

Identifying Odors



Overview

New Waste Concepts is the leading provider of environmental solutions to the Waste Industry. For over 20 years we have developed complete integrated solutions to deal with the complex issues the Waste Industry faces in the 21st century. Controlling odors is one such issue.

NWC's odor control products are the most reliable and flexible integrated odor control system on the market today. They have to be. Waste water treatment plants, landfills, transfer stations, recycling centers and hazardous clean up sites are some of the most heavily regulated in the world today.

The complexity of these specialized environments often means that a combination of specifically tailored products is the only way to effectively solve the root cause of the odor problem. Our products have helped many of these facilities successfully control their odors and stay in compliance.

Pungent Smells

Ally Thiol	Strong Garlic, Coffee
Ammonia	Sharp Pungent
Benzyl Thiol	Unpleasant, Strong
Diphenyl Sulphide	Unpleasant
Chlorine	Pungent, Suffocating
Chloro Phenol	Unpleasant, Penetrating
Crotyl Mercaptan	Skunk Like
Dibutylamine	Fishy
Diisopropylamine	Fishy
Triethylamine	Ammonia, Fishy
Ethylamine	Ammonia Like
Butylamine	Ammonia, Sour
1-Propanethiol	Very Strong Onion
Pyridine	Nauseating, Irritating
Sulphur Dioxide	Pungent, Irritating
Toluene	Benzene Like
Acetaldehyde	Pungent, Fruity
Thiocresol	Skunk, Rancid
2-Methyl-2-Butanethiol	Skunk, Unpleasant

In Landfills

Landfills are a complex system of naturally occurring chemical and biological reactions that break the waste materials down into its basic components. The base odors are the result of these biological and chemical processes taking place in an environment of moisture, heat and pressure. In an anaerobic (low oxygen) reaction phase the biological processes release methane and carbon dioxide gases that slowly make their way to the surface of the landfill. Attached to the methane molecules, as they rise to the surface, are other odorous substances resulting from materials with varying states of decay, which can compound the odor problems. Hydrogen sulfide, mercaptans and ammonia are just some of the other odorous and toxic gases that are produced in a landfill. The most common and easily identifiable odor problems in a landfill occur at or near the surface. Materials that are moist and wet can emit substantial amounts of odors as the moisture evaporates.



In Transfer Stations & Recycling Centers

Odors found in transfer stations largely come from the breakdown of the waste in its early stages of decomposition. The odor molecules are escaping from the waste on the floor and in areas where the waste is being loaded onto rail cars or on waste trucks prior to transport to the landfill.

In Contaminated Sediments

Many contaminated sediments have odors that are the result of the chemistry which has contaminated the sediments. Hydrocarbon contaminated waste may have odors of sulfur. Coal processing operations have over the years released lots of coal tar, pesticides, PCB's and dense nonaqueous phase liquids which often carry a uniquely bad odor. Sediments contaminate with creosote, naphthalene, and similar hydrocarbons also have bad odors. When removing contaminated sediments, regulations may require focused ambient-air monitoring, field observations of odors at regular intervals, and focused odor testing. Odor testing (via) can also be performed in accordance with ASTM Method E 679 (modified) due to the subjectivity of odor detection and the difficulty in quantifying odors using standard air monitoring equipment. This method utilizes a trained odor panel to evaluate air samples for odor character and average intensity.

In Wastewater Treatment Plants

A wide variety of odor-producing substances are found in municipal and industrial wastewater treatment and collection systems, usually as the result of biological activity. Most odors arise from the anaerobic (low oxygen) decomposition of organic matter containing sulfur or nitrogen. Gas produced from domestic wastewater is sometimes called sewer gas and commonly includes hydrogen sulfide, methane, ammonia, and carbon dioxide. Sewer gas may also contain build-up of wastewater solids can result in the formation of scum or sludge which can further inhibit a sufficient inward diffusion of oxygen, again resulting in anaerobic conditions which favor the production of these odor-causing chemicals.

