Chemical Detoxification

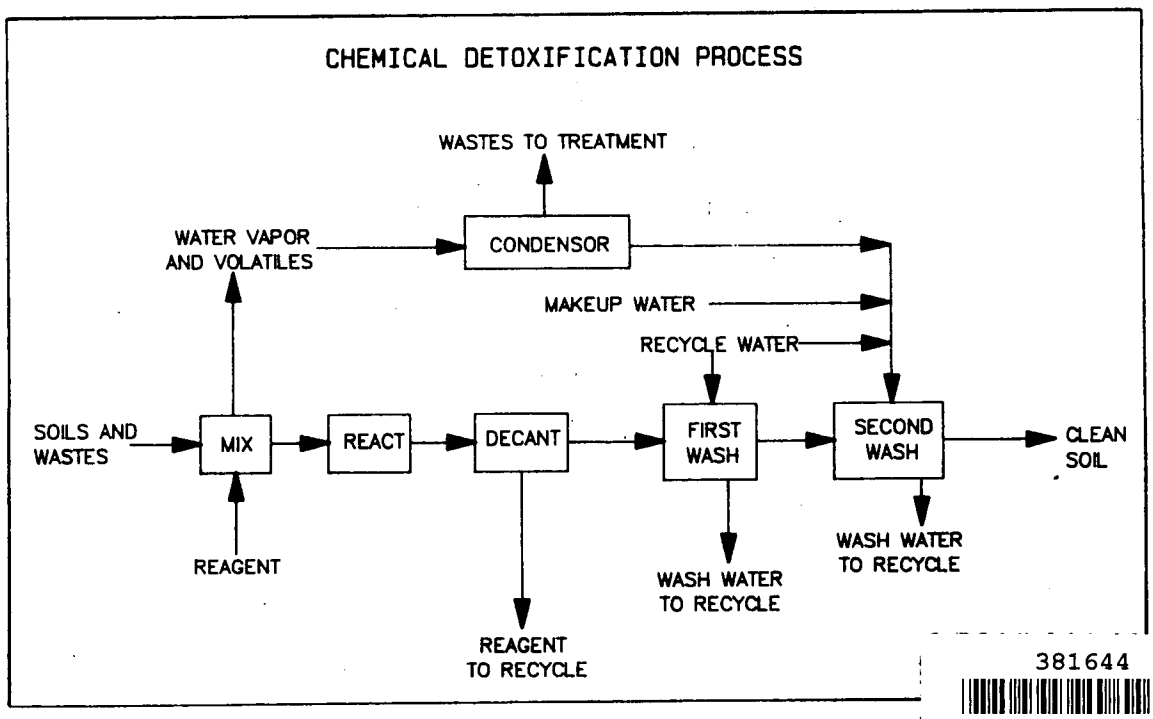
EPA Region 2

Chemical Detoxification is a treatment process that uses chemical reactions to break down hazardous organic chemicals into non-toxic or less toxic chemicals. Chemical detoxification processes have been designed for treating specific chemicals or groups of chemicals. Specific chemical detoxification (dechlorination) of polychlorinated biphenyls (PCBs) in soils and sludges is a potentially applicable treatment method.

Chemical dechlorination of PCBs involves the use of chemicals to remove chlorine from the PCB molecules. The residual is a less toxic biphenyl molecule. Other solvents may be added to increase the rate of PCB release from the soil into the reagent. Excavated solids are placed in a tank and the reagents are added and mixed. Water contained in the solids are removed by heating during the reaction. Completion of the reaction may require 1 to 4 hours or longer per batch to achieve the required destruction level.

Following completion of the reaction, water is added to the tank to cool the solid and dissolve soluble reaction products (potassium hydroxide and lead hydroxide) and excess reagents. Water is removed from the mixture using dewatering equipment. The mixture is washed repeatedly to remove excess reagent and soluble reaction products. Reagent and wash water must then be treated to remove excess reagent and reaction products. Both the reagent and wash water is recycled for reuse in the process.

Treated soils or sludges may contain 50 percent water by weight, up to 1300 parts per million (ppm) polyethylene glycol, heavy metals, and trace amounts of PCBs. Additional treatment may be required if hazardous concentrations of heavy metals remain in the treated materials.



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Technology Evaluation: **CHEMICAL DETOXIFICATION (Dechlorination)**

EFFECTIVENESS

ADVANTAGES

- Dechlorination results in a reduction of toxicity.
- Process is applicable to organic chemicals containing chlorine, such as PCBs.
- Process has been used to reduce PCB concentrations in transformer oil from __ ppm to less than 50 ppm.

DISADVANTAGES

- Process is sensitive to moisture and clay content of material treated.
- Field tests are required to estimate effectiveness and costs.
- Process has not been widely applied to soils and sediments or applied on large-scale projects.

IMPLEMENTABILITY

ADVANTAGES

- Dechlorination can be used to treat a variety of chlorinated organic chemicals.
- Potentially applicable to soils, sediments and sludges.
- Consistent with SARA's emphasis on innovative treatment technologies.

DISADVANTAGES

- Limited availability of equipment and operators. Technology is in field testing stage of development
- Waste streams will require secondary treatment prior to disposal.
- Process is inhibited by water content >4%.
- Materials with high clay content may prevent recovery of reagent.
- Results in treated material with high water content and containing some treatment residuals.

COST

ADVANTAGES

- PCB destruction reduces long-term monitoring costs.
- Operation and maintenance costs are in the moderate range.
- Unit costs for sediment and soil treatment range from $100 to $300 per in-place cubic yard.

DISADVANTAGE

- Treating materials with high water content may require higher operation and maintenance costs due to drying operations.

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