# Air Treatment Methods as Possible Alternatives to Activated Carbon

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**Background/Objectives.** During the remediation of soil and groundwater contaminated with organic contaminants like hydrocarbons and MTBE, contaminated air requires treatment as well. Contaminated air can originate from for example biosparging, SVE, aeration of on-site bioreactors or air extraction of biopiles. Common practice is to use activated carbon to treat the contaminated gas, which is both costly and not very sustainable. In the present paper, three alternative air treatment techniques (compost filter (1), completed-clean soil pile (2) and bioscrubber (3)) are presented.

**Approach/Activities.** Leakages of an old petrol station led to high contamination of the surrounding soil and groundwater. The main compounds present are BTEX, MTBE and Mineral Oil. GreenSoil proposed to combine SVE with (1) a 40 ft compost filter equipped with ATEX remediation units to treat high concentrated contaminated air. The compost filter consists of three layers of about 1.5 to 2 m thickness where the air is circulated with a flow rate of approximately 300 $m^3$/hr.

A former triacetate production site caused soil and groundwater contamination with BTEX (mainly xylene) and Mineral Oil to a depth of 10 m-bgl. The volume of contaminated soil and groundwater is about 18255 $m^3$ and 132,417 $m^3$, respectively. The approach used in this case of study was excavation and on-site landfarming (unsaturated and smearing zone) combined with in-situ enhanced aerobic degradation of the groundwater contamination. The innovative solutions to save active carbon usage proposed by GreenSoil are the recirculation of contaminated air through (2) a completed-clean soil biopile and (3) a bioscrubber.

**Results/Lessons Learned.** The air treatment performed by means of the compost filter was able to degrade the organic compounds from 1036 ppm to 95.9 ppm within 9 months with an average efficiency of about 70%. The degradation rate was considerably fast, with a residence time in the compost filter of few seconds.

The air treatment with the completed-clean pile (2) or bioscrubber (3) are designed as last steps of the landfarming process. After air is extracted from a contaminated biopile, it is driven through system (2) or (3). The air concentrations entering these systems ranged from 500 ppm to 2000 ppm xylene.

The air treatment by means of the completed-clean biopile (2) that served as biological filter, reached acceptable values within about 70 days, regardless the initial contamination concentration. The completed-clean biopile reduced the contamination with an efficiency up to 60-80% and up to 70% saving on active carbon.

The bioscrubber treated air coming from the contaminated biopile with a flow rate of about 500 $Nm^3$/h. Initially “fresh water” was used for scrubbing the contaminants from the gas stream. Water is recirculated through the bioscrubber with addition of nutrients in order to stimulate bacteria growth. The efficiency of this system varied with the recirculated water quality (pH and EC) and provided amount. However, the efficiency of the bioscrubber was in average about 60%.

In general, the presented air treatment methods are able to reduce the contamination concentrations up to 60-80% and are therefore potential alternatives to reduce the amount of active carbon used in the remediation works. However, it is still necessary to employ active carbon as polishing step whether strict concentration limits need to be achieved.