sorb** is available in bulk in compressed bales and in smaller “loose” amounts. Zorbit Pads and Socks are available in a variety of convenient sizes.
- ✚ **Peat Sorb** can be applied manually or mechanically.
- ✚ **Peat Sorb** will pick up a full range of petroleum products from crude oil to gasoline and has been used to solidify and adsorb resins, PCB's coal tars, fatty acids and hydrocarbon based inks.
- ✚ Pound for Pound **Peat Sorb** is about eight times as effective as clay based “kitty Litter” type sorbents, depending upon the type of oil to be cleaned up.
- ✚ **Peat Sorb** will not attract insects or rodents as other organics such as corn husk.
- ✚ **Peat Sorb** has been tested in independent laboratories and meets the requirements of the Toxicity Characteristics Leaching Procedure (**TCLP**), The Paint Filter Test and the Liquid Release Test (**LRT**).
- ✚ **Peat Sorb** is an effective vapor suppressant.
- ✚ **Peat Sorb** can be buried or burned in most jurisdictions subject to restrictions that may apply if it has been used to clean up hazardous waste.
- ✚ **Peat Sorb** products provide a comprehensive approach to meeting long standing environmental responsibilities and new legal requirements.
- ✚ **Peat Sorb** pads and socks are used daily around the world in shops, factories, transportation facilities, ports, refineries, garages, boats and golf courses; the products are available from local stocking distributors

# The Products

## Source:

Peat Sorb and the pads and socks are made from Canadian sphagnum peat moss. Canada has more than 250 million acres of peat lands covering over 12 % of the country.

Peat is partly decomposed plant matter that forms in waterlogged environments such as bogs and swamps from the gradual accumulation of mosses, grasses, shrubs and trees. Coal and oil form from peat following burial and compaction by mineral sediments over millions of years.

**Peat is plentiful and can be harvested without major damage to the peatlands.**

Unlike some European countries where the peat lands have been ravaged over time, peat harvesting and production in Canada is strictly regulated from the ecological perspective. The peatlands are viewed as a natural resources with a great commercial potential, but one that must be exploited in a responsible fashion. PEAT SORB is an environmentally friendly product in all stages from production through to use and disposal.

## Harvesting

Licenses to harvest peat in Alberta are granted only

following a full environmental impact assessment. PEAT SORB originates in a 9,000 acre bog in Alberta Canada, where the peat has a depth of from 3' to 15'. Harvesting takes place from May to September, weather permitting.

The current harvesting area is approximately 400 acres and has an expected life of 5 to 8 years. After the bog has been fully harvested it is turned over for agricultural purposes.

The portion to be harvested is first cleared and drained and then harrowed and raked. The loosened peat is then left in place to dry partially and is then vacuumed up. Raw peat stored at the plant ready for processing.

## Processing:

The raw peat is first put through a shredder to break large pieces to a consistent size. The product is then screened to take out wood sticks and other debris. It then passes through a proprietary drying process that reduces the moisture content to approximately 7% (as opposed to horticultural peat that has a moisture content of 55%).

Unlike other peat based products PEAT SORB is then passed through a de-dusting and dryer bin. The fine peat dust is separated from the coarse peat leaving a cleaner product from the user's point of view. The coarse product is then conveyed to compressing and bagging machines. PEAT SORB is

shipped in the form of double-compressed bales wrapped in pre-printed recycled plastic wrap.

**Properties:**

The range of physical and chemical properties of peat has led to many applications for it. It has long been used in agricultural and horticulture and its properties as a fuel have been appreciated for centuries. Because of its cellular structure, sorbent properties and high capacity for ionic exchange peat has been used a natural filter to purify residential and industrial effluents and to adsorb liquids and odors. Peat in its dehydrated form as PEAT SORB has additional properties.

Because of its dry cellular structure Peat Sorb has a wicking or sponging action that allows it to completely soak up hydrocarbons where water was once stored. The oil or other hydrocarbons is enclosed within the cells of the PEAT SORB and will not leach out. This appears to be the result of the very large surface area within the modified peat. In this respect PEAT SORB is not unlike activated carbon.

Since it repels water PEAT SORB will float while adsorbing water-borne contaminants. PEAT SORB will pick up a full range of petroleum products from crude oil to gasoline and has been used to solidify and adsorb resins; PCB's, coal tars, fatty acids and hydrocarbons based inks.

With respect to oil or petrol spills on water PEAT SORB's ability to float is of great benefit. Depending upon prevailing conditions PEAT SORB will float for a considerable amount of time (about 2 days) before taking on water and sinking. During this time it will soak up water-borne oil on contact. All oil is adsorbed and retained within the PEAT SORB where it can do no further harm to the environment, even if it should sink before recovery, workers can remove it from the water. Since it is a non-biodegradable, totally natural product PEAT SORB, whether it contains oil or not, can be left in the subject environment being cleaned up without fear of further damage.

When PEAT SORB was first developed, the manufacturer, in an attempt to describe the naturalness of the product, inadvertently described it as "biodegradable". This is in fact incorrect, as PEAT SORB is processed from material that has already biodegraded. After processing the resulting product is principally humic fiber that will only break down after a very long period of time; often over hundreds of years depending upon local conditions.

The hydrocarbons locked into the PEAT SORB will biodegrade however. Naturally occurring microorganisms and the humic acid in the PEAT Sorb contribute to the breakdown of the oil products. Petroleum products are complex mixtures that may

contain hundreds of different hydrocarbons compounds. Each constituent will affect the behavior of the product both before and after adsorption. In the final analysis, however, all hydrocarbons are organic carbon compounds containing only carbon, oxygen and hydrogen. Almost all petroleum hydrocarbons will be degraded to carbon dioxide and water by microbial process with PEAT SORB within a relatively short time.

The speed with which petroleum products biodegrade is affected by many factors, including oxygen levels, moisture, temperature, acidity, nutrient content and the size and type of natural microbes present. Significant degradation of petroleum hydrocarbons in soil has been documented in time periods of less than three months. Depending upon the nature of the petroleum product more typical time periods for degradation are in the range of six to eighteen months. The hydrocarbons trapped inside PEAT SORB will degrade to carbon dioxide and water long before the PEAT SORB itself does.

Oil retained and biodegrading inside non-leaching PEAT SORB is a better alternative to free floating oil which can continue to damage fish, plants and wildlife.

PEAT SORB is lightweight for easy handling and transportation. One 25 lb bale of PEAT SORB will do the same job as 500 pounds of

clay, resulting in significant savings in time and labor and storage cost.

#### **Properties of PEAT SORB:**

- Absorbs on Contact
- Effective on Land & Water
- Non-Toxic
- Non-Leaching
- Non-Biodegradable
- Lightweight
- Non-Abrasive
- Vapor Suppressive
- Easy Disposal
- Cost Effective

PEAT SORB has the advantage of being non-abrasive. For abrasive wear to happen to machinery it must come into contact with another substance of equal or greater hardness. PEAT SORB, with a hardness factor of 1 will not damage steel which has a hardness factor of 5. Clay, the major inorganic sorbent, has a hardness factor exceeding 6 and will damage metal parts and cause rapid deterioration of soft rubber and plastic parts. PEAT SORB can be used around all types of machinery without fear of damaging expensive equipment.

Most petroleum products are extremely volatile. Effective spill response involves rapid limitation of the exposure pathways to prevent skin contact, inhalation or ingestion. The vapor suppressive and static resistant qualities of PEAT SORB are a significant safety feature for

spill response crews. Results of an independent test of the vapor suppression qualities of PEAT SORB are described under the heading of "Laboratory Tests".

