CHEMTECH INTERNATIONAL

Solutions beyond your expectations

URINAL PLUS 10X

PRODUCT DESCRIPTION:

A fully formulated, microbial based, neutral pH hard surface cleaner, containing odor counteractant technology

Chemtech's biologically active formulas have been used for years to successfully combat odors by eliminating the organic source of the odors. A fast-acting patent pending odor counteractant is incorporated in Urinal Plus to achieve instant control of malodors. The odor counteractant works effectively to reduce a broad spectrum of malodors while the bacterial cultures degrade organic waste eliminating the source of the odor.

Most odor counteractant products on the market either fail to reduce a broad range of malodors or simply mask odors with pungent fragrances. With this in mind, scientists at Chemtech developed a biological odor counteractant product that can effectively reduce odors by coupling the latest technologies in microbiology and chemistry.

Urinal Plus is an integrated three-tiered approach to odor control. The first tier in odor control is the pleasant fragrance that immediately reduces the intensity of the malodor. Second, the odor counteractant chemically neutralizes the malodor, reducing the atmospheric concentration below detectable levels.

The third, and most important tier, is Chemtech's unique, stabilized bacteria that digest the organic waste eliminating the source of the odor.In addition to comprehensive odor control, Urinal Plusserves a hardworking neutral pH cleaner. It has been formulated with a multiple surfactant blend to dissolve and remove debris from soiled surfaces. This biologically active neutral cleaner does the complete job in just one step – it cleans, refreshes and deodorizes by digesting the source of bad odors!

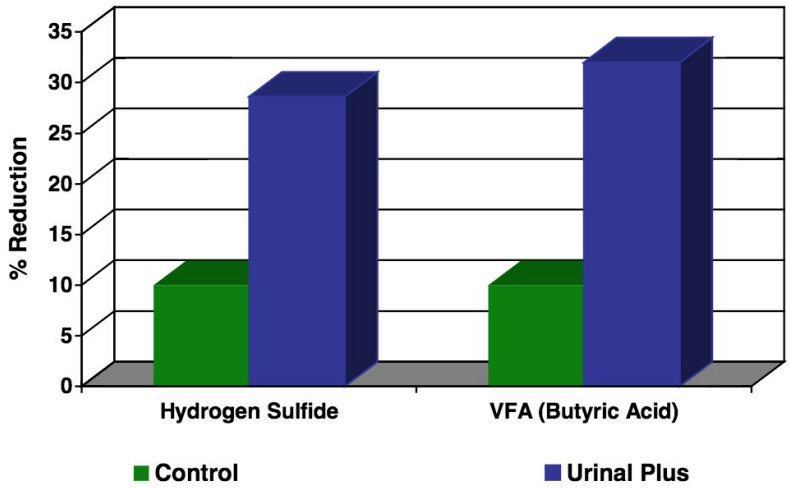
Odor Counteractant Technology

The number one problem in bathrooms is odor. A foul smelling bathroom gives the customer a perception of uncleanliness. This perception often travels behind the bathroom to give an impression that the entire establish is not clean. To address this issue, the scientists at Chemtech tested a variety of odor counteractants for the ability to reduce odors. These compounds actually bind to odors and prevent them from being released into the atmosphere. The goal of which is to keep the concentration of offending odor below a level detectable by the human nose.

The minimum level at which a person can smell an odor is called the threshold concentration. Threshold concentrations for common malodors are very low. For example, the threshold concentrations of hydrogen sulfide (rotten eggs) and butyric acid (vomit) are 0.00047 ppm and 0.001 ppm respectively. With this knowledge, the scientists at Chemtech developed a test system, which challenged the effectiveness of odor counteractants at excessively high levels of malodor (200 ppm) to determine which, if any, of the odor counteractants could withstand an extreme challenge.

The testing process was performed in closed containers. To perform these tests the malodor was mixed with water and placed in a sterile bottle. The odor counteractant was added to one set of bottles and the other set remained untreated. The bottles were sealed and allowed to equilibrate for 30 minutes. After equilibration, the air in the bottle was sampled and tested for the presence of the malodor using a gas chromatograph. Several odor counteractants were tested using this system, but one compound outperformed the others. The graph below shows the ability of the odor counteractant in Urinal Plus to reduce hydrogen sulfide and butyric acid.

Figure 1. Reduction of Malodors by Urinal Plus



Bacterial Digestion of Malodors

Offensive odors such as urine, feces, vomit, and those emanating from garbage are composed of many organic compounds that contribute to the overall odor intensity. Treating organic waste with scientifically selected, non-pathogenic bacterial strains is an environmentally responsible method of accelerating the biodegradation process of malodorous compounds. To combat these odor generating compounds, and reduce them in the environment, Chemtech has formulated Urinal Plus with beneficial, multiple enzyme producing bacterial strains that rapidly digest organic waste. Urine is often the source of malodors on tile, grout, toilets, and other hard surfaces. Urea is the primary constituent of urine. Many bacteria that are naturally present of hard surfaces produce an enzyme called urease. Urease converts urea into carbon dioxide (CO_2) and ammonia (NH_3), Figure 1. This process releases ammonia into the atmosphere producing a bad odor. To reduce the odors, one must reduce, or eliminate, the ammonia.

