ZEOLOGIC

SUBSIDIARY OF **MYTILINEOS**

Air Pollutants Control residues Treatment Line

Design, construction, installation and maintenance of waste treatment plants

Air pollutants control residues consists of a variety of different type residues, mainly produced by industrial facilities. The residues are mainly dust, ash and other similar type materials that they are captured by the air antipollution equipment which is installed in the industries in order to prevent the pollution of the atmosphere. The residues are mainly produced by air antipollution systems like cyclones, electrostatic filters etc or can be produced as incineration facilities furnace residue from thermoelectric power plants or waste incineration plants.

A significant part of the air pollutants control residues are the bottom and fly ash. Both of them are produced from the burning of coal or other solid fuel or solid waste. Bottom ash is the coarse, granular, incombustible by-product of coal combustion that is collected from the bottom of furnaces. Fly ash is a fine powder that is a byproduct of burning pulverized coal in electric generation power plants.

The Geochemical air pollutant control residues treatment process that is presented below can be applied in the treatment of these type of residues and produce a stabilized and inert final product. This is certified by the results of leaching tests to the final treated waste, which were performed according to the 2003/33/EU Decision.

Chemical residue composition (Ash)

Table 1

Parameter	Initial Sample % w/w	Final Sample % w/w
SiO_2	42,14	28,40
Al_2O_3	19,86	22,93
CaO	14,01	15,81
Fe_2O_3	13,04	10,43
MgO	2,64	3,16
K_2O	1,36	1,83
SO_4^{2-}	3,14	2,50
Na_2O	0,00	12,84
IL (Ignition loss)	3,81	2,10
Total	**100,00**	**100,00**

Leaching tests results of the Residue (Ash) treated sample

	Table 2		Table 3		Table 4	
	L/S = 2 lt/kg		L/S = 10 lt/kg		C_o (percolation test)	
Parameter	Limit* (mg/kg)	Result* (mg/kg)	Limit* (mg/kg)	Result* (mg/kg)	Limit* (mg/lt)	Result* (mg/lt)
Al	-	0,64	-	0,80	-	0,74
As	0,10	0,06	0,50	0,16	0,06	0,032
Ba	7,00	0,00	20,00	0,00	4,00	0,00
Cd	0,03	0,00	0,04	0,00	0,02	0,00
Cr (total)	0,20	0,11	0,50	0,27	0,10	0,093
Cu	0,90	0,10	2,00	0,10	0,60	0,11
Fe	-	0,46	-	0,37	-	0,19
Hg	0,003	0,00	0,01	0,00	0,002	0,00
Mo	0,30	0,08	0,50	0,09	0,20	0,16
Ni	0,20	0,19	0,40	0,33	0,12	0,075
Pb	0,20	0,00	0,50	0,00	0,15	0,00
Sb	0,02	0,00	0,06	0,00	0,10	0,00
Se	0,06	0,00	0,10	0,00	0,04	0,00
Zn	2,00	< 0,02	4,00	< 0,02	1,20	< 0,02
Cl-	550	0,00	800	0,00	460	0,00
F	4,00	0,36	10,00	0,14	2,50	0,42
Phenol Index	0,50	0,00	1,00	0,00	0,30	0,00
TDS	2.500	1.900	4.000	3.400	-	2.800
SO_4^{2-}	560	480	1.000	980	1.500	1.105
DOC	240	0,00	500	0,00	160	0,00

