UNCONTROLLED INDUSTRIAL WASTE DISPOSAL IN LANDFILLS: CASE STUDY IN ATTICA PREFECTURE

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Landfill mining

Background


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Google earth
2002
Imagery Date: 4/13/2013 38°01'43.04" N 23°23'17.82" E elev 521 ft eye alt 1665 ft

Site visit

6 subareas were pointed out as the most suspicious for illegal hazardous waste disposal

Waste sampling procedure

Key elements of sampling plan*

- Identify parties involved
- Identify sampling objective
- Determine waste properties to be defined
- Determine testing and analyses requirements
- Research on background of waste
- Take precautions of health and safety
- Select sampling approach. Probabilistic or judgmental type of sampling
- Define optimal sampling technique

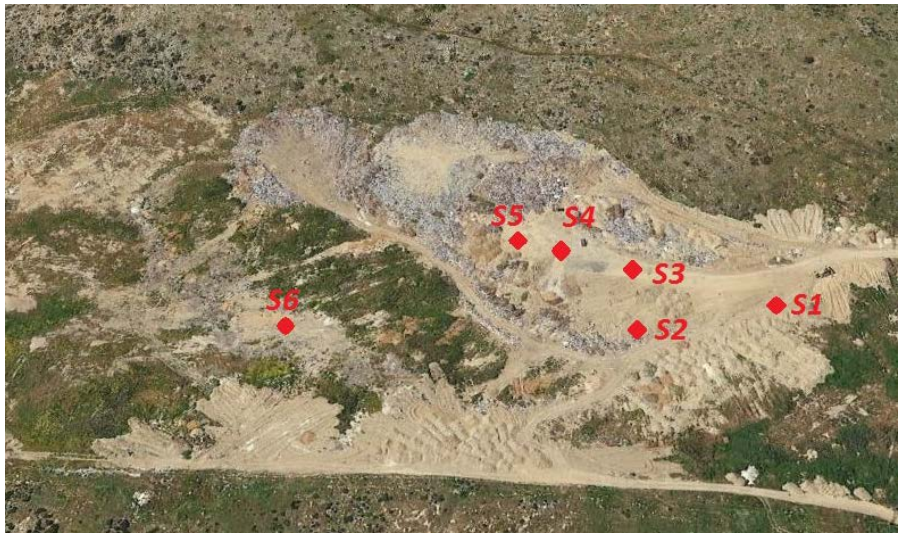
→ Take samples in accordance to sampling plan

↓ Pack and transport of sample to the laboratory

↓ Sampling Protocol and Sampling report

*ΕΛΟΤ EN 14899: *Characterization of waste - Sampling of waste materials - Framework for the preparation and application of a sampling plan)*

Sampling sections



Ground Section	Depth	No of samples
Section 1	4.6 m	4
Section 2	5.2 m	1
Section 3	1.7 m	2
Section 4	3.3 m	1
Section 5	5 m	1
Section 5	2.6 m	1

Waste identification

Oily sludge – section 1

Oily sludge - section 2

Oil phase on the ground

Waste identification

Industrial sludge – section 1

Industrial sludge – section 4

Inorganic dust - section 3

Waste identification

Hazardous waste packing – section 3

Hazardous waste packing – section 4

Hazardous waste packing with ammonia odor – section 5

Soil pollution

Burning soil – section 6

Polluted soil with petroleum products – section 2

Chemical Analyses

Methods of analyses
EPA 200.7 REV. 5: 2001 Trace elements in water, solids and biosolids by inductively coupled plasma-atomic emission spectrometry EPA 6010C 2, 2007 Inductively coupled plasma-atomic emission spectrometry (ICP) prEN 14405, 2003. Leaching behaviour tests – Up-flow percolation test – horizontal standard ENV 12506, Analysis of eluates – Determination of pH, As, Ba, Cd, Cl, Co, Cr, Cr(VI), Cu, Mo, Ni, NO2, Pb, total S, SO4, V and Zn (analysis of inorganic constituents of solid waste and/or its eluate; major, minor and trace elements) EN 12457/1-4, Leaching- Compliance test for leaching of granular waste materials and sludges (Compliance leaching test for granular waste)
ASTM D 5468 - 02 (2007): Standard test method for gross calorific and ash value of waste materials. ISO 9377 - 2: 1997 Water quality - Determination of hydrocarbon oil index - Part 2: Method using solvent extraction and gas chromatography

