Thracean Zeolite®

## ABOUT US

Thracean Zeolite is a company founded in 2021 and its aim is to exploit one of the few deposits of zeolites in Greece located in the Thracean area, in the Rodopi County.

The extraordinary properties of zeolites have defined the company's interest to turn a natural and ecological resource into finite products or raw material for various industries.

The Zeolites processing factory is opened in June 2021 when the investment program was completed and our advanced production line, with breakthrough technology that allows processing of zeolite rocks, is be up and running.

Mineralogical studies conducted in the areas of volcanic tuff, which is the subject of the exploitations that will capitalize zeolite reserves, showed us that the entire mass of the rock has been under intensive pressures and through the process of diagenesis it was turned into today's zeolites.

The quality of raw material is proved by numerous documents:

- Chemical analysis (XRF).
- Mineralogical Analysis (XRD).
- Various studies and researches regarding the main usages of zeolites in different areas.
- Document showing the properties of retaining heavy metals substances.
- Analyses regarding the cationic exchange capabilities (CEC).

All this information was obtained from research studies performed together with research institutes specialized in exploring theoretical and practical topics.

There is no part of the technological process that involves the use of toxic substances. There is only the extraction of ore from the quarry and its processing process, which is done through specific procedures.

The exploitation done by Thracean Zeolite meets all environmental requirements. All procedures are performed under the authorization of legal institutions.

# MINE APPLICATIONS

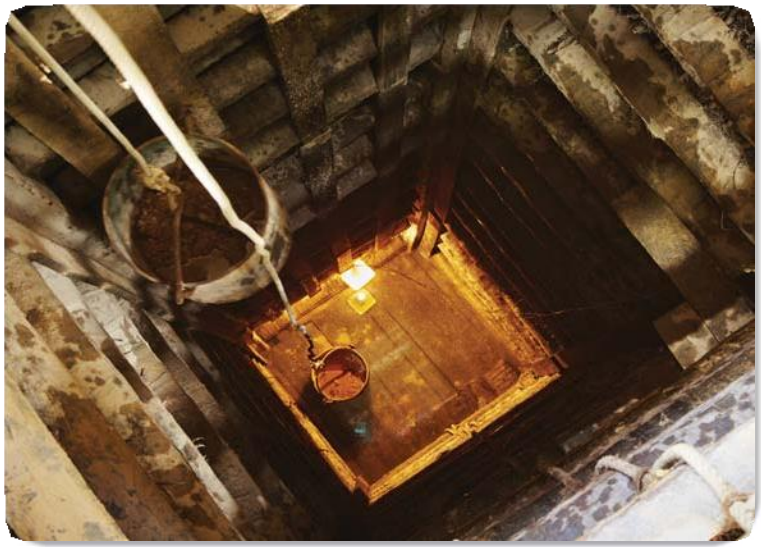
## HOW IT WORKS

Natural zeolite has two ways of holding cations. The first way is in its crystal lattice where the ammonium and other cations are held and are not water soluble. The second way is in its channel-ways where zeolite can hold up to 55% of its weight in water. It is an excellent desiccant. In this casethe cations are more loosely held and are water-soluble.

# AMMONIA CONTROL IN BLASTING

Ammonia emissions result from incomplete detonation, spillage, and fugitive dust from loading operations. Reducing the ammonia after shooting means getting back to the face faster, fewer health problems, and greater production.

It has been found that applying about 30% of the weight of the ANFO (Ammonium Nitrate Fuel-Oil) as zeolite significantly reduces ammonia after loading and shooting. The weight of the zeolite must be determined on a case-by-case basis.



## Shafts and Winzes

- Zeolite is sprinkled around the blast area prior to loading.
- Top dress the muck pile with zeolite.
- Has been shown to reduce ammonia levels from 180 - 220 ppm to less than 20 ppm.

## Drifts, Scrams, Stopes, Ramps, Raises

- Zeolite is spread on the floor in front of or under the drilled area prior to loading, and it can also be used to top dress the muck pile.

## Open Pit Operations and Seismic Blasting

- The environmental impact of the ammonia can be mitigated by applying zeolite around the drill holes or as stemming in the drill holes.
- Zeolite should not be mixed with ANFO.
  - ✓ It will become saturated with ammonium and will lose its ability to exchange ammonia into its lattice.
  - ✓ ANFO will lose its strength.

## Magazines and Stockpiles

- ANFO is hygroscopic and pulls water from the atmosphere. The ammonia quickly forms ammonium that leaks from the stockpile or magazine.
- Zeolite can be applied on the floor around the stockpile, in a trench outside the storage area, or in various other configurations.

## Desiccant and flow agent

- Zeolite is an effective desiccant that can be mixed in small amounts in fine particle sizes (minus 40 mesh) to keep ANFO dry and easily flowing.
- It will prevent caking and clumping.