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

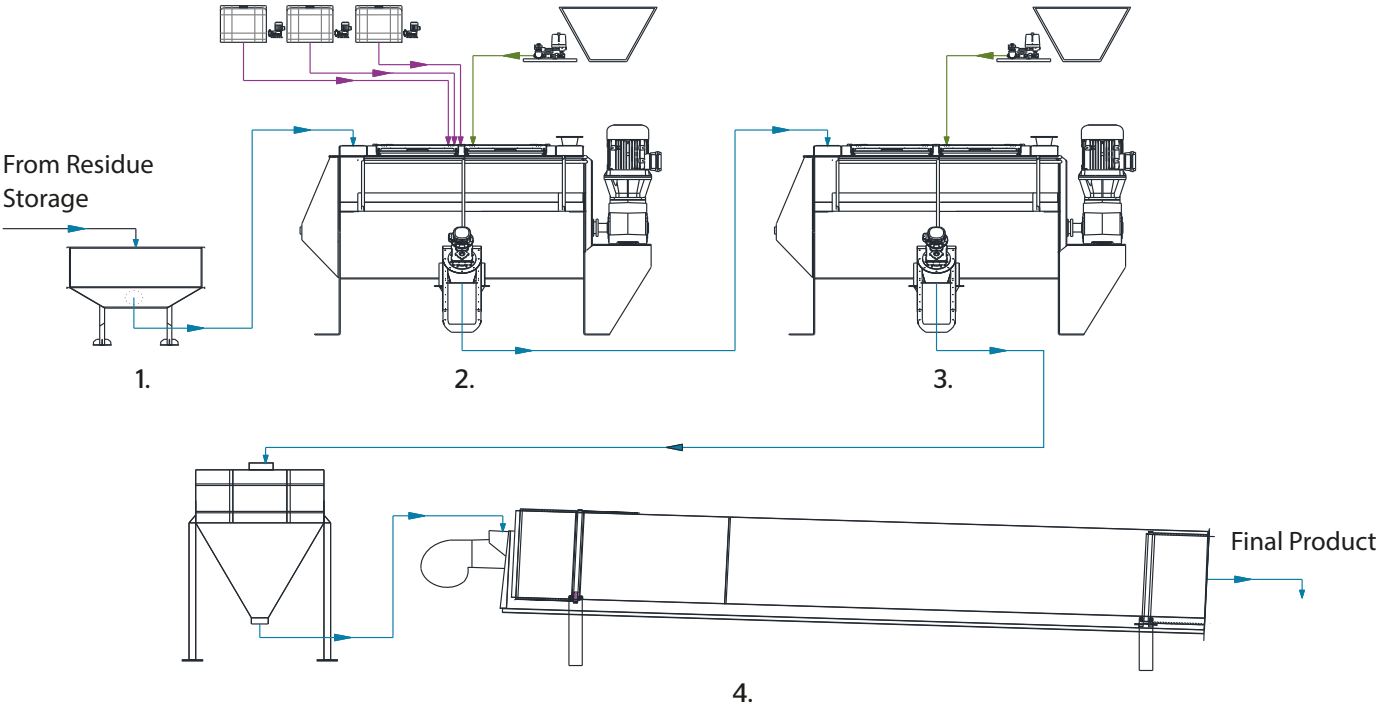
Table 1: Residue (Ash) chemical analysis (% w/w), of the initial and final sample

Table 2: Treated Residue (Ash) Leaching test 1 results (L/S = 2 lt/kg)

Table 3: Treated Residue (Ash) Leaching test 2 results (L/S = 10 lt/kg)

Table 4: Treated Reside (Ash) Leaching test 3 results (C_o (percolation test))

The stages of the proposed treatment line are:
1. Residue storage
2. 1st Geochemical Reactor
3. 2nd Geochemical Reactor
4. Dryer



Legend:
Chemicals Line:
Geopolymer Line:
Residue Line:

1. Storage
Residues can be stored to container or any other type of storage, according to the needs and the complete planning of the unit, with specific requirements to be protected from the environmental conditions and more specific to be protected from the wind. After storage, ash is transported to the next treatment stages with transport systems suitable for the transport of the material.

2. 1st Geochemical Stage (1st Reactor, Hygienation - Stabilization)
From storage, residues are transferred into the 1st Geochemical Reactor, for the 1st treatment stage with proper transport systems. Once the reactor is filled, the chemical oxidation stage begins by mixing. Chemical reagents in proper quantities are added while mixing in the reactor until the stage is completed. Chemical reagents are liquid chemicals that are added to the reactor with dosing pumps. After the homogenization of the waste, Type A geopolymer, is added to the waste for stabilization, using dosing systems. Mixing continues for a period of time until the waste is fully homogenized. When the process is over, the treated waste is moved to the 2nd Geochemical Reactor for the next treatment stage.

3. 2nd Geochemical Stage (2nd Reactor, Neutralization)
When the transfer of the waste from the 1st Geochemical Reactor to the 2nd Reactor is completed, second treatment stage begins. Mixing is starts and continuous during the process and the neutralization Type B geopolymer is added in proper quantities. After total homogenization of the mixture, and when process is completed, waste is hygienised, stabilized and neutralized and treated waste is ready for the drying stage.

4. Dryer
Drying of the treated residues is an important stage of the treatment, because the final waste volume is reduced, therefore less quantities of treated waste will be managed as final product. Size of the Dryer depends on the final material quantities and water in it. Dryer is constructed under special specifications, so it has maximum efficiency on humidity reduction of the material and with the lower energy consumption. When the process is completed, treated ash is hygienised, stabilized and neutralized and it is ready for a safe disposal as inert material.

- 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
Industrial Area of Thessaloniki Sindos Greece Block 8/3A-10 Post Office Box 1086
Postal Code 570 22 T: +30 2310 251243 E: info@zeologic.gr
www.zeologic.gr