Analyses Results

Total concentration (mg/kg d.m.)

	organic waste			inorganic waste				soil
As	12.1	10.8	10.8	6.4	8.87	7.6	3.82	9
Cd	0.23	<0.2	0.27	0.2	0.2	<0.2	<0.2	0.83
Pb	22	23.3	42	19	17.9	263	9.6	875
Ni	47.6	48.3	82	48	119	18.1	28.5	59
Hg	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	5.54
Cu	17.3	13.2	76.4	16.6	19.7	8.4	10.1	80.6
Cr	47	45.6	70	43	58.4	81.2	87	45
Zn	50	44.1	152	46	40.8	316	29	142
PAHs	77.23	83.5	0.35	<0.1	n.d.	5.7	<0.1	197
TPH	30800	17500	520	<100	<100	<2000	<100	8660
PCBs	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

Leaching concentration (mg/kg d.m.)

	organic waste			inorganic waste				soil	inert	non hazardous	hazardous
As	<0.05	<0.05	<0.05	0.05	0.06	<0.05	0.07	0.05	0.5	2	25
Ba	0.71	0.74	0.77	0.39	0.33	3.54	2.29	0.06	20	100	300
Cd	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.04	1	5
Cr	0.05	0.04	0.03	0.09	0.07	0.28	0.24	0.15	0.5	10	70
Cu	0.06	0.2	0.16	0.09	0.14	0.23	0.31	1.65	2	50	100
Hg	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	0.2	2
Mo	0.07	0.09	0.16	0.16	0.1	<0.03	0.05	0.04	0.5	10	30
Ni	0.08	0.08	0.17	0.06	0.07	0.07	0.26	0.66	0.4	10	40
Pb	0.05	0.06	<0.05	<0.05	<0.05	<0.05	0.11	0.23	0.5	10	50
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.06	0.7	5
Se	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.1	0.5	7
Zn	0.42	0.55	0.21	0.28	0.11	0.96	0.24	1.26	4	50	200
Cl	<100	128	456	1150	1060	890	357	78	800	1500	25000
F	<10	<10	<10	<10	<10	<10	<10	5	10	150	500
SO4	7000	14900	2870	1850	735	132	120	1180	1000	20000	50000
phenolic index	65	82	6.6	6.3	4.8	10.9	2.7	100	1		
DOC	9100	7100	6150	7550	5950	10900	7750	8400	500	800	1000
TDS	10000	10000	20000	n.d.	n.d.	30000	n.d.	n.d.	4000	60000	100000
dry matter	92.47	90.37	84.62	85.79	83.57	90.04	64.4	85.08			
pH	7.7	7.6	7.9	8.1	7.9	7.6	8	8.1			

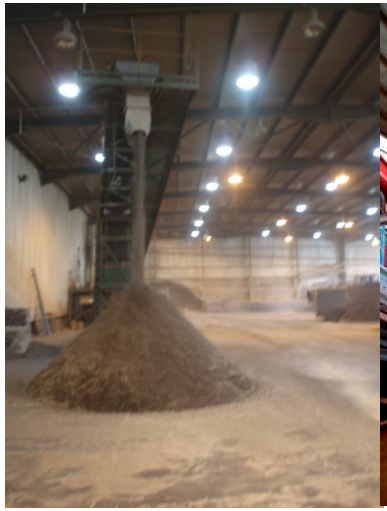
POLYECO – A Greek Hazardous Waste Recovery Facility

- Established in 2001 in cooperation with cement industry and refinery
- Management of >250.000 tn of hazardous waste
- Recovered aproximately 70% in the cement industry
- 30% exported to EU licensed facilities in accordance to EU Regulation

Main Waste Streams Producers

Refineries
Lubricants production industry
Paint industry
Organic chemicals industry
Metallurgic industry
Pharmaceutical Industry
Oil Waste from Vessels
Energy Production industry
Typing industry
Wood production industry
Electro logical equipment production (e.g. cables)

Fuel and Raw Materials Production



2 Production lines for solid fuel
a) sieving and mixing equipment (e. trommels) (oily, paint, e.t.c), sawdust, polyurethane, e.t.c..
b) shredding – granulating equipment, separators (magnetic, air separator, eddy current), sieving

Tank farms for the reception of oily waste mainly and production of liquid fuel .

