ZEOLOGIC

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Industrial & Heavily Contaminated Sludge Treatment

The power of nanotechnology in environmental protection

Design, construction, installation, and maintenance of waste treatment plants

Approach

Sludge produced by industrial applications must be treated and characterized inert, fulfilling the specifications set out by the applicable legislation. There are generally two types of industrial sludge: Organic sludge that is produced e.g. from food industries (Diaries, Olive Oil Production Facilities, etc.), and mainly inorganic and heavily contaminated sludge produced by other industrial applications such as Anodizing, Powder Coating Plants, Oil Industry, and MSW Leachate. Organic treated sludge can be used as a high-quality soil improver, whereas inorganic treated sludge can be disposed as an inert material.

Through innovative technologies, high-quality EPC, and Maintenance services, **ZEOLOGIC** provides flexible and effective treatment for industrial and heavily contaminated sludge.

In the following tables you can see an example of a chemical analysis of a Heavily Contaminated Sludge sample before and after its treatment with the GACS method.

Chemical analysis of the initial sample

Parameter	Unit	Value
Ash	% w/w	76.23
Volatile compounds	% w/w	23.77
Solid residue	% w/w	92.75
Chloride ions (Cl^-)	ppm	3,700
Sulfate ions (SO_4^{2-})	ppm	218
Calcium (Ca)	ppm	54,300
Potassium (K)	ppm	1,620
Sodium (Na)	ppm	18,550
Arsenic (As)	ppm	17.8
Cadmium (Cd)	ppm	2.79
Cobalt (Co)	ppm	11.7
Copper (Cu)	ppm	1,203
Chromium (Cr^{3+},$^{6+}$)	ppm	73.4
Iron (Fe)	ppm	232
Lead (Pb)	ppm	1,793
Manganese (Mn)	ppm	2,112
Mercury (Hg)	ppm	11.2
Nickel (Ni)	ppm	102
Thallium (Tl)	ppm	0.76
Vanadium (V)	ppm	142.4
Zinc (Zn)	ppm	6,286

Leaching tests (Unit: mg/kg d.s.) (treated samples)

Parameter	Leaching test L/S = 2 l/kg			Leaching test L/S = 10 l/kg		
	Value (bdl = below detection limit)			Value (bdl = below detection limit)		
	Initial Sample	Final Sample	Limit Value*	Initial Sample	Final Sample	Limit Value*
As	2.76	0.034	0.1	4.78	0.43	0.5
Ba	bdl	bdl	7	bdl	bdl	20
Cd	1.07	0.018	0.03	1.24	0.032	0.04
Cr total	5.62	0.041	0.2	8.47	0.11	0.5
Cu	18.5	0.020	0.9	34.7	0.12	2
Hg	1.53	bdl	0.003	1.86	0.002	0.01
Mo	bdl	bdl	0.3	bdl	bdl	0.5
Ni	8.59	0.003	0.2	14.5	0.013	0.4
Pb	48.5	0.014	0.2	123.5	0.056	0.5
Sb	bdl	bdl	0.02	bdl	bdl	0.06
Se	bdl	bdl	0.06	bdl	bdl	0.1
Zn	126.5	0.32	2	172.5	0.78	4
Chloride	1,258	260	550	1,560	405	800
Fluoride	bdl	bdl	4	bdl	bdl	10
Sulphate	2,780	12.1	560	4,550	34.1	1
Phenol index	2.96	0.22	0.5	5.34	0.53	1
DOC	2,423	41.6	240	6,350	128.0	500
TDS	5,890	78.4	2,5	9,500	125.7	4
BTEX	59.7	2.2	6	73.4	3.7	6
PCBs	bdl	bdl	1	bdl	bdl	1
Mineral oil (C10 to C40)	2,560	115	500	3,230	240	500
PAHs	bdl	bdl	-	bdl	bdl	-
Co	1.59	0.020	-	3.25	0.045	-
Fe	254	0.006	-	316	0.031	-
Mn	32.8	0.033	-	47.9	0.111	-
Na	1,678	68.5	-	2,370	115.5	-
Tl	0.16	0.001	-	0.85	0.005	-
V	6.78	0.007	-	9.89	0.011	-

