

OSBO<sup>®</sup> technology

OSBO<sup>®</sup> (On Site Separation, Biodegradation and Oxidation) combines the effectiveness of approved *in situ* and *ex situ* remediation methods. In 2008 GBU acquired licence of OSBO<sup>®</sup>. OSBO<sup>®</sup> includes mobile technologies of on site soil washing, the preparation of oils, solid matters and process water as well as methods of bioremediation (biological soil conditioning in heaps).

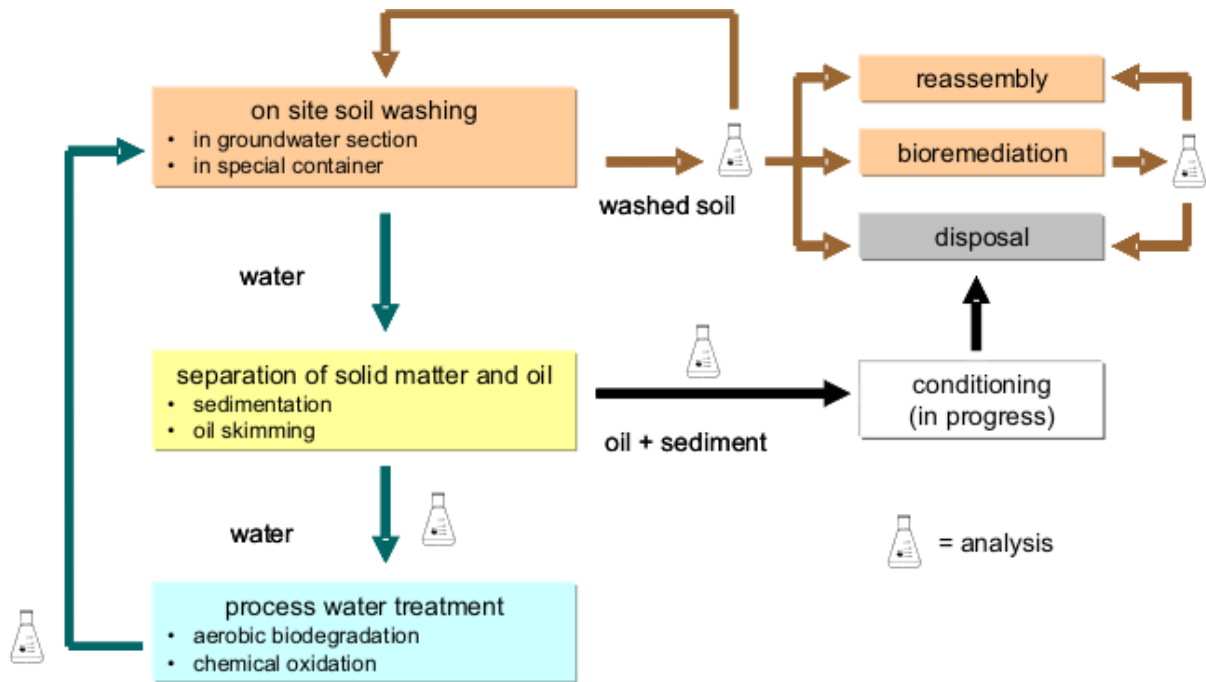


Fig. 1: OSBO<sup>®</sup> flow chart.

On site soil washing bases on the wet mechanical abrasion of the pollutants from soil grain. The soil structure will be disintegrated by energy implementation of the OSBOmat<sup>®</sup>. The high shearing forces assure an optimum of contamination transfer into the liquid phase.



Fig. 2: OSBOmat<sup>®</sup>.

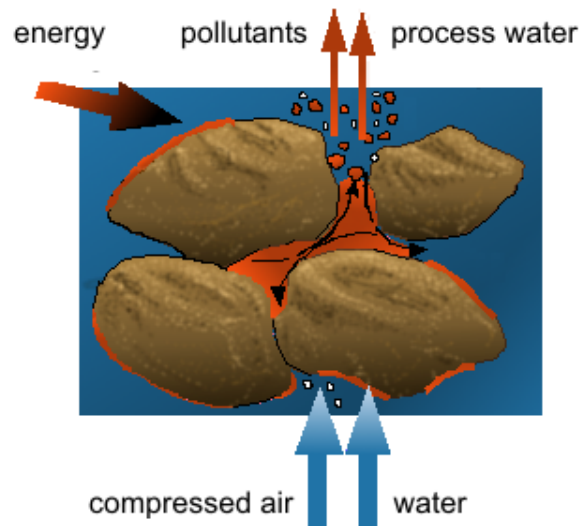


Fig. 3 (right): Energy implementation by OSBOmat<sup>®</sup>.