Putrid Smells

Cadaverine	Putrid, Decaying Flesh
1, 4-Diaminobutane	Putrid, Nauseating
Dimethylamine	Putrid, Fishy
Dimethyl Sulphide	Decaying Veggies
Ethanethiol	Decayed Cabbage
Hydrogen Sulphide	Rotten Eggs
Indole	Fecal Nauseating
Chlorophenol	Medicinal
Methylamine	Strong, Ammonia
Pentanethiol	Unpleasant, Putrid
Skatole	Fecal, Nauseating
Thiocresol	Skunk, Rancid
Thiophenol	Putrid, Garlic Like

Controlling Odors

★ ODOR BATTALION

Powerful and battle tested odor control formulations from NWC are engineered to destroy odors directly at the source. On a solo mission teamed up with the Waste Avengers, the results are the same: a highly cost effective and one application solution to eliminating all odor problems!



Integrated Approach to Odor Control

New Waste Concepts has created a complete system for controlling your odor problems. From delivery systems, specialized equipment, two unique product lines designed to handle any odor control issues, to a line of other products that easily integrate with the Odor Battalion. New Waste Concepts can create a solution custom tailored to your specific needs.



Our experts will walk with you through the evaluation of your solution needs and design a program that achieves goals that you specify.

Delivery Systems

Only NWC offers purpose-built SWAT Technology - "Sprays Wide And Terminates" - to effectively vaporize odor targets. Armed with the products from the Bacteria & Enzyme Brigade or Odor Neutralizing Infantry, NWC delivery systems eliminate virtually all odor problems. NWC also is building fixed nozzle systems to effectively vaporize odors where a fixed system offers benefits.

The SWAT Technology comes in 3 distinct forms:

TF Series - uses a powerful fan system similar to a Jet engine to cover a large area with our odor control products

RF Series - uses a standard rotary head fan to help disperse the odor control products

FN Series - is a fix nozzle system that can be permanently placed in an area and creates a fine mist in specific area.

Bacteria & Enzyme Technologies

Bacteria and enzyme technologies utilize and enhance the processes of bacteria in consuming organic matter. Bacteria that NWC use not only feed on organic matter helping to accelerate decomposition, but they also compete for the organic food sources that other odor-causing bacteria consume. NWC's bacteria derive nutrition for growth and reproduction without expiring odorous compounds. While the waste undergoes complex chemical and biological



reactions and is metabolized into a final metabolic waste material, the beneficial bacteria continue to reproduce and emit both methane, carbon dioxide and some other gases. All of this means that Bacteria & Enzyme technology can be used to accelerate stabilization of the landfill and front load the production of gases in landfills and Bio-Reactors.

Chemical Neutralizers

NWC's Odor Neutralizer's are different from nearly all other neutralizers and are clearly different from masking agents because they are made from unique blends of food and cosmetic grade chemical compounds and special botanical derivatives, and typically contain less than 1% (by total volume of concentrate) of commonly-used essential oils. NWC products work by both chemically-reacting with and/or complexing to odor causing molecules under a wide variety of ambient conditions. These products target both alkaline and acidic-type odors, and chemically-react these species into insoluble salts that can precipitate out in the leachate. Other chemistries include ingredients with ionically-charged molecules that can "bind" to or "wet-out" odor-causing airborne molecules and facilitate their removal from the atmosphere.

One of NWC's top neutralizers, Odor Sergeant, is made from naturally occurring compounds found in plants as well as other food grade chemicals, and contains no essential oils. Unlike conventional odor control products based on essential oil chemistries that volatilize fairly quickly, Odor Sergeant is supplied as an almost 100% solids concentrate and, even after dilution with water, can work for several days without having to be reapplied or misted. NWC Odor Neutralizers are chemistries that use oxidizers and other chemicals which react either with alkaline odors or strong acid odors. These reactions convert gases to salts that can precipitate out in the leachate. Our other chemical neutralizers include ingredients with long strands of ionically-charged molecules that attach themselves to the odor causing molecules and when they are misted and become connected they become heavier than the air allowing gravity to take them to the ground, out of the air you breathe or smell.