**LABORATORY TEST:**

PEAT SORB, and peat based sorbents generally have been subjected to a variety of laboratory tests. Most of these tests have been conducted in order to determine compliance with regulatory requirements, particularly in the United States.

Generally, the various regulatory authorities in the United States require three performance tests to determine whether a sorbent is suitable for landfill disposal. These are the Toxicity Characteristic Leaching Procedure (TCLP), the Liquid Release Test and the Paint Filter Test. PEAT SORB has been subjected to these tests and has been found to satisfy the requirements.

In May, 1990 PEAT SORB itself analyzed by ZENON Environmental Inc for leachate quality. Their opinion was that the product meets with the requirements of the Ministry of the Environment for the Province of Ontario, Canada and that the sample submitted appeared to be safe for disposal in a landfill site. The full results of these tests are included in the "Reference Material".

In March 1991 Analytical Services, Inc. Analyzed PEAT SORB

containing gasoline and oil pursuant to the TCLP in effect at the time. The results of both the gasoline test and the oil test indicate that most of the substances tested for were below detection limits and with the exception of benzene on the gasoline test all were below regulatory limits. The full results of these tests are included in the "Reference Material;"

In test performed in January 1992 and reported the following month National Environmental Technology Applications Corporation (NETAC) examined PEAT SORB's ability to absorb cutting oil and to characterize the cutting oil – adsorbent mixture as to suitability for landfill disposal. These test were conducted according to United States EPA approved methods and instrumentation in all analytical work. The tests indicate a holding capacity of 3.78 to 1 based on weight. The analyses of the samples of the cutting oil – PEAT SORB mixtures tested show that PEAT SORB had adsorbed cutting oil and passed the TCLP tests with none of the listed compounds being detected. The full NETAC report is included as part of the "Reference Material".

PEAT SORB meets the requirements of the Toxicity Characteristics Leaching Procedure (TCLP), the Paint Filter Test and the Liquid Release Test.
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Release of oil from Peat Sorb has been evaluated by the producer using a modified soil mechanics consolidated testing machine. PEAT SORB was mixed with varying proportions of Soya oil and subjected to a pressure of 50 psi. The tests show that at a ratio of 1 1/4 parts of oil to 1 part PEAT SORB no oil was released. At ratios greater than 1 1/3 to 1 some oil was released under 50 psi pressure. The tests show that PEAT SORB will absorb approximately seven times its own weight of oil but under pressure will release some of that oil.

An independent test of PEAT SORB's vapor suppression capabilities and the effects of foam on Peat Sorb was carried out by the Fire Department of a city in the state of Kansas, USA. The tests show that PEAT SORB is an effective product in the suppression of flammable vapors. An extract of the report on this test is included in the "Reference Material".

Independent lab tests show that PEAT SORB is non-leaching, non-toxic and suitable for landfill disposal provided that the substance absorbed is not toxic.

The sorbent properties of peat products have been extensively tested by the Emergencies Engineering Division of Environment Canada. A Modified peat sample, similar to

PEAT SORB, was lab tested on 6 hydrocarbons and water. For each gram of modified peat sorbent used the hydrocarbon capacities were 8.38 grams of C-hexane, 9.36 grams of Toluene, 9.07 grams of Diesel, 6.16 grams of crude oil, 6.76 grams of weathered crude oil and 5.51 grams of Bunker C- on contact. Initial water pickup was minimal- but modified peat will take on water over longer time periods.

Lab and practical tests show Peat Sorb to be an effective sorbent for a wide variety of liquids. Further lab tests are ongoing and the results will be reports as received.

Peat Sorb Works On:

Acetone  
Acetonitrile  
Amyl Acetate  
Benzene  
Butanol  
2-Butanone  
Bromodichloromethane  
Bromoform  
Carbon Disulfide  
Carbon Tetrachloride  
Chloroform  
Chloromethane  
Chlorobenzene  
Cutting Oils  
Cyclohexane  
Dichlorobenzene  
1,2-Dichloroethane  
Diesel Fuels  
Ethanol  
Ethylbenzene  
Ethyl Ether  
Ethylene Glycol  
Gasoline  
Glycerine  
Heptane  
Hexane  
Hexachlorobenzene  
Hexachlorobutadiene  
Hexachloroethane  
Isobutanol  
Isopropene  
Isopropanol  
Jet Fuels  
Kerosene  
Methanol  
Methylene Chloride  
Methyl Ethyl Ketone  
Methylphenol  
Motor Oils  
Naphthalene  
2-Nitroaniline  
Nitrobenzene  
Pentane  
Pentachlorophenol  
Phenol  
Propanol  
Styrene  
Tetrachloroethane  
Tetrachloroethylene  
Tetrahydrofuran  
Toluene  
Trichloroethylene  
Trichlorophenol  
Varsol  
Vinyl Acetate  
Vinyl chloride  
Xylenes

### **Use and Disposal:**

On land PEAT SORB is spread on the spill manually or mechanically using a blower until all of the oil is absorbed. On small spills it should be spread from a height of about 6" to prevent excessive dispersion of the product. On larger spills dispersion may be more desirable. In windy conditions Peat Sorb should be spread from the upwind side of the spill. The saturated Peat Sorb can be swept up with a stiff broom and placed in a suitable container. On hard surfaces such as asphalt and concrete it can be used as a sweeping compound to remove traces of oil.

Following an explosion at an oil storage tank farm in Texas that resulted in two deaths and the dispersion of oil over a wide area, spill response teams used Peat Sorb for the clean up operation. The loose Peat Sorb was spread manually over the oil soaked fields and then tilled into the ground mechanically. The Peat Sorb was simply left in place to absorb the oil from the earth.

Within a matter of a few weeks grass was again growing over the whole site and there was no evidence of the contamination caused by the explosion. Similar results have been achieved using Peat Sorb to clean up spills in marshy areas. After a short period of time there is strong regret of damaged plant life with no evidence of contamination.

On water Peat Sorb is spread from the upwind side of the spill manually or mechanically using a blower. The Peat Sorb will float until it comes into contact with oil, which it will then soak up and hold. The Peat Sorb, with the oil safely retained within it can be left in place or removed from the water. Screened forks, pool skimmers, skimmer shovel shovels or suction devices can be used to remove the oil saturated Peat Sorb from the water.

Peat Sorb can be used to fill in the spaces around "over pack" drums as a further safety precaution. On removable lid hydrocarbon drums Peat Sorb can be mixed with the liquids inside until the contents are solidified for easier handling, transportation and disposal.

Pads and socks can be used in situations where loose Peat Sorb is not appropriate or where it would be difficult to clean up. The pads can be used under drips or placed in pools, sumps, bilges, or storage tanks where ease of extraction is a factor. The socks can be used to contain spill on water or solid ground. On land or solid flooring the socks are heavy enough to form a good seal, preventing further migration of the oil. The socks are particularly useful for wrapping around leaking machinery or valves until they can be repaired or replaced.

As a rule, one pound of Peat Sorb whether loose or in a pad or sock will clean up approximately one gallon of liquid. When it is fully

saturated Peat Sorb becomes very dark in color, resembling coffee grounds or used tea leaves. When this occurs the used product should be disposed.

The disposal of used Peat Sorb depends upon the contaminate absorbed and local laws and regulations. Since Peat Sorb is non-leaching it can be disposed of in landfill sites in most jurisdictions depending upon the substance absorbed.

In November 1992 the US EPA ruled that disposal in hazardous waste sites of liquids contained in biodegradable sorbents would be prohibited. The purpose of this ruling is to prevent the leaching of hazardous wastes from the landfill sites. Non-leaching and non-biodegradable Peat Sorb meet this requirement. The liquid retained within the humic mass will degrade, but the humic material will not degrade further.