Fig. 4: Unwashed soil.



Fig. 5: Washed soil.

The OSBO® technique directly operates in the contaminated core zone or in special containers and allows a decontamination of the problem site with simultaneous activation of natural degradation processes (ENA = enhanced natural attenuation). Goals are the reassembly of washed soil or a cost-effective disposal. Further proceedings depend on analysis of washed soil. For heavily polluted soils a repetition of washing procedure might be necessary. If the concentration is minimal higher than the target value soil can be treated by biological conditioning in heaps (bioremediation).

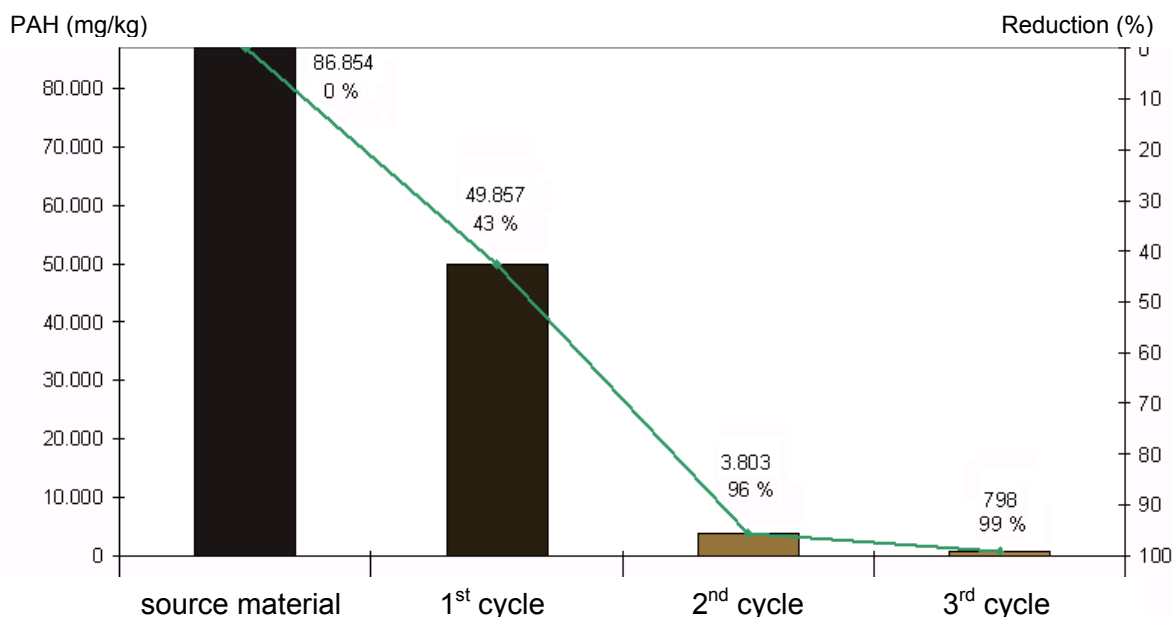


Fig. 6: PAH reduction in soil by on site washing.

The process water passes through separation tanks (oil skimming, sedimentation) and a biological and oxidative treatment plant and is recirculated afterwards. The single modules will be combined depending on the kind and quantity of contaminants.



Fig. 7: Transfer of contaminants into the liquid phase (on the left before and on the right after soil washing).



Fig. 8: OSBO® on site soil washing in a special container with downstream multifunctional separation stage.



Fig. 9: Oil separator.



Fig. 10: Separated heavy oil.



Fig. 11: Biological and oxidative process water treatment plant.



Fig. 12: Water probes before, during and after biological and oxidative purification.