Odor masking is a substitution of one odor for another. A common example of this is placing a fruity odor over an existing bad odor that might be coming from the waste. Odor maskants typically mix odors but the net result may be a combined fragrance that is not pleasant to smell. The odor of a toxic chemical may have been "disguised" but the chemical itself may be still intact and present in a concentration that is hazardous for personal health and safety.

We advise all our customers not to use masking agents and to work with their NWC sales representative to determine which of our Odor Battalion combatants will work for them.

Odor Neutralizing Infantry



Overview

On the ground or in the air, your New Waste Concepts Infantry combatants will be your best strategic attack force against odors. The odor infantry is virtually unbeatable when combined with the SWAT technology to go after odors at their source. Don't give odor a beachhead at your facility.



Odor Sergeant

Application:
Topically or Misted

Mixing Ratio:
0.25% - 2% active solutions

Odor Sergeant stands ready to stop odors at landfills and transfer stations. It can be topically applied to a variety of waste surfaces or it can be misted using NWC's SWAT technology. It can also be mixed with NWC's daily cover material before daily cover is applied. Add it to your water truck and integrate it into your daily dust control process. It carries a slight grape or some say bubblegum scent. The natural acting botanical extracts which are a part

of the product, are also excellent at controlling odors. This product works well at staging areas for waste to energy plants in controlling odors. Odor Sergeant comes in four different blends, which are modified formulas designed to deal with specific problem areas



Odor Master Sergeant is a special blend of Odor Sergeant containing special blends of a naturally occurring botanical extracts and other chemicals that can sequester or suppress hydrogen sulfide gas. Odor Master Sergeant works on H₂S gas by uncoupling the electron transfer process in the sulfate-reducing bacteria (SRB) that is required for the odor-causing bacteria's respiration using sulfate. When this metabolic pathway is blocked, the SRB are incapable of reducing sulfate to H₂S. Sprayed topically on the working face each day provides a coffee filter approach to suppressing H₂S and Methane gas, as well as controlling other odors.

Odor Sergeant Specialist is a special blend of Odor Sergeant that integrates odor control with Insect control. Odor Sergeant Specialist works by negatively impacting larvae of flies in the waste that are deposited in the landfill, as well as repelling adult insects. This material combines both fly and odor control in one package.



Odor Lieutenant targets alkaline odorous compounds like ammonia, butylamine, trimethylamines, amines, skatoles and other similar compounds that are

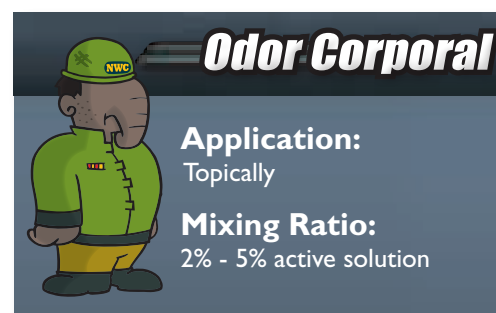


found in putrescible waste (household garbage), sewage treatment plants, sewage reticulation systems, animal breeding and processing facilities. Spray Odor Lieutenant topically or mist it, on a time programmed basis, and all odors can be eliminated. Odor Lieutenant is especially effective against alkaline compounds with their toxic and offensive potential neutralized by the following general reaction:



