Innovative Solution to Hazardous Industrial Waste

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Hazardous waste, derived from industry or factories utilising incineration methods, is perceived as a significant problem for its owners, who tend to dedicate substantial financial resources either for waste storage or for its disposal. The lack of appropriate hazardous waste storage solutions and escalating costs of storage seem to be other complications. Moreover, waste-related regulations specify that not all types of waste can be directly stored. What should we do with the waste stored for years in the industrial factories?

New methods of stabilisation are important alternatives to traditional storage or expensive incineration methods. As a consequence of the stabilisation, hazardous waste can be converted into non-hazardous elements. Chemical Fixation and Solidification (CFS) technologies are well-developed methods in the process of hazardous waste stabilisation. At present, a great number of CFS technologies have been utilised in the process of connecting various types of organic and inorganic compounds. These methods are used with stabilisation of hazardous waste such as: soil contamination, sludge, ash, or slag.

Most of applied methods of stabilization have hinged on the implementation of cement and/or lime as the stabilising factor. The use of sole cement for solidification has major shortcomings: the large increase in volume (and mass) of the mixture, caused by the addition of a huge amount of cement, limited time of solidification's durability, and large porosity. According to recent studies, the period of full cement connection lasts only 2 to 3 years, depending on the quantity and quality of used cement. After this period, the secondary leaching of pollution and its return to the environment take place.

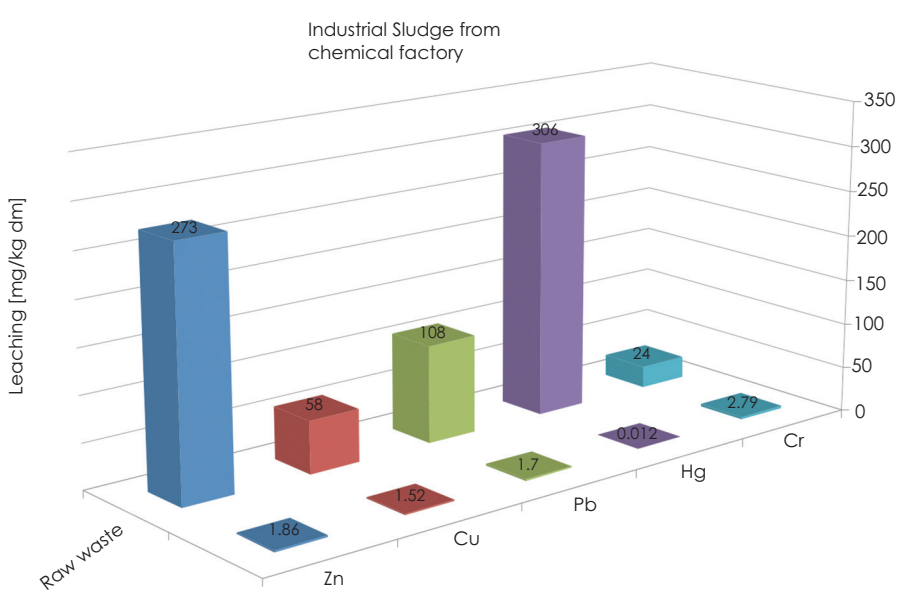
Polish company Ecotech developed an alternative stabilisation approach, using magnesium compounds. The patent-protected process, called EnviroMix®, is based on the connection of pollution as thermodynamically stable minerals phases and on altering organic pollution into microcapsules of mineral structures. The process focuses on the combination of catalytic reactions and the use of corresponding additions. It is not connected to any incineration processes. As a consequence of catalytic reaction, three-dimensional polymerisation of the synthetic mineral matrix, which imitates naturally existing structures, takes place. Then, connected pollutions are solidified in a firm matrix that is highly resistant to crumpling. To put it simply, the process involves the closure of pollution in an "artificial rock". Owing to it, the guarantee of safety is simply limitless, no matter whether stabilised waste would be crumbled or put in the sour environment. Thus, adopters of the technology can use waste for building materials such as ballast, aggregate, or filling materials to concrete. In such a case, we talk about the recovery of hazardous waste. Effectiveness of this process is so high that post-process waters of high salinity level may be used to hydrate solid waste. The absorption of carbon dioxide from the atmosphere during the stabilisation process appears to be an additional ecological facet. Stabilising material is of natural origin (not subject to REACH regulation), and the surface of 35m²/g insures previously unheard-of reactivity.