## Control of Nitrous Oxide

- Adsorbs $NO_3$ and $NO_3$ gas.
- Testing will be necessary to determine the best application method, but top dressing the blast area should be adequate to mitigate nitrous oxide.

# CLEANING MINE EFFLUENTS

## Ammonia Control

Ammonia quickly becomes ammonium in water and then oxidizes to water soluble nitrites and nitrates that contaminate the water table. This is a critical environmental problem throughout the world.

Many mine wastewaters are contaminated with ammonium (usually reported as ammonia). To remove the ammonium, the wastewaters can be treated in various ion exchange zeolite vessels (see Exchange Vessel Operation diagram below) or by applying zeoliteto ponds or through channels lined with zeolite. If the wastewaters has a high hardness measured as Ca, it is recommended that a pretreatment of the wastewaters be made by adding a small amount of sulfuric acid to precipitate the Ca as gypsum, CaSO4. This will increase the capacity of the zeolite to exchange the ammonium.

## Cation Removal

Mine tailings, waste rock piles and discharge of acid mine drainage waters contain heavy metals that pollute the environment. Zeolite has high cation selectivity to removeheavy and light metals.

- **Heavy Metals:** Lead (Pb), zinc (Zn), cadmium (Cd), copper (Cu), iron (Fe), manganese (Mn), antimony (Sb), mercury (Hg), nickel (Ni), cobalt (Co), beryllium (Be), zirconium (Zr), arsenic (As), chromium (Cr), thallium (Tl), rubidium (Rb), silver (Ag), barium (Ba), and others.
- **Light metals:** Sodium (Na), lithium (Li), potassium (K), aluminum (Al), calcium (Ca), and magnesium (Mg), etc.

## Spill Clean-Up

Mining production machinery also contributes to environmental pollution. Zeolite is effective for the clean-up of spills of:

- Oil, antifreeze, grease, diesel fuel, gasoline, etc.

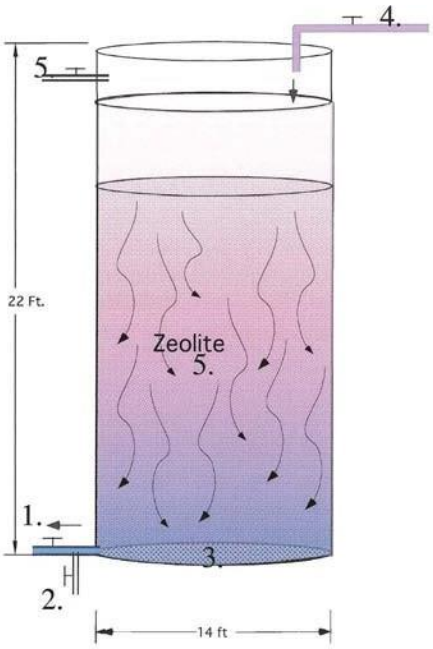
## Radioactive Element Removal

Mining of ore deposits containing radioactive elements results in ground and water contamination.

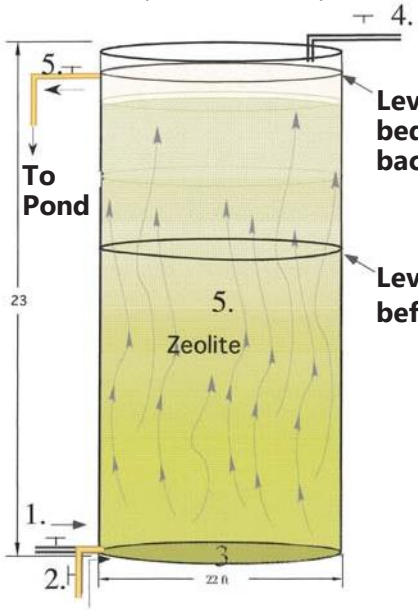
- Zeolite is used to remove radium (Ra), uranium (U), strontium (Sr), cesium (Cs), etc.

## EXCHANGE VESSEL OPERATION

**Ion Exchange Stage**
*(elevation view)*



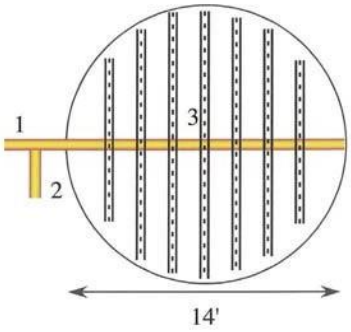

**Backwash Operation**
*(elevation view)*




**Level of zeolite bed during backwash**

**Level of zeolite before backwash**

**Vessel Bottom**
*(plan view)*




**Key to diagrams**

1. Discharge pipe to discharge or other cation exchange vessel.
2. Pipe to clean sediment from ion exchange bedor for regenerating the zeolite.
3. Piping system with holes in bottom of ion exchange vessel.
4. Inlet pipe from mine
5. Discharge pipe for backwashing or regenerating.