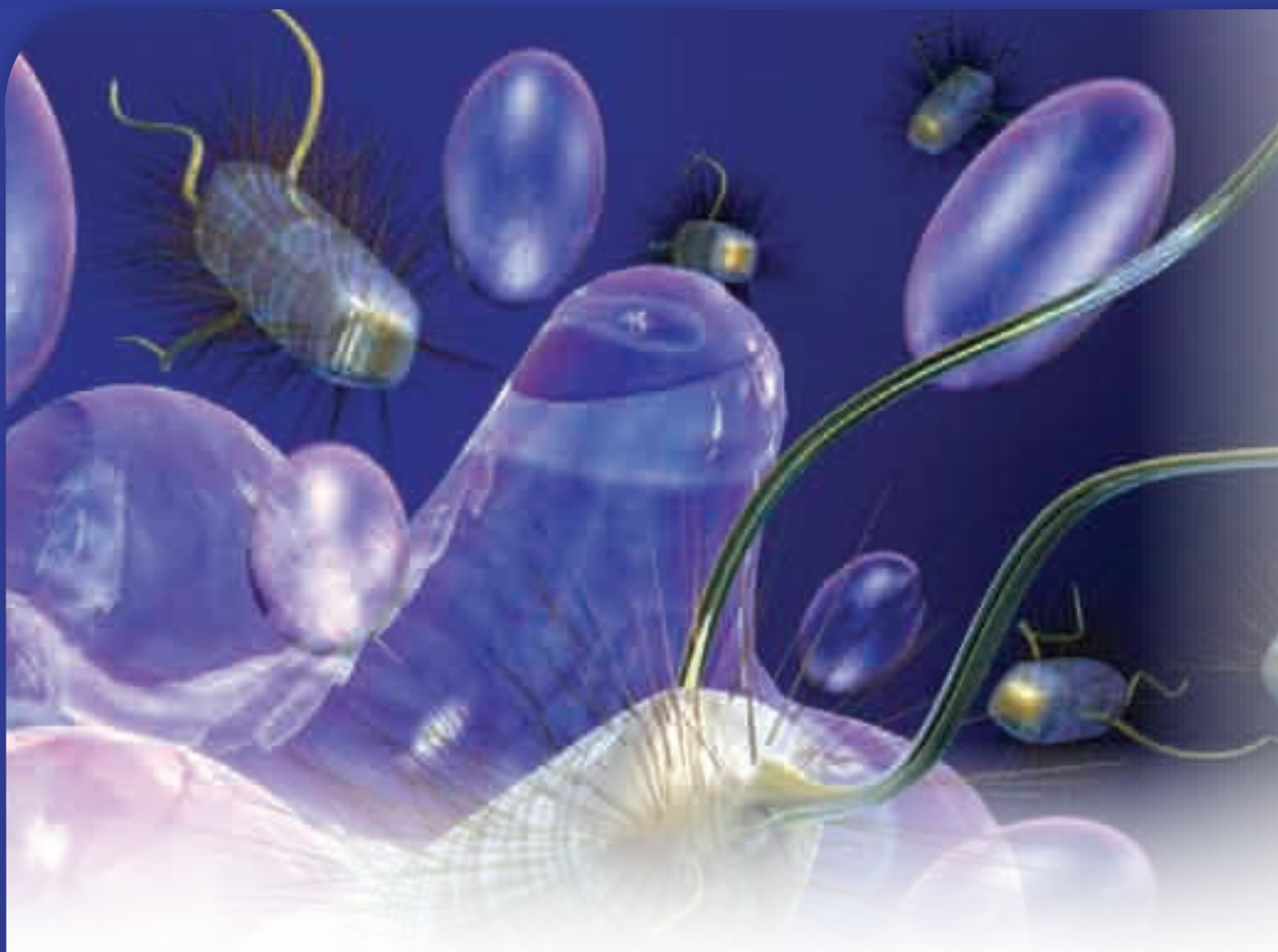
Odor Lieutenant is normally supplied as a concentrate, but can also be supplied prediluted with water and, for cold weather applications, "winterized" with a non-toxic antifreeze package.

Odor Corporal attacks strong acid odors like hydrogen sulfide, methyl mercaptans, and other gases associated with sewage and fatty wastes. As one of NWC's Odor Neutralizing Infantry Combatants, Odor Corporal also has various emulsifying agents which help with the dispersion of oil and reduces fat build up on a plant and machinery, reducing maintenance costs and prolongs equipment life. It is designed to neutralize hydrogen sulfides by the following reaction:



Odor Corporal can be used also to neutralize hydrocarbon odors such benzene, toluene, ethylbenzene, xylene, naphthalene and polycyclic aromatic hydrocarbons.

