

SUSTAINABLE REDEVELOPMENT WITH A CLOSED MASS BALANCE

SOIL WASHING



In Canada a lot of former industrial sites are scheduled to be redeveloped as residential and community areas: most brownfield sites are located in densely populated areas. How to deal with contaminated soils is often a challenge. The relation of densely populated areas and contaminated

land creates a need for sustainable redevelopment of these sites, including the use of large volumes of sand for backfilling and grading purposes.



by Bastiaan Lammers

“The goal of applying soil washing techniques is to have a closed mass balance.”

There is a need for an affordable and sustainable technique for cleaning these sites. Techniques like biological treatment (attenuation), “pump and treat” and soil washing are alternative ways for sustainable redevelopment of these sites.

Treatment of the soils in a soil washing plant and reusing the processed material is one option. Soil washing has different benefits for brownfield development projects.

Soil washing technique

Soil washing facilities are designed for a water-based volume reduction process, using particle size and density separation. The cleaning technique is based on the principle that contamination most affects the fine (organic) particles in the soil. A traditional soil washing process has three major stages: Coarse material separation (more than 2 mm), sand separation (2 mm-63 µm) and dewatering of the fines (less than 63 µm).

After sampling and physical and/or chemical analysis, the

coarse material and the sand is potentially ready for use at the location. The separated fines are, in principle, contaminated. The mechanically dewatered fines can be additionally treated by adding solidification material as an additional process step to the soil washing plant. By stabilizing this material the contamination gets fixed into the sediments. After this treatment the stabilized filter cake is ready for beneficial use.

Maximizing reuse on-site

For the redevelopment of brownfield areas, large quantities of sand are often necessary for backfilling, grading or landscaping. The goal of applying soil washing techniques is to have a closed mass balance. Excavated soils are treated in a soil washing plant constructed at the brownfield development area. This plant separates particles based on particle size and density as described above. After processing, the output material can be reused on the site, resulting in tremendous project cost savings (i.e., by avoiding off-site disposal).

Previously, the installation of a soil washing plant on a remediation site was a rather expensive exercise due to the way the equipment and process parts were constructed. Another limiting factor in deciding on a remediation approach was the production capacity of the available plants. Often the production of the plant was lower than the capabilities/needs for excavation, resulting in downtime of the excavation equipment.

These days, soil wash technology has become much more sophisticated. Contractors and equipment vendors have had the opportunity to gain a lot of experience in European countries (for example The Netherlands), resulting in sophisticated plants. The throughput of the plant has increased to 100-150 tonnes of soil per hour, meeting or even out producing excavation capabilities. Modern plants have a high level of automation resulting in an optimum process efficiency and minimum use of (chemical) additives like, for example, polymer used for the mechanical dewatering of the fines. Also, the flexibility of the equipment has improved. Modern equipment is built on standardized container frames. Once on site, all the individual plant parts (containers) are stacked together and connected, resulting in a quick (and cheaper) mobilization. Due to this plant design the process is flexible as well. Additional plant parts

can be added easy or unnecessary plant parts can be left uninstalled. A modern plant has a footprint of about 2,000 m², making it a financially attractive option for brownfield development.

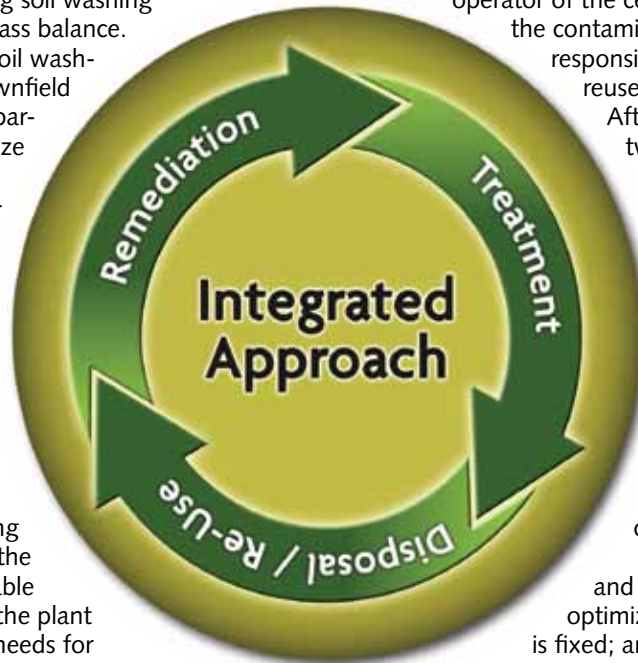
Regional soil washing centres

If it's not feasible to install a mobile soil washing plant on a development site due to (for example) local legislation, space limitations or a limited quantity of contaminated material, it's also possible to transport the contaminated material to a regional soil management centre. Usually the operator of the centre is paid by the generator of the contaminated soil. The operator is, in turn, responsible for the treatment, beneficial reuse and/or disposal of the material.

After the financial transaction between the generator and the operator, the operator becomes the "owner" of the contaminated soil. This option might be more feasible in situations where there are more, relatively small, contaminated (brownfield) sites within a relatively short distance of one another. In The Netherlands, soil washing centres have operated for years and hauling contaminated soils to these locations has become a common operation.

In these centres the treatment and the disposal of the material can be optimized due to the fact that the plant is fixed; and agreements with disposal sites can be made for relatively large quantities of potentially disposable material. Soil washing centres may sometimes even be located at landfills, resulting in minimal transportation needs.

Looking at the overall mass balance of a soil washing centre, these centres are accepting contaminated material and are producing clean reusable aggregates (gravel, sand). This reusable material can be transported back to the original site for reuse. Or the reusable material can be an aggregate with a variety of applications.



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