The following table presents comparative results of leaching for the chosen parameters of EnviroMix® stabilisation and a "classic" method that uses cement of Portland and lime. The study was conducted by one of Ecotech's customers.

The parameter [ppm]	EnviroMix®				Cement/lime			
	1 hour	5th day	11th day	18th day	1 hour	5th day	11th day	18th day
Sb	3,48	0,44	0,281	0.265	20,6	46,2	175,1	45,2
As	0,07	0,097	0.086	0,050	6,7	17,1	9,78	7,6
Ba	0,021	0,009	0,021	<0	921,9	1848	1592,9	1385
B	0	0	0	0	1242,8	634,8	570,3	543,2
Co	0	0	0	0	73,6	32,6	26,3	20,7
Cr	0,05	0,029	0,03	0,021	203,2	160,4	91,4	151,5
Mn	0	0	0	0	491,6	445,6	389,4	410,6
Hg	0,42	0,57	1,24	0,662	4,9	11,9	8,68	9,3
Ni	0,56	0,165	0,153	0,207	370,3	201,1	167,4	187,1
Pb	0,11	0,012	0,0256	0,017	709.6	498,1	410,9	465
Cu	11,86	1,8	1,12	1,329	1622,3	1065	732,2	824,1
Se	0,09	0,086	0,138	0,094	4,6	6,8	7,8	9,7
V	0	0	0	0	19,2	14,5	12,6	14,1
Zn	0,44	<0,003	0,004	0	2365,5	2162,2	1835,5	2570,5
TOC [%]	0	0	0	0	22,16	6,285	10,49	8,21

The technology is especially useful for the waste from incineration methods. Slag, dust and ash contain high concentrations of heavy metals and other substances of hazardous nature. On the other hand, however, they can constitute a good mineral matrix that would increase the parameters of endurance. The Enviromix® technology can be adopted to close the incineration method system ("end of pipe") and to create the "no-waste" system.

Very good results can also be obtained in terms of hydrometallurgy, metallurgy, chemical industry, and oil industry waste. Furthermore, EnviroMix® is a great solution to chloroorganic waste and building materials polluted with heavy materials. The simplicity of installation becomes an additional asset. A mixer of good quality and the dosage system will suffice for the process, so that this technology can be used in an in situ version and as a mobile system. The outlet of the mixer provides a paste out of which various shapes can be created, as presented by the picture (briquette, cylinder, molder). Every customer can buy an appropriate mixing device in his own market or adopt an existing mixer. Another important economic is the fact that the process is not the source of dust, sewage, additional waste or gas emissions.



Technology verification, conducted by the company and its clients in Israel, Italy, Poland, Finland, Germany and Great Britain, confirmed the exceptional effectiveness of the process and safety of stabilised waste. Particular results of hazardous waste stabilisation are presented on the graphs.

Interestingly, the results of over 99% of the reduction of mercury leaching in waste offer the possibility of using this technology to neutralise, for example, building waste that contains this metal. Building materials waste is a global problem that is particularly severe in old chemical factories, where mercuric method is used to produce chlorine. Thus, post-productive waste and hazardous waste that derives from the incineration method do not need to be an unnecessary burden for their owners. They no longer need to pay the cost of hazardous waste storage. The hazardous waste can be safely stored or transformed into a product of the commercial value.

Ecotech from Poland applied for patents from the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO). The company was selected by the Polish Ministry of the Environment as one of the leading, innovative green technology companies from Poland, promoted by the government-managed GreenEvo project (Accelerator of Green Technologies).

Ecotech uses an innovative method of selling the solution. As a company from Poland, they initially coped with problems of limited trust by foreign customers from major Western markets. The company introduced an interesting sales method, verifying the solution's credibility. The representatives of Ecotech Polska sp. z o. o. offer stabilisation sampling for every waste provided by a potential customer free of charge. These samples can be verified directly in the presence of the customer or transferred for further examination. The procedure provides the best possible sales argument and a guarantee of the process' effectiveness and helped the innovative company gain a foothold in major markets, based on the quality of the EnviroMix® technology.