When forced air incineration can be used as a disposal method, Peat Sorb will save on disposal costs. On its own, Peat Sorb will deliver 9,000 BTU's /lb. With a hydrocarbon present this energy source delivers up to 15,000 BTU/lb. Incineration produces very little ash per residue for disposal.

### **Competing Products:**

There are about 190 sorbent products available worldwide. These can be categorized into 3 types according to the material from which they are made;

- (1) Inorganic
- (2) Natural Organic
- (3) Synthetic or Polymeric

### **Inorganic**

The most readily available inorganic sorbents are clay and diatomaceous earth products. There is a large market for sorbents that is served principally by suppliers of clay granules, diatomaceous earth and fuller's earth. Sand, which is used in limited circumstances, also falls into the inorganic category. At this point in time, however, clay sets the industry standard for sorbents and accounts for the largest share of the sorbent market. From an environmental perspective this standard is unacceptably low.

In comparison with Peat Sorb there are some major drawbacks to clay and related inorganic products. After use, clay and sand will allow the oil to leach out and contaminate surrounding land and ground water. The inorganic sorbents do not contribute to the biodegradation of the sorbed contaminant. Peat Sorb is non-leaching. Once a hydrocarbon product is drawn into the Peat Sorb it will remain there and degrade naturally without doing further damage to the environment.

Clay and sand come in large, heavy, and hard to carry bags. One bag of Peat Sorb carried manually by one person will do the same job as a pallet load of clay carried on a fork lift. Sand is inexpensive and readily available, but like clay is heavy and has a very high disposal cost associated with its transportation.

Generally a second application of inorganic sorbents is required to clean up the residue. Thereby increasing the amount of time and sorbent required for a complete clean-up. The associated transportation and disposal costs are similarly increased.

There are major health concerns associated with clay sorbents. Attapulgitte clay, commonly used as an adsorbent, contains crystalline silica. Inhalation causes irritation of the respiratory tract and may cause progressive pulmonary fibrosis (silicosis). Test by the International Agency for Research on Cancer have found evidence that crystalline silica is carcinogenic to experimental animals, but, although suspected, there is as yet no firm evidence of carcinogenicity to humans. Notwithstanding, this lack of evidence the American state of California, New Jersey and Texas have restricted the use of clay absorbents and other states are considering similar legislation.

In a comprehensive laboratory study of sorbents carried out on behalf of the Emergencies Engineering Division Environment Canada, ( the Canadian equivalent of the US EPA) dehydrated peat outperformed clay by a wide margin. (Source:

Environment Canada, Selection Criteria and Laboratory Evaluation of Oil spill Sorbents: Update IV June 1991).

The table shows the initial hydrocarbon capacity of clay and dehydrated peat when tested on six different liquids. The tests compared the weight of the hydrocarbon adsorbed by one gram of each type of sorbent. From the perspective of adsorption capacity alone clay is an inferior product to Peat Sorb.

### **Absorption Capacity of Clay and Peat in Lab Test on 6 Oil Products**

(Grams of liquid absorbed/one gram of sorbent)

Liquid	Clay	Peat	Margin
Cyclohexane	0.69	8.38	12.1x
Toluene	0.76	9.36	12.3x
Diesel *	n/a	9.07	n/a
Crude Oil -1	0.76	6.16	8.11x
Crude Oil -7	1.21	6.76	5.59x
Bunker C	1.59	5.51	3.46x

\* Clay will not sorb liquids with the consistency of Diesel Oil

### **Natural Organics:**

The most common natural organic sorbents readily available today are wood chips, sawdust, cork, dried corn, wool, recycled newspaper and telephone books and modified or processed peat.

Of these natural organic products only wool has a greater sorbent capacity than peat. It is also

reusable after it has been put through a wringer. Since it is imported from New Zealand wool is the least available of the commercially available sorbents. The other drawback to wool as a sorbent are the stringent storage requirements; it is known to attract insects and rodents.

Wood chips and sawdust are adsorbents; their sorbent capacity is dependent upon surface tension. For this reason sawdust with its greater surface capacity is the better of the two products. In the lab tests carried out by Environment Canada sawdust exhibited an initial sorbent capacity almost as high as peat on all six test liquids. It also had a reasonably fast reaction time. Like sand and clay however sawdust is bulky and has a high cost associated with transportation and disposal. Since it is an adsorbent it also will allow the product adsorbed to leach out and cause further contamination.

Heat treated granulated cork is sold as a sorbent for hydrocarbons and solvents. It is sold in loose form and as pads and socks. Depending upon the viscosity of the oil it will pick up about 8 times its own weight in oil, as compared to about 12 times for peat products. Cork has a slow to immediate reaction time depending again on the viscosity of the hydrocarbon product to be cleaned up. This product is non-toxic and can be incinerated. It is biodegradable however, and

therefore may not be acceptable for landfill disposal.

Absorbents made from recycled paper are available in some areas that have advanced public recycling programs. They are about three times more absorbent than clay, but do not come close to peat in absorbent capacity. A major drawback to recycled paper absorbents is that they also absorb water on contact and are therefore of no use in cleaning up spills on water or wet surfaces. In addition they will allow the substance absorbed to leach out and cannot be sent to the landfill, must be by incineration.

Dried corn cobs (maize) are sold as an absorbent in some parts of North America. Test results suggest that they are not much more effective as a sorbent than clay. Like the paper products they also absorb water. Their reaction to oil is slow and incomplete. Their acceptability for landfill disposal is partially restricted. Some users have reported that corn cobs, like wool attract insects and rodents.

There are a number of modified peat products available on the market. Four of these included Peat Sorb, are Canadian peat products. In addition there is one small producer in Scotland and one in Finland. Canadian products have been extensively tested for compliance with US regulations and peat has been tested by Environment Canada's Emergencies Engineering Division with respect to its effectiveness on water borne

spills. All of the test results indicate that peat products are superior absorbents that pose no problems with respect to disposal.

**Peat is the most effective, readily available, non-leaching natural organic sorbent on the market today.**

### **Synthetics:**

Synthetic or polymeric sorbents are generally sold as pads or mats or in a granular or particulate form. The most common synthetic sorbents are made from polypropylene, which may be stitch bonded or melt-blown. Polyurethane either granulated or in the familiar “sponge” state is also available as a sorbent. Flash-spun polyethylene with polymer fillers are heavily marketed in the US.

The synthetic sorbents have a very high initial capacity for hydrocarbons. Their reaction time is immediate to fast. They do not absorb large amounts of water. Manual labor is required to apply this type of sorbent; they do not lend themselves to mechanical applications such as blowers. For this reason the synthetic sorbents are most effective in small spill situations.

The synthetic sorbents work on the basis of exterior surface tension; they do not retain the hydrocarbon. There is a tendency, when synthetic pads are physically lifted from the spill

area for the oil to run off or drip from them. Anecdotal evidence suggest that synthetic pads are messy to physically handle after they become saturated with oil. One advantage of this quality is that it does allow for some recovery of waste oil. Most producers also sell wringers to recover oil from their products. The polypropylene and polyethylene products do meet the US EPA requirements as to non-biodegradability, but this does not necessarily mean that they are non-leaching. The synthetic sorbents may be incinerated. But they may not always be acceptable for landfill disposal. Synthetic sorbents are useful in specific limited situations, but they are not as versatile, generally effective or universally disposable as Peat Sorb.

### **Peat Sorb’s Advantages:**

Peat Sorb has significant advantages over each of the other types of sorbents. Unlike the inorganics it will not allow the hydrocarbons adsorbed to leach out and do further damage to the environment.