Bacteria & Enzyme Battalion



What exactly are bacteria?

They are microscopic organisms of various shapes, constituting some of the smallest and most elemental forms of life. They are almost everywhere in nature and multiply with remarkable rapidity. Bacteria consist of single cells with a nucleus and typically a tough cell wall. Inside the wall is the cell matter, which contains enzymes that help break down food for digestion and build cell parts. When the bacteria collide with a food source, the enzyme punctures the outer shell allowing the nucleus to enter the food source and devour it. An enzyme is the catalyst that allows the bacteria to function. The use and development of enzymes is still relatively new and until recently was cost prohibitive. Enzymes as a whole are the 'take charge' catalysts.



They each perform a very specific action but do not become part of the action. Enzymes are the key to the life of bacteria through their powers of being able to digest and promote assimilation and reduction. Without enzymes, bacteria would not exist. In ponds, waste materials such as slime, sludge, algae and other organic contaminants are attacked by enzymes and turned into a form that can later be eliminated by natural bacteria. Enzymes work more effectively with aeration and help decompose toxic hydrogen peroxide and release healthful oxygen from poisonous waste. These small biochemical digesters have the individual power to break apart vitamins, minerals, proteins, carbohydrates, fats, etc., and make them absorbable. Remember that enzymes do not become part of the end product but they do make the process possible. Processed enzymes are able to exert a unique reaction that will do more than dissolve accumulated toxins and prepare them for elimination. With the use of enzymes you can stimulate and



improve water's natural appearance.

Some products promote bacteria with enzymes but the majority of the product is really bacteria. Enzymes do not contain bacteria and should not be confused with bacteria-based products.

A bacterium is a single cell life form with each cell being a separate, unique organism. Bacteria grow in colonies and use a process of cell division as a method of reproduction. The mature bacterium reproduces by dividing into two sister cells, with each cell being identical to the other. Under ideal pH, oxygen and temperature conditions, bacteria can duplicate in 20-30 minutes. This allows the population of microorganisms to explode logarithmically. At some point when the bacteria's food source is depleted or other changes occur in temperature, oxygen or pH, the growth in the population of bacteria will slow and may eventually die.

Bacteria & Enzyme Battalion

NWC's Bacteria and Enzyme Technology:

NWC's battalion of bacteria and enzyme populated products use microorganisms that are prequalified populations engineered to work on various types of odor causing organics in the landfill, waste water treatment plant, on contaminated sediment remediation projects, or in transfer stations. NWC's systems are designed to support and enhance microbial action already occurring that is breaking down waste organics. The genetic capabilities of the microbes that comprise the biomass control the ability of the system to breakdown specific components of the waste.

The purpose of using bacteria for odor control is to immobilize and transform the odor causing organics to other chemical forms that no longer release or carry odor. For example, instead of using chemicals such as sodium hydroxide (lye) or sodium hypochlorite (laundry bleach) to degrade hydrogen sulfide, NWC's Odor Colonel's microbes convert the hydrogen sulfide into odorless hydrogen sulfate, which is carried away by water percolating through the waste. Sewage-plant operators would really like to get rid of the chemicals because they are corrosive and dangerous. These chemicals can also be very harmful ("poisonous") to the indigenous populations of beneficial bacteria found in these environments.

NWC's bacteria and enzymes go after what is causing the odors, as opposed to encapsulating them. This technology is more expensive than neutralizers and absorbents, but eliminates the source of the problem. Application of these materials, such as Odor Colonel, Odor Major or Odor Ranger, are done topically on the waste, and can be applied daily or as required.