Waste rich in CaO, SiO2, Al2O3 and Fe2O3, are tested with adequate additives for raw materials recovery (EWC 190306*, 190307)

Production of Alternative Raw Materials

Name of (group) products : RAWCEM (RAW MATERIALS FOR CEMENT INDUSTRY

It is a group of alternative raw materials produced in POLYECO in order to use in the cement industry as a substitute for natural raw materials, rich in main oxides, ie. CaO, SiO2, Al2O3 and Fe2O3.

We take care of the environment on your behalf…

Industrial waste that compose RAWCEM

- Physicochemical Sludge
- Polluted Soil
- Sandblasting Waste
- Catalysts
- Slags / Ashes
- Filter Dusts

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- Industrial Raw Materials

Alternative raw materials

Final disposal / recovery site

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Alternative Raw Materials specifications (parameters)

RAWCEM Specifications
$CaO + SiO_2 + Al_2O_3 + Fe_2O_3$
MgO
Hg
Tl
Cd
As + Ni + Co + Se + Te + Cr + Pb + Sb + Sn + V
Cr
Cu
Mn
Zn
Cl
Na_2O + K2O (Na2Oeq)
PCBs + PCT
Phenols
Dioxines /Furans

Production of Alternative Fuels

Name of (group) products : ASF or ALF

(ALTERNATIVE SOLID or LIQUID FUELS)

Production of alternative fuels and alternative raw materials. Every day, a different (productive) day.

Industrial waste that compose AF

- Oily sludges
- Polluted absorbent materials
- Polluted packaging
- Activated Carbon
- Painting sludges
- Organic Filter Dusts

*

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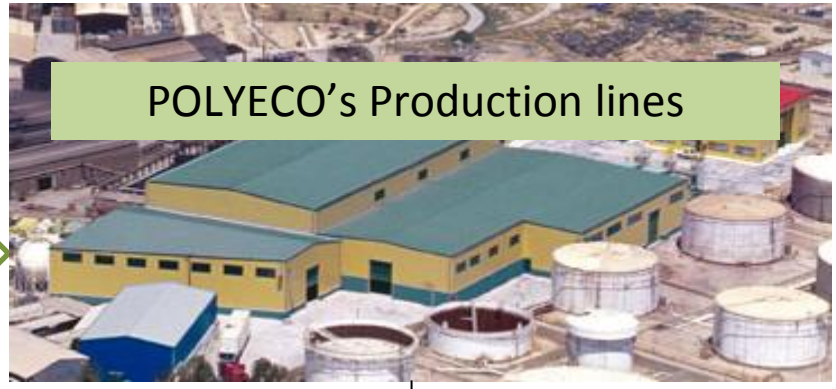
- Industrial Raw Materials out of specs



Alternative fuels

Final disposal / recovery site

Alternative Fuels specifications (parameters)

AF Parameters
Moisture
Lower calorific Value (Kcal/kg)
Cl / F
Ash
Volatiles
S
$N\alpha_2Oeq$
Tl + Hg +Cd
As
Pb
Cr
Co
Cu
Mn
Ni
V
Zn
Flash Point

Potential of mining waste

Conclusions

- ✓ Reduction of soil and groundwater pollution
- ✓ Land reclamation
- ✓ Extension of landfill life
- ✓ Recovery of valuable resources (fuels and raw materials)
- ✓ Advancing research & entrepreneurship
- ✓ Job growth

Thank you for your attention

For more information visit our website:

www.polyeco.gr

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