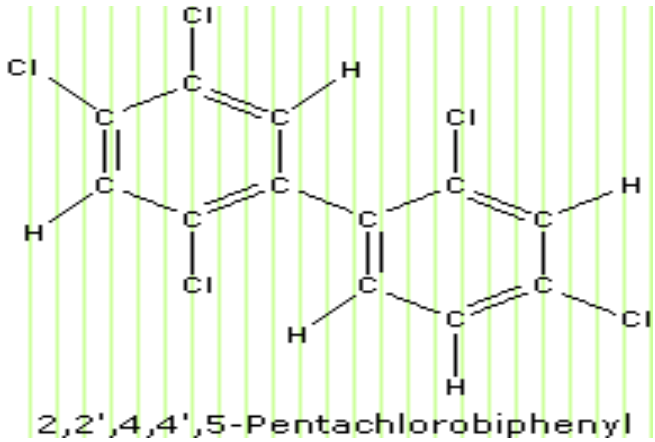
Design of Novel Mobile Process For Remediating PCB Contaminated Soils Project Plan



Illinois Institute of Technology
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Mission Statement:

Design a mobile fluidized bed process that desorbs Poly Chlorinated Biphenyls (PCB) and other toxic materials from identified contaminated areas.

Objectives:

1. Review research papers and articles on PCB and current policies. These are available at university libraries and via 'I-share'.

2. Define PCB chemistry with emphasis on its cancer forming properties.

3. Document industrial usage of carcinogens (PCB in particular).

4. Apply Chemical Engineering principles to design a mobile high capacity fluidized bed operation.

5. Design the overall process sans incineration that converts PCB's to other toxic materials.

6. Use a computer process simulation system to model the design. This model will include a material and energy balance over the process.

7. Determine equipment size, process capital and operating costs.

Background:

Polychlorinated biphenyls (PCB's), also known in the U.S. by their industrial trade name, Aroclor, are synthetic chemical compounds consisting of chlorine, carbon and hydrogen. First synthesized in 1881, PCB's have high degree of chemical stability, low solubility in water, low vapor pressure. They are also categorized by their high heat capacity, low flammability and electrical conductivity, and favorable dielectric consistency.

These and other properties have made them desirable components in a wide range of industrial and consumer products. PCB's were used as insulating fluids in electrical equipment like transformers in power plants, industrial plants, telecommunications and utility lines, and large buildings across the country. Due to the unregulated production of PCB's, hundreds of millions of pounds of PCBs were improperly dispersed into the environment. Although PCB's production was ceased in 1977, due to their hazardous effects, exposure still occurs. Many previously manufactured transformers and capicitors that have lifetimes of 30 years or more still cantain fluids made with PCB's.

This is of particular concern because upon exposure into the environment, PCB's are not biodegradable and may result in serious health problems among exposed humans and animals, as well as causing significant environmental contamination. Exposure to PCB's can be by inhalation, skin contact or consuming fish from contaminated waters. The EPA classifies PCB's as carcinogens. Studies have also shown that PCB's can cause a variety of non-cancer related heath effects including effects on the immune system, the reproductive system, the nervous system, and the endocrine system.

PCB's are regulated by the U.S. Environmental Protection Agency under the Clean Water Act Effluent Guidelines. Under Section 313 of the Emergency Planning and Community Right to Know Act of 1986, releases of more than one pound of polychlorinated biphenyls into the air, water, and land must be reported annually and entered into the Toxic Release Inventory (TRI).

Due to their proximity to Chicago more information will be retrieved and presented for the PCB contaminated sites at Waukegan Harbor, Altgeld Gardens, and Bloomington Indiana.

Methodology:

First stage: Information Gathering

- Library research to determine structure of PCB and utilizing fluidized beds. Will look into the Kirk-Othmer encyclopedia of chemical technology available at the Galvin Library.
- Background on industrial usage of carcinogens and government policies on allowable amounts.
- Investigation of contamination sites – how big?

Second stage: Process Design and preliminary reports

- High capacity fluidized bed

- Cost estimates
- Mid-term report and presentation update

Third stage: Presentation of results in preparation for IPRO day

- Identify possible customers
- Complete presentation
- Catalog reports in presentable manner
- Executive summary
- Invite chemical engineering faculty for review and a question/answer session

Expected Results:

The design of a mobile fluidized bed reactor is to be removed and recover PCB's and any other toxic materials from specific contaminated sites.

- The application of chemical engineering principles in the design of a mobile high capacity fluidized bed operation that removes PCB from contaminated soils.

- The design of the above process to fit on conveyances such as a flat bed truck to allow mobile treatment of soils.

- The effective use of a computer process simulation system (HYSIS) for the process design.

Milestone Events and Due Dates:

Events	*Due Date*
IPRO First class	Accomplished!
Project Management workshop	Accomplished!
Project Plan	Accomplished!
Midterm Progress Report	October 20
Final Report Rough Draft (one page abstract)	November 27
Poster	November 22
Final Project Report	November 30
PowerPoint Presentation	November 29
IPRO Projects day Conference	December 1
Comprehensive Deliverables CD	December 1
IPRO Team Debriefing	December 4-15

Individual Team Members' Assignments:

PROJECT Assignment	TEAM MEMBERS
Group Leader	Dolapo Popoola
Project Plan	Robert Rivera, Ahlam Hmadouch
Process Design/Integration	Dolapo Popoola, Suman Bir, Robert Rivera, Ahlam Hmadouch, Lashawna Taylor, Katya Perez, Charlotte Okwudi
IKNOW/IGroups Maintenance	Vito Bussman
Capital/Operating Cost Analysis	Dolapo Popoola, Suman Bir, Robert Rivera, Ahlam Hmadouch, Lashawna Taylor, katya Perez, Charlotte Okwudi
PCB general Research	Jonathan Witthoeft, Justin Kirk, Sotiel Polena
Contaminated Sites	Sotiel Polena
Health and Safety Issues	Suman Bir
PowerPoint presentation	Jonathan Witthoeft, Justin Kirk, Sotiel Polena
Meetings Minutes	Suman Bir

Although individual team members are responsible for their respective tasks, the IPRO 345 team as a whole collaborates to assist and ensure that tasks are accomplished, as well as that all information within the deliverables is true and correct.

Budget and Anticipated Expenses:

Expenses	Amount
Food incentive for IPRO team Members	$110
Printing account with CNS and supplies to properly document the various aspect of the project	$30
Phone Card (Long distance Call to Canadian CINTEC Company	$20
Poster board, color paper, glue and sketch markers	$20
Microsoft Project	$66
Total	$246