Odor Ranger (waste containers, compactor and waste boxes, animal and pet odors)

- Surfactants and selected bacteria with lemon fragrance

	Odor Ranger	
	Application:	Bacteria
	Typically	Concentrations:
	Mixing Ratio: 8 oz to 1.5 gallons of water	200 billion per gallon Versions: • Standard

- Excellent for neutralizing odors in garbage bins, waste roll off boxes and compactors for waste industrial setting
- Bacteria continue to fight odors, long after Odor Ranger has been applied
- Superb cleaner for the home, office or industrial setting





Odor Captain

Application: Topically Mixing Ratio: 0.25% - 2% active solution	Bacteria Concentrations: 7.6 billion per gallon Versions: • Standard • HCl (hydrocarbon bioremediation)
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- Biodegradable biostimulants and cleaners
- Use of proprietary blends of naturally occurring



Odor Colonel

Application: Topically Mixing Ratio: 0.5% - 2% active solution	Bacteria Concentrations: 300 billion per gallon Versions: • Odor Colonel 15 • Odor Colonel 20 • Odor Colonel 21
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Odor Colonel 15 (pulp and paper mill applications)

- Synergistic blend of selectively adapted bacteria for application to pulp and paper mill
- Promotes stability through enhancement of organic removal efficiencies as measured by BOD and COD
- Minimizes impact of toxic shock loads



Odor Major

Application: Topically & Misting Mixing Ratio: 0.5% - 3% active solution	Bacteria Concentrations: 150 billion per gallon Versions: • Standard
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Bacteria that digest:

- grease, short chain and long chain fatty acids, proteins, lipids
- Environmentally friendly - non-corrosive to plant & equipment
- Available in liquid and dry powder form

bacterial cultures adaptive & tolerant to high contamination concentrations

- Special biodegradable surfactants and bionutrients for added efficacy
- Decontaminates soil and ground water containing hydrocarbons resulting from leaking underground storage tanks
- Can tolerate petroleum concentrations inhibitory to many indigenous bacterial populations
- Rapidly degrades all major organic components of #4, #5 & #6 fuel oils, crude oil and coal tar

Accelerates start ups that follow scheduled shut downs

- Reduces effluent toxicity

Odor Colonel 21 (municipal wastewater environments, sewage sludge ponds)

- Consortium of bacteria designed to help reduce lagoon sludge
- Controls H₂S via competitive inhibition of SRB's
- Reduces filamentous (bacteria) abundance
- Accelerates start up of new systems and accelerates recovery after upset
- Enhances flocculation in activated sludges

Odor Colonel 20 (municipal and industrial fats, oils and greases applications)

- Proprietary Blend of selectively-adapted bacteria designed to reduce and dissolve greases & oils
- Effective in controlling rancid, foul-odorous volatile fatty acids in septic or anaerobic environments

Odor Major (landfills, composting, transfer stations, rail car, poultry & dairy farms, sludge ponds)

- Consortium of facultative bacteria and biostimulants that control and suppress H₂S gas
- Controls H₂S via competitive inhibition of SRB's
- Excellent for applying topically to composting piles to reduce the odors
- Powerful combination of fast acting chemical neutralizers and reactants complimenting selective adaptive bacteria
- Active against an array of nitrogen and sulfur containing compounds

Application Technologies

NWC offers several options for the effective application and dispersion of our full line of Odor Battalion products. Effective odor control is achieved through implementing a system specifically tailored to your specific needs that can be integrated with equipment that applies dust control, daily cover, or other spray application equipment on site. The packages which we offer include:

- Mobile application platforms
- Fixed application platforms
- Integrated application platforms

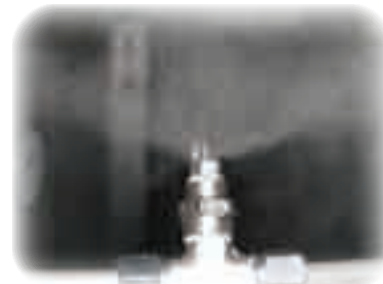
NWC primary equipment utilizes the rotary head misting systems pictured below. Rotary head systems offer the advantage of being able to mist liquids that are too thick pump through a fixed nozzle system, or which may have ingredients that could plug a fixed nozzle system. To the Right is shown the tube which delivers the odor control material to the rotating misting head. There are no nozzles or other components that can get plugged. The fluid is injected inside the rotating hub and high velocity centrifugal force throws the liquid out and through the rotating screen (pictured left). This system is durable enough to pass



a thick slurry of bentonite clay without clogging the screen or delivery tube. NWC does offer an impingement fixed nozzle systems that can be mounted as shown on the SOS platform below or as in the fixed platform model shown in the photos attached.

