

# Ivey International Inc.

## Bioremediation of PCP Treated Waste Wood

The disposal of pentachlorophenol (PCP) treated waste wood has become a prominent environmental problem. Utility companies in North America are faced with finding new, environmentally acceptable means to dispose of millions of tonnes of out-of-service PCP treated wood waste. Industry estimates suggest that in the United States there are 72 million PCP treated utility poles (28.8 million tonnes) presently in service while in Canada there are ca. 300 million cubic feet (6.8 million tonnes) of PCP treated utility poles installed.

Since PCP treated utility poles have an average life of ca. 35 years, the first installed generation of PCP poles is just now being removed from service. The industry is faced with a massive disposal problem as, during the next decade, large numbers of PCP poles will become due for replacement. The present removal rate has been estimated at 1.5 million tonnes per year.

In the past disposal of out-of-service poles has included land filling and burning, neither of which is ecologically acceptable in the face of evolving environmental standards.

Ivey Environmental Services Ltd. will utilize a biological (bioremediation) treatment for PCP contaminated wood.

This process degrades the PCP rapidly and in an environmentally safe manner. The process relies upon specially selected natural microorganisms which have a high tolerance to PCP under the treatment conditions and which rapidly metabolize it to carbon dioxide and biomass.

Laboratory testing has shown that up to 80 percent of PCP in contaminated wood chips can be degraded in only four weeks. In another test 50 percent of PCP in contaminated wood was converted to carbon dioxide within seven weeks. Chemical analysis of the treatment residue has indicated that there is no appreciable accumulation of intermediate metabolites such as pentachloroanisole, a problem which has plagued other processes. The process mineralization rate ranges between 1 and 2 percent per day. (Figure 1)

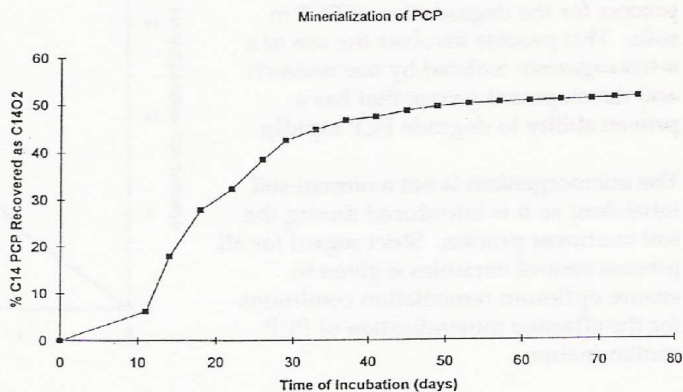


Figure 1: Mineralization of PCP in utility pole wood.



For more information,  
contact:

Ivey International Inc.  
PO Box 706,  
Campbell River, BC,  
V9W 6J3

Toll Free: 1-800-246-2744  
Tel: (250) 923-6326  
Fax: 1-888-640-3622  
Email:

budivey@iveyinternational.com



Presently laboratory testing is being undertaken to determine the rate of disappearance of PCP. These findings should be made available in the near future.

The treatment is operationally very simple and is amenable to a composting type of system such as is routinely used for bacterial bioremediation of hydrocarbon contaminated soils. The process is reproducible and there is no apparent inhibition due to concentration of PCP. (See Figure 2)

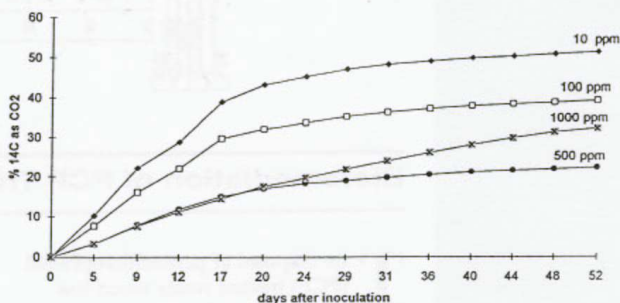


Figure 2: Elimination of PCP from wood using bioremediation.

## Treatment of PCP Contaminated Soil by Bioremediation

Bioremediation is a cost-effective method for cleaning soils contaminated with a wide range of organic pollutants. However, the normal process utilized for petroleum hydrocarbons does not always work well with pentachlorophenol (PCP) since this compound is difficult to oxidize and is toxic to many soil microorganisms.

Ivey Environmental Services Ltd. has developed a proprietary bioremediation process for the degradation of PCP in soils. This process involves the use of a microorganism isolated by our research and development group, that has a proven ability to degrade PCP rapidly.

The microorganism is not a normal soil inhabitant so it is introduced during the soil treatment process. Strict regard for all process control variables is given to ensure optimum remediation conditions for the effective mineralization of PCP contamination.

The microorganism mineralizes the PCP into  $\text{CO}_2$  and other non-toxic products.

Ivey Environmental Services Ltd. laboratory studies have shown that PCP degradation proceeds much more rapidly than in untreated soil. A mineralization rate of 1 percent per day has been consistently observed. (See Figure 3)

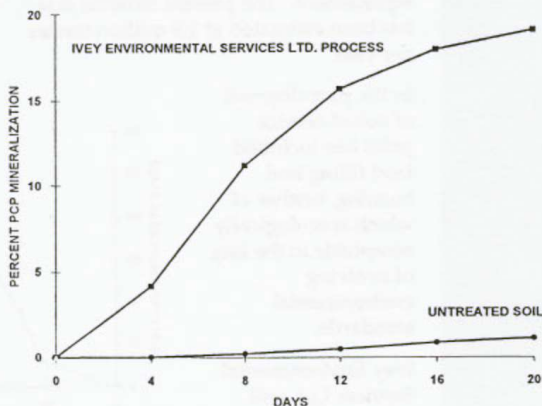


Figure 3: Bioremediation of PCP in soil.