It is lightweight and easy to transport, store and use. Peat Sorb is non-toxic and non-carcinogenic; it is not hazardous to health.

Peat Sorb has a higher absorption capacity than all other organic sorbents except wool. Unlike wool and corn cobs it does not attract insects or rodents and it is far more plentiful. Peat Sorb is

non-leaching, a claim that cannot be made for cork or recycled paper products. It will not degrade further in a landfill site, but will allow, and even encourages degradation of the adsorbed hydrocarbon.

Although Peat Sorb is similar to the other modified peat products commercially available, the drying and de-dusting processes to which it is subjected result in a more absorbent, dust reduced product.

Notwithstanding the de-dusting process Peat Sorb is not as clean as the synthetics. The slight amount of dust however, is not as great a problem as run-off from the synthetics after use; they can be extremely messy to pick up and dispose of. The synthetic sorbents will allow leaching; Peat Sorb is non-leaching thereby simply being more effective than the competing products.

As compared to the competing products Peat Sorb is relatively clean after use, lightweight, easy to handle and apply and are very highly effective oil absorbent products. In addition they are easily, legally disposed of. Above all Peat Sorb products are COST EFFECTIVE.

### **Environmental Factors**

#### **New Attitudes and Laws:**

Over the past few years, major oil spills and the removal of hazardous contaminants from the industrial workplace have

received a high level of attention. Government authorities and businesses have been put under increased public pressure to improve their environmental performance.

Although not as far advanced as in America this trend is becoming evident in Europe as well. In all of the industrialized countries of the Western world there is a major emphasis on waste reduction and water and air quality. On the practical level this emphasis has been translated into new legal and moral codes of environmental responsibility.

These codes do not apply only to fresh oil spills. Increased concerns over the clean-up of contaminants that were dumped and neglected for many years have led to requirements for environmentally safe and effective clean-up services, equipment and products. These new laws affect every phase of the clean-up process.

<b>International Cost Comparison of Major Sorbents Material</b>			
<b>Cost to Clean up Equal Volumes of Oil</b>			
<b>Sorbents</b>	<b>Amt Req</b>	<b>Unit Cost</b>	<b>Total Cost</b>

North American Pricing: Cost of Material to Clean up Ten US Gallons

<b>PEAT SORB</b>	<b>10 lbs</b>	\$2.40/lb	\$24.00
<b>ZORBIT-SOCKS</b>	<b>2 x 10'</b>	\$31.12	\$62.24
lay @ \$0.08/lb	200 lbs	\$0.08/lb	\$16.00
Clay @ \$0.15/lb	200 lbs	\$0.15/lb	\$30.00
Sand	275- lbs	\$0.03/lb	\$82.50
Magic Sorb	75 lbs	\$1.68/lb	\$126.00
Pig Skimmer Pulp	14 lbs	\$6.70/lb	\$93.80
Pig Skimmer Pillows	10 pillows	\$12.30	\$123.00

UK & EC Prices - Cost of Material to Clean up Ten Imperial Gallons

<b>PEAT SORB</b>	<b>12 lbs</b>	£1.80 / lb	£21.60
<b>ZORBIT-SOCKS</b>	<b>6 x 4'</b>	£9.00 / lb	£54.00
Sand	3300 lbs	£0.02/ lb	£66.00
Arcosorb ( sand)	240 lbs	£0.12/lb	£28.80
Duco Granules (clay)	240 lbs	£0.13/lb	£31.20
Sorbican Oil Eater	13 lbs	£2.50/lb	£32.50
Oclansorb	12 lbs	£3.10/lb	£37.20
Poly pads	65 x 3/16"	£0.30	£19.50
Rench-Rapid	50 liter bag	£25.00/lb	£25.00

## **Criminal and Civil Liabilities**

In the US the laws relating to oil spill cleanups and hazardous waste are complex and constantly changing. A variety of federal, state and local laws and regulations apply to the generation, transportation, treatment, storage, disposal and cleanup of wastes and hazardous material. The requirements differ from land and water contamination. Enforcement of these laws varies from state to state. A particular spill situation can fall within the jurisdiction of a multitude of government agencies. The result is that an alleged offender can face enforcement and penalty action from numerous sources. Multi-million dollar penalties and settlements are increasingly evident in pollution cases and jail sentences have been handed down.

Under existing laws at least one toxic waste offender has been reported to have been sentenced to a jail term. As of April 1992 new laws in the US have imposed a new Duty of Care on anyone who produces, imports, stores, treats, processes, transports, recycles or disposes of any household, commercial or industrial waste. Not only can major fines result from a breach of this duty there is a strong possibility that the E.C.'s "fifth environmental action program" will impose civil liability for damage caused by waste. This latter program would usher in no-fault civil liability for "damage"

and "impairment of the environment" without reference to best available practices for an industry, without any financial or time limits and without any mandatory insurance.

In addition the public will have increased access to information (as they have had in the US for many years) and individuals and public interest groups will have greater access to the courts to enforce their environmental interests. Increasing public awareness of environmental issues means that these new laws will be more strictly enforced, thereby requiring us to rethink how we deal with contamination problems. What will be required in the future are services and products that provide safe, effective, cost efficient methods for responding to oil and other spills on land and water and for cleaning up and disposing of contaminates.

<p>Peat Sorb products provide safe, effective, cost efficient methods for responding to spills on land and water and for cleaning up, disposal of contaminants.... Reducing exposure to both civil and criminal liabilities.</p>
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## **Cleanup and Disposal:**

Cleanup of hydrocarbons, PCB's, resins and fatty acid are difficult for numerous reasons. Recently enacted laws and directives in all jurisdictions affect and restrict tried and true methods of the way

we contain, control, pickup, transport and dispose of contaminants. These new regulations bring increased liabilities for waste producers, landfill and incinerator users and everyone involved in the cleanup process. Gone are the days where once the contaminants were picked up and we could breathe a sigh a relief and go back to business at hand.

In addition to new liabilities major expenses now accompany all spills. The same is true of the storage, transportation, and disposal of contaminants. In some jurisdictions over 1/2 of the total cleanup cost is for disposal alone. Over the next few years, disposal costs will increase significantly. New laws governing disposal methods leave fewer disposal options. This creates higher storage fees, insurance costs and legal fees, particularly in the event of litigation. In some cases, "disposal laws" may be retroactive, requiring additional cleanup of landfill sites.

Obtaining regulatory permission to build new state of the art incineration facilities has become almost impossible. Even when approved, construction funding is hard to generate in today's economy. The general public is reluctant to allow new incinerators to be built in their own neighborhoods and in some cases have successfully blocked construction of new facilities.

A proposed high-tech waste incinerator in East Liverpool, Ohio has been under review since 1970 notwithstanding that the closest existing facility emits over 1500% more dioxins than the proposed plant. People are concerned with present and future air quality along with additional contaminants that may filter into their neighborhood resulting from stack emissions. Without new facilities we will have to burden existing incineration systems that clearly require high levels of maintenance and new additions to conform to clean air laws.

In Britain 90% of all waste in landfilled; somewhat less in North America, in part because of the success of recycling programs. New landfill space is difficult to find even for non-hazardous waste. Municipal trash and contaminants labeled non-hazardous are often shipped long distances to their final destination. Hazardous waste landfills are expensive and are also subject to changing legislation; in the future storage of contaminants will become more difficult. Ground water contamination in landfills and leaks from underground fuel tanks pose serious environmental problems.

Liquid waste may be banned completely from landfill. Sorbents like Peat Sorb will be particularly useful because they stabilize and solidify liquid waste and provide a medium within which the contaminants can

biodegrade without leaching. This will be particularly important since both the operator of the site and the clients of the site may be liable for any adverse environmental effects.

