



Ecotech Polska S.A.

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Omnia subiecta sunt naturae.

Innovative stabilization of hazardous waste

Nationally unique technology for the stabilization of hazardous waste, combining previously unattainable effectiveness with competitive pricing.

EnviroMix® is highly effective in stabilizing particularly noxious waste, such as heavy metals, halogen derivatives and others.



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EnviroMix®

Commercially viable technology for hazardous waste stabilization.

The EnviroMix® process is based on a world-renowned technology with excellent results in chemical fixation and stabilisation of hazardous waste. The physicochemical processing of waste involves changing its chemical and physical parameters through processing with specific components that cause certain chemical reactions and rely on defined physical phenomena. This type of stabilisation is supported by independent academic research and meets regulatory requirements in many countries. The technology is used on an industrial scale to process thousands of tons of contaminated soil, deposits, mining waste and waste by-products of industrial processes.

The goal of the waste immobilisation process is to chemically transform the waste to prevent the washing out of hazardous substances in the form of soluble compounds, and, within limits, to change certain physical parameters of the waste to improve mechanical durability, increase water-permeability, etc.

The EnviroMix® process can be used to neutralise contaminated soil, sludge and other solid waste containing both organic, inorganic and mineral compounds. The process is very effective on e.g. heavy metals, cyanides, PAH's or pesticides.

Processing with EnviroMix® is commercially viable, economic and reliable, and enables one-step stabilisation of various types of waste.

The technology is all the more interesting in light of increasingly restrictive UE legislation on hazardous and industrial waste neutralisation and storage. This legislation requires that waste be neutralised prior to storage and, if possible, subjected to recovery as the first stage of processing.

EnviroMix® stabilisation of hazardous waste is many times more effective than common ways of stabilisation using Portland cement. Due to the specifics of magnesium-compound waste fixation, the EnviroMix® technology resists waste washout which occurs



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with time in waste stabilised with Portland cement. Unlike other companies, Ecotech Polska Sp. z o.o. conducts waste immobilisation effectiveness analyses on pre-ground waste.

When solidifying with just cement, the process only creates the so-called “external barrier”. Due to their morphology, crystals create a physical structure. Migration is impossible due to binding within the cement mass, reduction of permeability and increased density of the mix. The downsides of cement solidification include: significantly increased volume and mass (due to adding large amounts of cement), limited durability of the solidified mix and high porosity. The creation of crystals when cement is added results from reactions with four important components of cement. Hydration is caused by tricalcium silicate (20-60%), dicalcium (20-30%), tricalcium aluminate (5-10%) and calcium aluminate (8-15%). Adding water creates calcium hydroxide Ca(OH)_2 with crystals. Due to the fast rate of the process, the resulting material is porous and therefore water-permeable. With water penetrating the pores and acid rain / CO_2 interaction, pH change caused by free Ca(OH)_2 is stopped only initially. After a certain period, the washing out of heavy metals continues, leading to excessive concentrations in the water. It is estimated that, depending on the amount and quality of cement used and atmospheric conditions, cement retains full immobilisation properties for 2 to 3 years.

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TECHNOLOGY

Method

Chemical fixation and solidification (CFS) technologies are well developed for the stabilisation of hazardous waste. Currently many CFS technologies are being used to immobilise (fixate) various types of organic and inorganic compounds.

The EnviroMix[®] process is classified as a CFS technology. EnviroMix[®] is a material based on magnesium oxide with high magnesium carbonate content. The material is ground, calcinated (roasted) and prepared specifically for the individual stream of processed waste. The specific surface of the EnviroMix[®] material is 35 m²/g.

The process involves the immobilisation of waste as thermodynamically stable phases of minerals and microencapsulation of organic waste into mineral structure. EnviroMix[®] is based on catalytic reactions using appropriate additives. The catalytic reaction three-dimensionally polymerises the synthetic mineral matrix that imitates naturally found structures. The bound waste material is next solidified into a rigid matrix which is highly resistive to crushing.