Fixed Application Platforms:

Fixed Nozzle Systems: NWC is successfully marketing its fixed application platform in China for transfer stations, using a special impingement nozzle. The fixed installation uses high pressure pump (1100 psi max operating pressure) that delivers diluted product to the linear spray line made with a UV and chemical resistant high pressure hose (3000 psi rated). The fixed nozzle design that incorporates an internal filter that aids in the prevention of blockages, produces an atomizing disbursement of the liquid in a cone shape. The NWC's odor control chemical is directly injected in the water feed line by use of an adjustable metering pump. The pump system has an onboard water filter system to clean the incoming water of any particles that might be present that could cause blockages or damage in the operating system. The system has a digital programmable timer that allows for operation without constant attention, on a 24 hour, 7 day schedule.



Electric Rotary Head Fixed Systems: NWC also offers a simple low maintenance low pressure, rotary head system. Rotary head sprayers are driven by a large electric motor that can be suspended from the ceiling. The units have an effective circular range of 50 feet so a grid pattern has to be laid out to get the effective coverage in a building. All that is required is 120 v power for each location along with a low pressure water line, run from a central control location for the low pressure pump, controller and injector metering pump.



Mobile Application Platforms:

Simplified Odor Sprayer: The SOS Odor sprayer (pictured at right) is a mobile platform on which is mounted a 500 gallon spray tank, an electric pump, a chemical metering system, diesel engine, and high pressure nozzle arms. The SOS Odor Sprayer can cover a wide area for odor control and functions only for spraying odor control material. This is an inexpensive system that can provide low volume misting where you need it.

SWAT Technology: SWAT means - "Sprays Wide And Terminates" - and by doing so efficiently vaporizes odor targets. SWAT Odor control vehicles that are solely dedicated to applying odor as well as bird and dust control chemistries are:

SWAT TF 1000 - Mobile platform with 1000 gallon tank and 25 gallon chemical tank, a spray platform for topically applying NWC's Odor Neutralizing combatants. Can be constructed with one, two or three tangential fans that can push the mist from the rotary head atomizer 200 ft into the air.

SWAT RF 500 - Mobile platform with 500 gallon tank and 25 gallon chemical tank, a spray platform for topically applying NWC's Odor Neutralizing combatants. Is constructed with two or four rotary fans that can push the mist from the rotary head atomizer 90 ft into the air.



Integration is an important part of the NWC strategy and the SWAT technology can be incorporated into their CAPS line of cover application equipment. The integrated approach allows you to accomplish odor control, daily cover, bird control, fly control, and dust control, all with one machine. Both the TF and RF fan technology can be added to any of the machines, making the machine significantly more versatile for landfill managers.

The SWAT technology is primarily a hydraulically driven system that is significantly more durable than an electric driven fan or misting system. The hydraulics are not subject to moisture corroding electrical parts and switches. Further, these systems can be made weather proof enough to operate in sub-freezing conditions. We can also sound deaden the engine and equipment noise so that the system can be operated all through the night.

Armed with products from the Bacteria & Enzyme Battalion or the Odor Neutralizing infantry, this NEW odor weapon delivery platform can attack virtually all odor problems at their source. Ideal uses for this technology:

- Rail yard unloading sites or transfer stations for municipal solid waste
- Hazardous sites where unloading MGP or other odorous substances in the landfill area
- Operate all night when temperature inversions can occur and waste odors are kept near ground levels around surrounding property
- Dust control when Construction and Demolition waste is being unloaded
- Odor control at the working face
- Sewage sludge is part of your waste stream and you need to suppress odors when it comes in
- Waste ponds that have odor
- Dewatering drilling mud or other no hazardous liquids
- Areas with high H₂S concentrations