Liability for contaminants in a hazardous landfill may extend to the landfill owner and all of his clients and their hazardous waste. Serious efforts are underway in most Western countries to reduce the volume of hazardous material disposed of in landfills. As a result, landfill owners will be able to charge a premium for space. They will also have to become increasingly selective on the types of contaminants stored at their site, going as far as rejecting cleanup products made of synthetic materials that add to contamination problems.

### **A Comprehensive Approach:**

All aspects of the process must be taken into account when considering the cleanup of spilled materials; equal consideration must be given to emergency response, containment, control, pick-up, storage, transportation and disposal. All of these steps are regulated by different laws that are changing rapidly. Products utilized in cleanup must conform to laws regulating transportation and disposal. Sorbents must have the flexibility to work under a variety of clean-up conditions and quickly clean-up different types of contaminants. Using sorbents that cause additional disposal

problems can be both counter productive and costly.

**The Problem:** The US Coast Guard has estimated that LESS oil is spilled in tanker accidents like the Exxon Valdez or Braer incidents than seeps into coastal waters and groundwater from land spills every year. Some estimates range as high as 200 million gallons annually on US soil and water alone.

**The Result:** One pint of oil can create a one acre slick on water. A quart of motor oil will foul the taste of ¼ million gallons of drinking water. Degradation of oil requires oxygen, reducing the amount of available to aquatic life. On land, spilled oil destroys plant life.

**The Solution:** Accidental spills will happen. Fast, effective spill response procedures are part of the solution. Peat Sorb is key to any response plan. It is easy to use, effective and disposable. The most environmentally friendly and responsible sorbent product available today.

Reference Material:

1. Zenon Environmental Inc., Laboratory Test Results; May 1990
2. Analytical Services Inc., Laboratory Test Results; March 1991
3. University of Pittsburgh Applied Research Center – National Environmental Technology Applications Corporation (NETAC), Technical Evaluation Report: Peat Sorb Absorbent for Cutting Oil, February 1992
4. Uncredited extract from letter re: vapor suppression
5. Peat Sorb Material Safety Data Sheet

**Zenon Environmental Inc.**  
**Analytical Services Division**  
**5555 North Services Road, Burlington, Ontario L7L 5H7 (416)332-8788**

**Project No. AN908968**  
**Lab No. 5817-5818**

**May 23, 1990**

**Mr. Don Noland**  
**PEAT "T" INC.**  
**14312-63 Ave.**  
**Edmonton, Alta**  
**T6H 1S4**

**Dear Mr. Noland:**  
**Please find enclosed results and invoice for your sample, namely Peat Sorb,**  
**which was treated according to the Ontario Ministry of the Environments**  
**Regulation 309-Schedule 4.**

**The Sample was first extracted using 9.5N Acetic Acid according to MOE's**  
**extraction procedure 43 FR 58956. The resulting extract was analyzed for the**  
**parameters presented in Schedule 4 with all parameters analyzed being below**  
**the Leachate Quality Criteria. Thus, in my opinion, the sample appears to be**  
**safe for disposal in a landfill site.**

**If you have any questions or concerns, please do not hesitate to contact me.**

**Yours truly,**  
**ZENON ENVIRONMENTAL INC.**

**Shawn D. Heier**  
**Inorganic Project Scientist**

**Client Information**  
**Name: PEAT "T"**  
**Project: PO#90-02**

**LAB Information**  
**Contact: SDH**  
**Project: AN908968**  
**Date: May 11, 1990**

**Prepared by ZENON Environmental Inc.**

< = less than MDL			<b>Client ID: PEAT SORB LEA-HAC</b>
			<b>Lab ID: 00851890</b>
<b>COMPONENT</b>	<b>MDL</b>	<b>Units</b>	
<b>Cyanide total</b>	<b>0.001</b>	<b>mg/L</b>	<b>0.004</b>
<b>Arsenic</b>	<b>5</b>	<b>ug/L</b>	<b>&lt;</b>
<b>Selenium</b>	<b>5</b>	<b>ug/L</b>	<b>&lt;</b>
<b>Mercury</b>	<b>0.2</b>	<b>ug/L</b>	<b>&lt;</b>
<b>Fluoride</b>	<b>0.01</b>	<b>mg/L</b>	<b>&lt;</b>
<b>Nitrate ( as N)</b>	<b>0.04</b>	<b>mg/L</b>	<b>2.1</b>
<b>Nitrate (as N)</b>	<b>0.04</b>	<b>mg/L</b>	<b>&lt;</b>
<b>Aldrin</b>	<b>0.02</b>	<b>ug/L</b>	<b>&lt;</b>
<b>a-Chlordane</b>	<b>0.02</b>		<b>&lt;</b>
<b>g-Chlordane</b>	<b>0.02</b>		<b>&lt;</b>
<b>p,p'-DDT</b>	<b>0.02</b>		<b>&lt;</b>
<b>Dieldrin</b>	<b>0.02</b>		<b>&lt;</b>
<b>Endrin</b>	<b>0.02</b>		<b>&lt;</b>
<b>Heptachlor</b>	<b>0.02</b>		<b>&lt;</b>
<b>Heptachlor Expoxide</b>	<b>0.02</b>		<b>&lt;</b>
<b>Lindane</b>	<b>0.02</b>		<b>&lt;</b>
<b>Methoxychlor</b>	<b>0.05</b>		<b>&lt;</b>
<b>Toxaphene</b>	<b>0.5</b>		<b>&lt;</b>
<b>PCB (total)</b>	<b>0.1</b>		<b>&lt;</b>
<b>2,4-D</b>	<b>0.2</b>		<b>&lt;</b>
<b>2,4,5-TP (Silvex)</b>	<b>0.1</b>		<b>&lt;</b>
<b>SURROGATE REC. (4BB)</b>			<b>150</b>
<b>Chloroform</b>	<b>2.5</b>	<b>ug/L</b>	<b>&lt;</b>
<b>Bromodichloromethane</b>	<b>2.5</b>		<b>&lt;</b>
<b>Chlorodibromomethane</b>	<b>2.5</b>		<b>&lt;</b>
<b>Bromoform</b>	<b>2.5</b>		<b>&lt;</b>
<b>Carbaryl</b>	<b>0.5</b>	<b>ug/L</b>	<b>&lt;</b>
<b>Diazinon</b>	<b>0.2</b>		<b>&lt;</b>
<b>Parathion</b>	<b>0.2</b>		<b>&lt;</b>
<b>Methyl Parathion</b>	<b>0.2</b>		<b>&lt;</b>
<b>SURROGATE REC. ( Alachlor)</b>			<b>91</b>

### Analytical Results Report

**Client Information:**  
**Name: PEAT "T" INC.**  
**Project: PO #90-02**

**LAB Information:**  
**Contact: SDH**  
**Project: AN908968**  
**Date: May 11, 1990**

< = less than MDL			Client: PEAT SORB LEA-HAC
Components	MDL	Units	
Calcium	0.02	mg/L	68
Magnesium	0.05		28
Sodium	0.1		3.9
Potassium	0.5		8.3
Aluminum	0.03		0.2
Barium	0.001		0.34
Beryllium	0.001		<
Boron	0.01		0.14
Cadmium	0.002		<
Chromium	0.004		<
Cobalt	0.01		<
Copper	0.006		0.058
Iron	0.01		0.12
Lead	0.02		0.04
Manganese	0.005		0.78
Molybdenum	0.02		<
Nickel	0.01		<
Phosphorus	0.06		3.2
Silicon	0.05		<
Silver	0.01		<
Strontium	0.001		0.36
Sulphur	0.06		18
Thallium	0.06		<
Titanium	0.01		<
Vanadium	0.005		<
Zinc	0.005		0.18
Zirconium	0.01		<