The EnviroMix[®] process effectively solves problems with many types of hazardous waste from various industries, including coal, metallurgy, production and post-industrial areas. Thanks to individual optimisations to specific materials, this technology is widely applicable in the neutralisation of both organic and inorganic waste, including especially various hazardous wastes, irrespective of type or degree of contamination.

The effectiveness and efficiency of the process is confirmed by the fact that stabilisation of solid waste for the purpose hydration can be achieved with highly-salinity post-process water or hydrated preliminary waste from treatment plants containing heavy metals.

Depending on customer requirements and further use of the waste, the EnviroMix[®] process can be classified as D16 neutralisation or R14 / R15 recovery process.



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Stabilization *in situ*

One strong advantage of the EnviroMix[®] technology is the option to complete the process on location where the waste is produced, eliminating the need for transportation to intermediate locations. The process takes place without significant energy expense and with relatively low capital investment.

Processing can be carried out with commercially available mixing equipment or in a custom-designed and built mobile installation. It is also possible to modify existing industrial applications to adapt them to restrictive HSE requirements concerning toxic substances.

Stabilised waste can also be used as construction aggregate due to good physical properties. Post-processing waste can also be used on location, for example in ground levelling, or stored in a waste dump. It is important to note that processed waste does not need to be stored in a hazardous waste dump, eliminating very high costs!

Another advantage of the EnviroMix[®] technology in an era of limiting greenhouse gas emissions is the absorption of CO₂ from the atmosphere while in process, unlike the traditional stabilisation process using cement.

Advantages of Enviro Mix[®]

- EnviroMix[®] uses conventional technologies and equipment for the mixing process; the required materials can be delivered to the processing location.
- EnviroMix[®] enables the safe transportation of processed material.
- EnviroMix[®]-processed waste can be stored in lower-classified dumps (smaller charges) or used on location.
- Liquid waste and sludge is solidified. Clays, oils and organic waste is fixated.
- EnviroMix[®] can be mixed with contaminated and saline water.
- Better mixing proportions compared to other processing methods (lower cost).
- The EnviroMix[®] process eliminates odour

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- EnviroMix[®] can be used to neutralise mixed waste with high organic and inorganic content.
- EnviroFix[®] can neutralise waste with high moisture content (>70%) reducing the need for expensive and time consuming decanting (precipitation).
- EnviroMix[®] can be used to neutralise incinerating plant ash containing hazardous substances (e.g. lead) and easily leaching waste.
- EnviroMix[®] transforms problematic sludge into safe, solid materials which can be safely removed.
- Full immobilisation of waste and excellent physical parameters facilitate the use of stabilised waste as, e.g. building aggregates.

Ecotech Polska S.A. is an expert in low-expenditure processes for the neutralisation of hazardous and complex waste. **Ecotech Polska S.A.** owns the intellectual property rights to the "**EnviroMix[®] waste stabilisation technology**". The technology used by Ecotech Polska Sp. z o.o. has been analyzed, improved and verified over many years.

The EnviroMix[®] technology can be considered the most accessible and easiest to replicate technology capable of neutralising toxic inorganic compounds and many organic compounds without significant financial expenditure.

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Key benefits of the EnviroMix® technology include:

- ✓ Neutralisation of hazardous waste to avoid high charges for storage or thermal processing.
- ✓ High resistance to contaminant washing, even under unfavourable environmental conditions (e.g. acidic environment).
- ✓ Low stabilising material consumption which guarantees highly economic processing.
- ✓ Certain types of waste can be recovered and transformed into construction material.
- ✓ Can process mixes of hazardous waste, sludge and post-processing water.
- ✓ The technology has been tested by many independent laboratories and was found to conform with the strictest environmental legislation around the world.
- ✓ The technology has passed many tests and pilot studies in businesses that generate waste, as well as by waste processing organisations.

Ecotech Polska is supported by the Ministry of Environment

RP as the best environmental technology (GreenEvo).

**EnviroMix® is registered in European Patent Office and
US Patent and Trademark Office**

***EnviroMix® is registered in the European technology database
Enterprise Europe Network.***



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