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Application range

- Coarse and fine grained soil with silt < 10 %
- Treatment of mineral and tar oil contamination
- Depth of groundwater level 1 - 8 m

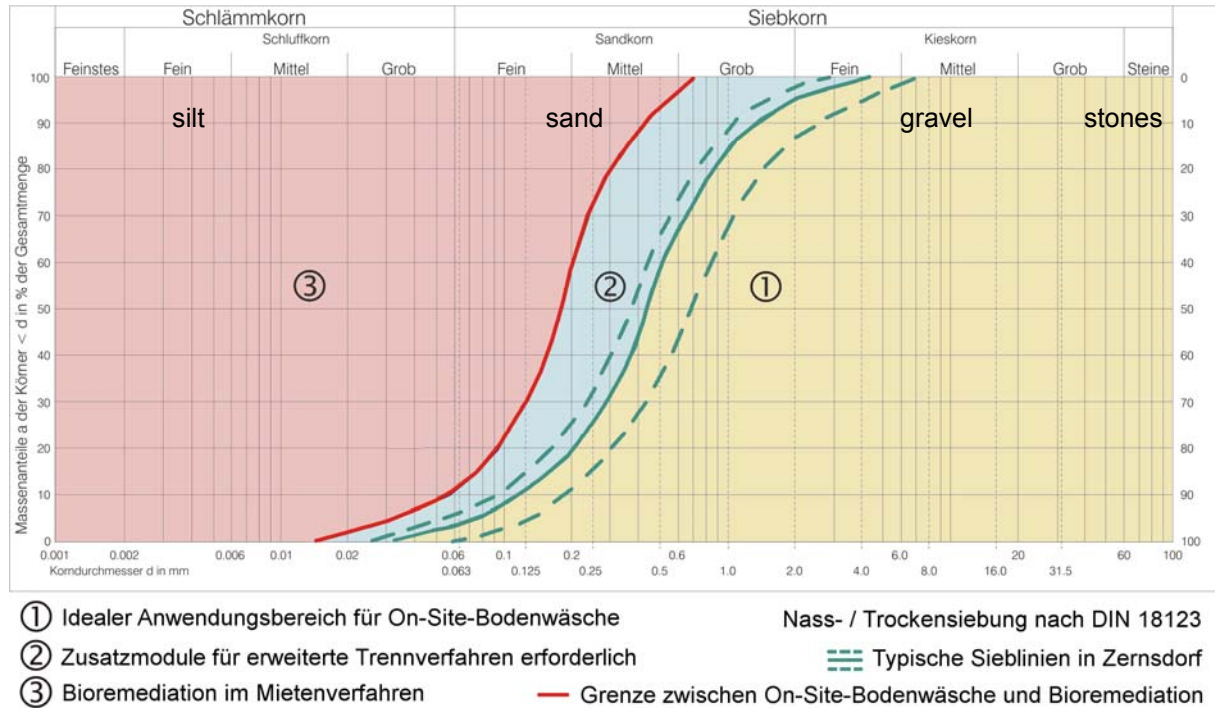


Fig. 13: Application range of OSBO® proceedings - (1) ideal application range of soil washing (2) extra modules for soil washing necessary (3) bioremediation in heaps.

Limit of applicability

- Silt > 10 %: extra costs for process water treatment (sedimentation conditions, adsorption effects, sludge formation).
- Continuous groundwater flow or groundwater fountain with  $Q \geq 3,5 \text{ m}^3/\text{h}$  (needed as process water)

Development status

- Originally developed for short chained mineral oils as well as mono- and diaromatics
- Current status: established for long chained TPH and higher condensed PAH ( $\Sigma \text{TPH} > 100.000 \text{ mg/kg}$ ,  $\Sigma \text{EPA-PAH} > 80.000 \text{ mg/kg}$ ) by optimization of separation techniques and the biological and oxidative water treatment plant
- First successful tests of biological degradation of oil sludge in a pilot plant

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**OSBO® technology**

- Further development: on-site washing and bioremediation of heavy metal contaminated soils (container washing under acidic conditions followed by precipitation / flotation, soil conditioning by phytostabilization)

**Reference projects / responsible authority**

- Former sleeper factory Zernsdorf / Umweltamt Landkreis Dahme-Spreewald
- Freight depot Stuttgart-Bad Cannstatt / Amt für Umweltschutz Stuttgart
- Former Progress factory Zeesen / Umweltamt Landkreis Dahme-Spreewald
- Service station Elf Oil Cottbus / Umweltamt Cottbus
- Former Minol fuel depot Bad Liebenwerda / Umweltamt Landkreis Elbe-Elster
- German highway A15, Autobahnmeisterei Gallinchen / Umweltamt Cottbus
- Former CIS area in Stahnsdorf / Umweltamt Landkreis Potsdam-Mittelmark

**Web**

- Teresa 3.0 online - Technologieregister zur Sanierung von Altlasten (www.teresa3.de, search item: osbo)
- www.gbu-mbh.de

**Hint**

The technology can be used in licence.