# Analytical Services Inc

Environmental Monitoring & Laboratory Analysis  
390 Trabert Avenue, Atlanta Georgia 30309 (404) 892-8144  
Fax (404) 892-2740

## Laboratory Report

PEAT SORB Sales Inc.  
14312-63 Avenue  
Edmonton, Alberta T6H 1S4

Attn: Mr. Donald Nolan

Sample: Peat Sorb, pilot test, Oil test: received 3/1/91 Report #26149-1

### RESULTS

The sample was extracted and analyzed according to the procedures outlines in the TCLP Method 1311 promulgated as Appendix II, 55 FR 11862, March 29, 1990 (revised June 29, 1990). The results of the analysis are as follows:

EPA HW #	Constituent	Result (mg/l)	Detection Limit (mg/l)	Regulatory Limit (mg/l)
D005	Barium (Ba)	6.53	0.1	100.0
D006	Cadmium (Cd)	0.07	0.01	1.0
D007	Chromium (Cr)	0.07	0.01	5.0
D026	Total Cresol	BDL	0.01	200.0
D027	1,4-Dichlorobenzene	BDL	0.01	7.5
D030	2,4-Dinitrotoluene	BDL	0.01	0.13
D032	Hexachlorobenzene	BDL	0.01	0.13
D033	Hexachlorobutadiene	BDL	0.01	0.5
D034	Hexachloroethane	BDL	0.01	3.0
D008	Lead (Pb)	0.06	0.025	5.0
D036	Nitrobenzene	BDL	0.01	2.0
D037	Pentachlorophenol	BDL	0.01	100.0
D041	2,4,5-Trichlorophenol	BDL	0.01	400.0
D042	2,4,6-Trichlorophenol	BDL	0.01	2.0

### Zero Head Space Extraction (ZHE)

EPA HW #	Constituent	Result (mg/l)	Detection Limit (mg/l)	Regulatory Limit (mg/l)
D018	Benzene	BDL	.02	.05
D019	Carbon Tetrachloride	BDL	.02	.05
D021	Chlorobenzene	BDL	.02	100.
D022	Chloroform	BDL	.02	6.0
D028	1,2-Dichloroethane	BDL	.02	0.5
D029	1,1-Dichloroethylene	BDL	.02	0.7
D035	Methyl Ethyl Ketone	BDL	.02	200.0
D038	Pyridine	BDL	.02	5.0
D039	Terachloroethylene	BDL	.02	0.7
D040	Trichloroethylene	BDL	.02	0.5
D043	Vinyl Chloride	BDL	.02	0.2

BDL = Below Detection Limit

# Analytical Services Inc

Environmental Monitoring & Laboratory Analysis  
390 Trabert Avenue, Atlanta Georgia 30309 (404) 892-8144  
Fax (404) 892-2740

## Laboratory Report

PEAT SORB Sales Inc.  
14312-63 Avenue  
Edmonton, Alberta T6H 1S4

Attn: Mr. Donald Nolan

Sample: Peat Sorb, pilot test, Gasoline test: received 3/1/91 Report #26149-2

### RESULTS

The sample was extracted and analyzed according to the procedures outlines in the TCLP Method 1311 promulgated as Appendix II, 55 FR 11862, March 29, 1990 (revised June 29, 1990). The results of the analysis are as follows:

EPA HW #	Constituent	Result (mg/l)	Detection Limit (mg/l)	Regulatory Limit (mg/l)
D005	Barium (Ba)	7.94	0.1	100.0
D006	Cadmium (Cd)	0.02	0.01	1.0
D007	Chromium (Cr)	BDL	0.01	5.0
D026	Total Cresol	BDL	0.01	200.0
D027	1,4-Dichlorobenzene	BDL	0.01	7.5
D030	2,4-Dinitrotoluene	BDL	0.01	0.13
D032	Hexachlorobenzene	BDL	0.01	0.13
D033	Hexachlorobutadiene	BDL	0.01	0.5
D034	Hexachloroethane	BDL	0.01	3.0
D008	Lead (Pb)	0.05	0.025	5.0
D036	Nitrobenzene	BDL	0.01	2.0
D037	Pentachlorophenol	BDL	0.01	100.0
D041	2,4,5-Trichlorophenol	BDL	0.01	400.0
D042	2,4,6-Trichlorophenol	BDL	0.01	2.0

### Zero Head Space Extraction (ZHE)

EPA HW #	Constituent	Result (mg/l)	Detection Limit (mg/l)	Regulatory Limit (mg/l)
D018	Benzene	9.6	.02	.5
D019	Carbon Tetrachloride	BDL	.02	.5
D021	Chlorobenzene	BDL	.02	100.
D022	Chloroform	BDL	.02	6.0
D028	1,2-Dichloroethane	BDL	.02	0.5
D029	1,1-Dichloroethylene	BDL	.02	0.7
D035	Methyl Ethyl Ketone	BDL	.02	200.0
D038	Pyridine	BDL	.02	5.0
D039	Terachloroethylene	BDL	.02	0.7
D040	Trichloroethylene	BDL	.02	0.5
D043	Vinyl Chloride	BDL	.02	0.2

BDL = Below Detection Limit

National  
Environmental  
Technology  
Applications  
Corporation

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Technical Evaluation Report  
Peat Sorb Absorbent  
For Cutting Oil

February 1992

Prepared for  
PEAT SORB CORPORATION  
Edmonton, Alberta T6H 1S4

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University of Pittsburgh Applied Research Center  
615 William Pitt Way, Pittsburgh PA 15238  
Fax (412)826-3360  
(412) 826-5511

National Environmental Technology Applications Corporation  
University of Pittsburgh Applied Research Center  
615 William Pitt Way, Pittsburgh, PA 15238

5-2007-000

TECHNICAL EVALUATION REPORT  
PEAT SORB ABSORBENT FOR CUTTING OIL

February 1992

Prepared for  
PEAT SORB CORPORATION  
Edmonton, Alberta

Prepared By  
NATIONAL ENVIRONMENTAL TECHNOLOGY APPLICATIONS  
CORPORATION  
UNIVERSITY OF PITTSBURGH TRUST  
PITTSBURGH, PA

## 1.0 INTRODUCTION

The National Environmental Technology Applications Corporation (NETAC) was contracted by Peat Sorb Corporation to conduct independent evaluation testing of the Peat Sorb absorbent's capacity to absorb cutting oil. Peat Sorb Corporation requested that the tests be conducted at two different levels of added cutting oil to absorbent. Peat Sorb Corporation also requested that all appropriate tests be provided to both characterize the cutting oil used in the tests and to characterize the cutting oil-absorbent mixtures as to suitability for landfill disposal.

## 2.0 EVALUATION TESTS

The tests were performed at two different loadings of cutting oil to absorbent. The two oil-sorbent mixtures were evaluated for hazardous characteristics as per 40 CFR Part 268 as well as for fuel-related properties.

An unused commercial cutting oil (Gulf Cut 21) was used in these tests. Table 1 lists the inspection tests run at the Pittsburgh Applied Research Corporation on a sample (BPEC-1-15C) of the cutting oil used.

The holding capacity of the Peat Sorb to absorb the cutting oil was determined by mixing weighed quantities until excess liquid was observed. The excess oil was drained from the absorbent overnight using a Buchner funnel without any added compressive force. Based on the weight of recovered oil in this experiment, a holding capacity of 3.78 (weight oil absorbed: weight absorbent) was determined.