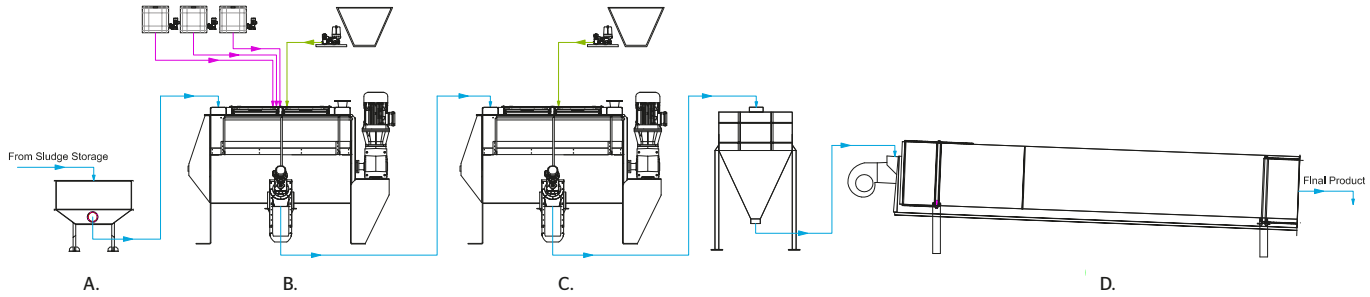
Co (percolation test) (Unit: mg/l) (treated samples)

Parameter	Value (bdl = below detection limit)		
	Initial Sample	Final Sample	Limit value*
As	1.33	0.051	0.06
Ba	bdl	bdl	4
Cd	0.85	0.015	0.02
Cr total	0.61	0.028	0.1
Cu	21.1	0.16	0.6
Hg	0.89	0.001	0.002
Mo	bdl	bdl	0.2
Ni	1.38	0.013	0.12
Pb	47.5	0.11	0.15
Sb	bdl	bdl	0.1
Se	bdl	bdl	0.04
Zn	54.6	0.15	1.2
Chloride	98.5	98.6	460
Fluoride	bdl	bdl	2.5
Sulphate	3,890	74.5	1,500
Phenol index	0.91	0.12	0.3
DOC	2,380	28.5	160
TDS	2,130	35.6	-
Co	1.78	0.012	-
Fe	255	0.87	-
Mn	74.3	0.36	-
Na	805	44.5	-
Tl	0.21	0.006	-
V	2.91	0.007	-

Chemical analysis of a Heavily Contaminated Sludge sample before and after treatment with GACS method

*Limit Value for Inert Waste according to 2003/33/EC COUNCIL DECISION, 19/12/2002

ZEOLOGIC provides specialized air antipollution solutions adjusted to each case



Legend Chemicals Line: Geopolymer Line: Sludge Line:

Technical Description of a typical industrial sludge treatment unit using the Geochemical Active Clay Sediment method (GACS)

A typical industrial sludge treatment plant using the Geochemical Active Clay Sediment method (GACS), includes the following stages:

A. Pre-Storage

Industrial Sludge Pre-Storage is the stage where the incoming sludge for treatment is stored under particular conditions. Sludge is stored temporarily, until it can be transferred to the next stages of the process.

B. Stabilization

Initially, sludge is weighed and monitored before it reaches the Stabilization reactor. Once the reactor is filled, the mixing begins. Water might be added in the tank so that the sludge can acquire the required humidity. Right after, proper reagents are added while mixing. The stabilization geopolymer powder is added to the reactor. Mixing continues, and after the homogenization of the mixture, sludge can be characterized fully stabilized in order to be transferred to the next treatment stages.

C. Neutralization

The stabilized sludge is transferred in the Neutralization reactor under specific conditions. In Neutralization reactor, neutralization geopolymer powder is added in proper quantities, during continuing mixing. After total homogenization, sludge is neutralized and proceeds further to the next treatment stages.

D. Drying

The sludge is stored temporarily to a buffer tank and then it is transferred to a dryer. Drying of the sludge is the final stage of the treatment, and it is built under certain specifications depending on the type of the sludge. When the process is completed, sludge is stabilized, neutralized, inert, and ready for a safe disposal as inert material, or even as a high-quality soil improver, if the sludge is of an organic origin.

- All of the stages described above are fully automated and controlled through a Programmable logic controller (PLC).
- On-site control and interference with the operation of the unit is done via a touchscreen HMI (Human-machine interface).
- Supervisory control and data collection is done through the SCADA system (Supervisory Control And Data Acquisition).
- Remote control and operation of the unit is possible. Wireless communication for remote control can be done via mobile phone, tablet and PC.

Contact information

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