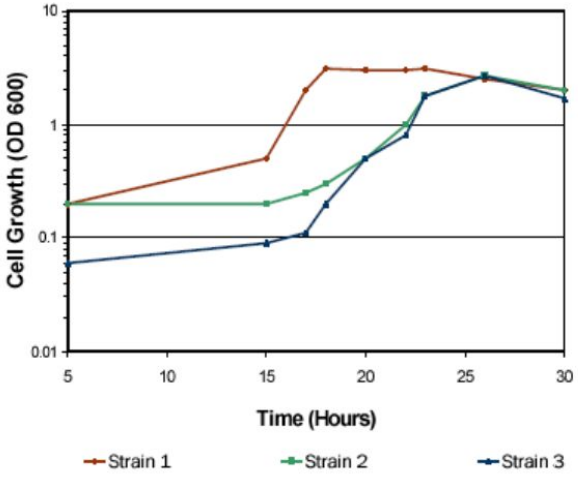
Figure 2. The Breakdown of Urea by Urease

$CH_4N_2O \rightarrow CO_2 + NH_3 \rightarrow$ Atmosphere

With this background information, the scientists at Chemtech set out to develop a biologically based product to degrade urea and utilize the liberated ammonia. The first step in the development of the product was to screen the bacteria in the Chemtech culture collection for the ability to produce urease. The screen was performed using Christensen's urea agar. This medium contains urea and a yellow dye that turns red when urea is metabolized. By placing bacteria on the surface of this agar, one can choose bacteria that are superior urease producers.

Having identified bacteria that can degrade urea, a study was performed to test the ability of the most promising urease producers to utilize ammonia. For this study, replicate flasks of sterile media consisting of basal salts, glucose, and ammonia were inoculated with different strains of urease producing bacteria. The flasks were placed on an incubated shaker, and bacterial growth was monitored over a thirty-hour period. An increase in growth is indicative of the ability to utilize ammonia. As demonstrated in Figure 3, some of Chemtech's bacteria have the ability to utilize ammonia.

Figure 3. The Growth of Chemtech's Bacteria on Ammonia



The studies described above yielded a set of bacterial strains that are superior urease producers and have the ability to utilize ammonia as a nitrogen source for cell growth. The breakdown of urine by these bacterial strains is shown in Figure 4. By consuming the ammonia liberated by the urease enzyme, these strains greatly reduce the odors associated with urine found on tile, grout, toilets, and other hard surfaces.

Figure 4. The Breakdown of Urea by Chemtech's Selected Bacterial Isolates

$CH_4N_2O \rightarrow CO_2 + NH_3 \rightarrow$ Bacterial growth (CO_2 to the atmosphere)

Another common source of malodors is volatile fatty acids. The researchers at Chemtech developed a screening method to quickly test the ability of various bacterial strains to degrade these odor-causing compounds. As shown in Figure 5, the strains of bacteria in Urinal Plus have the ability to digest a variety of volatile organic acids associated with malodors. The result of which is a reduction of malodors released into the atmosphere.

Figure 5. Volatile Fatty Acid Digestion by Chemtech's Bacterial Strains incorporated in Urinal Plus

Strain #	Acetic	Propionic	Butyric	Isobutyric
1	+	+	+	-
2	+	+	+	-
3	+	+	+	+
4	+	-	+	-
5	+	-	+	+

Summary

Urinal Plus is a multi-tiered cleaning and odor control solution with utility in various applications. The researchers at Chemtech have incorporated three layers of odor control into this product including, a pleasant fragrance, a broad-spectrum odor counteractant, and biological degradation of odor causing compounds. In addition to the odor control technology, Urinal Plus contains a neutral pH cleaner that reduces the presence of odor causing soils. Hard surface cleaning and odor reduction from one product.

Urinal Plus is another example of Chemtech's product development philosophy of creating products that work.

APPLICATIONS

- **Bathrooms**
  - **Around urinals/toilets**
  - **Added to mop water**
- **Locker Rooms**
- **Mop Deodorizer**
- **Pet odors/Kennels**
- **Dumpsters and Garbage Chutes**
- **Flood Restoration**

PRODUCT PROFILE

- Multiple *Bacillus* Species
- Naturally occurring, non-engineered
- Aerobes and facultative anaerobes
- Highly motile
- Positive chemotaxis
- 100% stabilized bacterial spores

Guaranteed Minimum Bacterial Concentration:

675 million CFU/ml (2555 Billion CFU/Gallon)

TYPICAL PROPERTIES

Appearance.....blue liquid/spring mint fragrance
Shelf Life.....one year at 21 degrees C (70F)
Salmonella Free.....non pathogenic, contaminant-free

PERFORMANCE PROPERTIES

Effective pH range.....5.0 - 10.0
Effective Temperature Range.....40 -130 degrees F (5 – 55 deg. C)
Bacterial Enzyme Production.....Amylase, Protease, Lipase, Esterase, Urease, Cellulase, Xylanase

STANDARD PACKAGING

Quarts (12 x 1 per case)
1-gallon containers (4 x 1 per case)
5-gallon pails
55 gallon drums
330 gallon totes

STORAGE AND HANDLING

Storage.....Store in a cool, dry place do not freeze
Handling.....Wash hands thoroughly with warm, soapy water after handling

USAGE GUIDELINES

Mix drum thoroughly prior to blending. For optimum performance, dilute one part Urinal Plus with nine parts water to obtain a finished product. Please refer to the Chemtech General Formulation Guidelines for additional instructions.

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