Single samples of cutting oil-Peat Sorb mixtures were prepared in weight ratios of 1:1 and 3:1 (weight oil: weight absorbent) for Toxicity Characteristic Leaching Procedure (TCLP) and other environmental test by Wadsworth/ALERT Laboratories, Inc., Pittsburgh, PA. The results from these analyses are abstracted and compared in Tables 2 and 3. The complete report by Wadsworth/ALERT is attached as Appendix 1.

## 3.0 CONCLUSIONS

The analyses of the samples of cutting oil-Peat Sorb mixtures show that both the 1:1 mixture and the 3:1 mixture passed the TCLP test with none of the listed compounds being detected. In some tests, the 3:1 mixture had higher detection limits due to higher organic background for that sample.

Wadsworth/ALERT  
Laboratories, Inc.  
450 William Pitt Way  
Pittsburgh, PA 15238

## ANALYTICAL REPORT

PROJECT NUMBER 5-2007-000  
WADSWORTH/ALERT PROJECT NUMBER 4379

Presented to:

Bruce King  
NETAC

## NARRATIVE

The following report contains the analytical results for samples submitted to Wadsworth/Alert Laboratories Inc. The samples were received into the laboratory in accordance with documented sample acceptance procedures.

Wadsworth/Alert Laboratories, Inc., utilizes USEPA approved methods and instrumentation in all analytical work. The methods used for the analyses presented in this study can be found on the following pages. A summary of QC data for these analyses is included at the rear of the report.

Wadsworth/Alert  
Laboratories Inc.

**ANALYTICAL METHODS**

Wadsworth/ALERT Laboratories, Inc. utilizes only USEPA approved analytical methods and instrumentation. The Analytical methods used in the analyses of these samples are listed below.

Parameters	Methods
<b>Organics:</b>	
TCLP-Volatile Organic Compounds	SW846 1311 8240
TCLP-Semi-Volatile Organic Compounds	SW846 1311 8270
TCLP-Herbicides	SW846 1311 8150
TCLP-Pesticides	SW846 1311 8080
<b>Metals:</b>	
TCLP-Silver	SW846 1311 6010
TCLP-Arsenic	SW846 1311 6010
TCLP-Barium	SW846 1311 6010
TCLP-Cadmium	SW846 1311 6010
TCLP-Chromium	SW846 1311 6010
TCLP-Mercury	SW846 1311 7470
TCLP- Lead	SW846 1311 6010
TCLP-Selenium	SW846 1311 6010
<b>Inorganics:</b>	
Ash Contents	ASTM D1553-83
BTU per pound	ASTM D2015-85
Cyanide Reactivity	SW846 7.3.3.2
Flash Point	SW846 1010
pH	SW846 9045
Paint Filter	SW846 9095
Sulfide Reactivity	SW846 7.3.4.1

ASTM= American Society for  
Testing and Materials

SW= SW846-Test Methods for  
Evaluating Solid Waste,  
Physical/Chemical Methods,  
Third Edition, EPA 9/1986

**NATIONAL ENVIRONMENTAL TECHNOLOGY APPLICATIONS CORPORATION**  
University of Pittsburgh Applied Research Center  
615 William Pitt Way  
Pittsburgh, PA

February 14, 1992

Mr. Donald Noland  
CEO  
PEAT SORB CORPORATION  
14321 63<sup>rd</sup> Avenue  
Edmonton, Alberta

Dear Mr. Noland:

Enclosed are two copies of NETAC's final report prepared for Peat Sorb Corporation in which NETAC evaluated the Peat Sorb absorbent to absorb cutting oil. These bound reports include the complete analytical report by our subcontractor, Wadsworth/ALERT, as an appendix to the report. In addition, we have also enclosed two copies of a shorter, modified version of the report, without the extensive appendix, as a stand alone document for Peat Sorb to use in their marketing materials.

In these studies, NETAC determined the sorptive capacity of Peat Sorb for cutting oil to be 3.78 (weight oil absorbed: weight absorbent). In addition, 1:1 and 3:1 cutting oil-Peat Sorb mixtures were prepared and analyzed by the USEPA Toxicity Characteristic Leaching Procedure (TCLP) and other environmental tests. None of the listed compounds in the TCLP test procedure were detected.

By copy of this letter, two copies each of the complete report and two copies each of the shorter version of the report are being sent to Scott Sibiski and Paul Barbish.

A final invoice for the project will be mailed to you directly from NETAC's accounting department next week.

As soon as I receive from you a copy of the translation of the Pemex study, I will be proposing a test program for Peat Sorb as a bioremediation aid. Please let us know how we can be of further assistance. It has been a pleasure to assist you in your commercialization efforts.

Sincerely,

A. Bruce King, Ph.D.

**NATIONAL ENVIRONMENTAL TECHNOLOGY APPLICATIONS CORPORATION**  
University of Pittsburgh Applied Research Center  
615 William Pitt Way  
Pittsburgh, PA

**TECHNICAL EVALUATION REPORT  
PEAT SORB ABSORBENT FOR CUTTING OIL**

Project 5-2007-000

Prepared for: Peat Sorb Corporation

### **Experimental Summary**

The National Environmental Technology Application Corporation (NETAC) was contracted to conduct an evaluation of Peat Sorb's capacity to absorb cutting oil. The tests were performed at two different loadings of cutting oil to absorbent. The two oil-sorbent mixtures were evaluated for hazardous characteristics as per 40 CFR Part 268 as well as for fuel related properties.

An unused commercial cutting oil (Gulf Cut 21) was used in these tests. Table 1 lists the inspection tests run at the Pittsburgh Applied Research Corporation on a sample (BPEC-1-15C) of the cutting oil used.

The holding capacity of the Peat Sorb to absorb the cutting oil was determined by mixing weighed quantities until excess liquid was observed. The excess oil was drained from the absorbent overnight using a Buchner funnel without any added compressive force. Based on the weight of recovered oil in this experiment, a holding capacity of 3.78 (weight oil absorbed: weight absorbent) was determined.

### **Technology Development Results**

Single samples of cutting oil-Peat Sorb mixtures were prepared in weight ratios of 1:1 and 3:1 (weight oil: weight absorbent) for Toxicity Characteristic Leaching Procedure (TCLP) and other environmental test by Wadsworth/ALERT Laboratories Inc , Pittsburgh, PA. The results from these analyses are abstracted and compared in Tables 2 and 3.

The analyses of the samples of cutting oil-Peat Sorb mixtures show that both the 1:1 mixture and the 3:1 mixture passed the TCLP test with none of the listed compounds being detected. In some tests the 3:1 mixture has higher detection limits due to higher organic background for that sample.

Prepared by:  
A. Bruce King PhD

Approved by:  
Victor A Fishman PhD

Table 1  
CUTTING OIL INSPECTION DATA

PITTSBURGH APPLIED RESEARCH CORPORATION  
University of Pittsburgh Applied Research Center  
100 William Pitt Way, Pittsburgh, PA

PITTSBURGH APPLIED RESEARCH CORPORATION  
ANALYTICAL SERVICES SAMPLE REPORT

SAMPLE id: 108003

Sponsor : W. McKinney  
Work Order #210309 12/27/91  
Reference: NETAC  
Description: Cutting Oil BPEC-1-15-C

Inspection:

0100	Gravity, API, D287	23.1
1091	Viscosity, KIN., D445,CS,100 F	36.195
1425	Flash, P-M, D93, F	315.
1500	Pour Point, D97 DF	-50
1785	Color D1500	>8.0
2025	Odor, D1833	1
3362	Particulate Matter, D2276, MG/100 ml	5.5
3505	Copper Strip, 212 F, 3 hr., D130	4C
3945	Acid No. Total, D974, Mg KOH/G	0.36

Table 2  
SUMMARY OF TCLP EXTRACT ANALYSES

		1:1 MIXTURE		3:1 MIXTURE	
		Sample BPEC-1-15A		Sample: BPEC- 1-15B	
		Lab No. 4379- 42224		Lab No. 4379- 42225	
Volatile Organics Methods SW846 1311,8240		Result mg/l	Detection Limit	Result mg/l	Detection Limit
Benzene		ND	0.025	ND	0.025
Carbon tetrachloride		ND	0.025	ND	0.025
Chlorobenzene		ND	0.025	ND	0.025
Chloroform		ND	0.025	ND	0.025
1,2-Dichlorethane		ND	0.025	ND	0.025
1,1-Dichloroethylene		ND	0.025	ND	0.025
Methyl ethyl ketone		ND	0.250	ND	0.250
Tetrachloroethylene		ND	0.025	ND	0.025
Trichloroethylene		ND	0.025	ND	0.025
Vinyl Chloride		ND	0.050	ND	0.050
Semi-Volatile Extractable Organics Methods SW846 1311,8270		Result mg/l	Detection Limit	Result mg/l	Detection Limit
Cresol		ND	1.0	ND	4.0
1,4-Dichlorobenzene		ND	1.0	ND	4.0
2,4-Dinitrotoluene		ND	1.0	ND	4.0
Hexachlorobenzene		ND	1.0	ND	4.0
Hexachloro-1,3-butadiene		ND	1.0	ND	4.0
Hexahloroethane		ND	1.0	ND	4.0
Nitrobenzene		ND	1.0	ND	4.0
Pentachlorophenol		ND	5.0	ND	20.
Pyridine		ND	1.0	ND	4.0
2,4,5-Trichlorophenol		ND	5.0	ND	20.
2,4,6-Trichlorophenol		ND	1.0	ND	4.0
ND= None Detected					

Table 2  
SUMMARY OF TCLP EXTRACT ANALYSES (continued)

	1:1 MIXTURE		3:1 MIXTURE	
	Sample BPEC-1-15A		Sample: BPEC-1-15B	
	Lab No. 4379-42224		Lab No. 4379-42225	
<b>Chlorinated Pesticides Methods SW846 1311,8080</b>	<b>Result mg/l</b>	<b>Detection Limit</b>	<b>Result mg/l</b>	<b>Detection Limit</b>
Lindane	ND	0.001	ND	0.005
Heptachlor	ND	0.001	ND	0.005
Heptachlor Epoxide	ND	0.001	ND	0.005
Endrin	ND	0.002	ND	0.010
Chlordane	ND	0.010	ND	0.050
Methoxychlor	ND	0.010	ND	0.050
Toxaphene	ND	0.20	ND	0.100
<b>Herbicides Methods SW846 1311,8150</b>	<b>Result mg/l</b>	<b>Detection Limit</b>	<b>Result mg/l</b>	<b>Detection Limit</b>
2,4-D	ND	0.100	ND	0.100
2,3,5-TP(Silvex)	ND	0.010	ND	0.010
<b>Metals Methods SW846 1311,6010,7470</b>	<b>Result mg/l</b>	<b>Detection Limit</b>	<b>Result mg/l</b>	<b>Detection Limit</b>
Silver	ND	0.010	ND	0.010
Arsenic	ND	0.300	ND	0.300
Barium	ND	0.200	ND	0.200
Cadmium	ND	0.005	ND	0.005
Chromium	ND	0.010	ND	0.010
Mercury	ND	0.001	ND	0.001
Lead	ND	0.050	ND	0.050
Selenium	ND	0.300	ND	0.300
ND= None Detected				

Table 3


ANALYTICAL REPORT

Parameter	1:1 Mixture	3:1 Mixture	
	Sample: BPEC-1-15A	Sample: BPEC -1-15B	
	Lab: 4379-42224	Lab:4379-42225	
Method	Result	Result	
Percent Water	ASTM E1064-85	8.6%	5.2%
Ash Content-solid	ASTM D1553-83	3.5%	1.6%
BTU per pound	ASTM D2105-85	12900 btu/lb	15500 btu/lb
Cyanide Reactivity	SW846 7.3.3.2	ND (1)	ND (1)
Flash Point	SW846 1010	>200°F	>200° F
pH-Solid	SW846 9045	6.6 su	5.6 su
Paint Filter Test	SW846 9095	No free flowing liquid	No free flowing liquid
Sulfide Reactivity	SW846 7.3.4.1	ND (2)	ND (2)

NOTE:

ND = None detected dry weight  
 ND (1) = Detection limits 10mg/kg  
 ND(2) = Detection limits 50mg/kg  
 PMCC = Pensky Martin Closed Cup

# Material Safety Data Sheet

<ul style="list-style-type: none"> <li> <b>Material Identification &amp; Use</b>            Material Name: Peat Sorb            Chemical Family: Sphagnum Peat Moss            Material Use: Absorbent            Product ID: 30401/2/3            Manufacturer: Zorbit Technologies Inc.            Toronto, Canada            (800) 461-0300         </li> </ul>	<b>5.Reactivity Data</b> Chemical Stability: Yes <u>Incompatibility with other substances:</u> , No, However, fire may continue in rolls or bags. <u>Reactivity &amp; Under What Conditions:</u> None, however, fire may continue in rolls or bags.
<b>2.Hazardous Ingredients</b> Dust from Peat Moss Breathable 5 mg/m <sup>3</sup> Total=15mg/m <sup>3</sup> Biocide    Insignificant    Conc.	<b>6.Toxicological Properties:</b> Eye Contact:: Dust and chemical agent inside product may irritate the eyes resulting in redness or watering. Inhalation: Excessive dust concentration may cause unpleasant deposit/obstruction in nasal passage LD <sub>50</sub> : Not known    LC <sub>50</sub> : Not known Not considered irritating. Not considered allergen. Carcinogenicity: Not known
<b>3. Physical Data</b> Brown Solid Specific Gravity 0.15 g/ml Boiling point: N/A                  Odor: N/A % Volatile: N/A                      Solubility: N/A Vapor: N/A                              Vapor Density: N/A	<b>7. Preventative Measures:</b> Personal Protection: N/A Eye: Safety Glasses Respiratory: NIOSH/MSHA respirator Engineering Controls: Provide local exhaust as needed so that exposure limits are met. Leak & Spill Procedure: Sweep or vacuum for recovery of disposal. Waste: Federal or local guidelines Shipping: Cool Dry Place away from open flame
<b>4. Fire &amp; Explosion Hazard</b> <u>Flammability:</u> No <u>Means of Extinction:</u> All usual methods. Caution: Fire may continue in rolls or bags although fire is extinguished on the surface. Special: None                  Flashpoint: N/A <u>Explosion Data:</u> Sensitivity to Mechanical impact. <u>Hazardous Combustion:</u> Including CO, CO <sub>2</sub> *May include insignificant traces of NOx HCl CN NH <sub>3</sub>	<b>8. First Aid:</b> <u>Skin &amp; Eyes:</u> Wash thoroughly with water <u>Inhalation:</u> Remove to fresh air <u>Ingestion:</u> Not applicable in purchased form.
<div style="display: flex; align-items: center;">  <div> <p>Supplier:  <b>Circle T Sales &amp; Service Inc.</b>            P.O. Box 4874            Midland, Texas 79704            (432) 570-4081            (866) 570-4081</p> </div> </div>	<b>9.MSDS Preparation:</b> Sylvia Bergeron, Chem Eng. (418) 346-5593 #132 3/5/1998