

Enhanced Ex Situ Bioremediation of Hydrocarbons Using Natural Absorbents



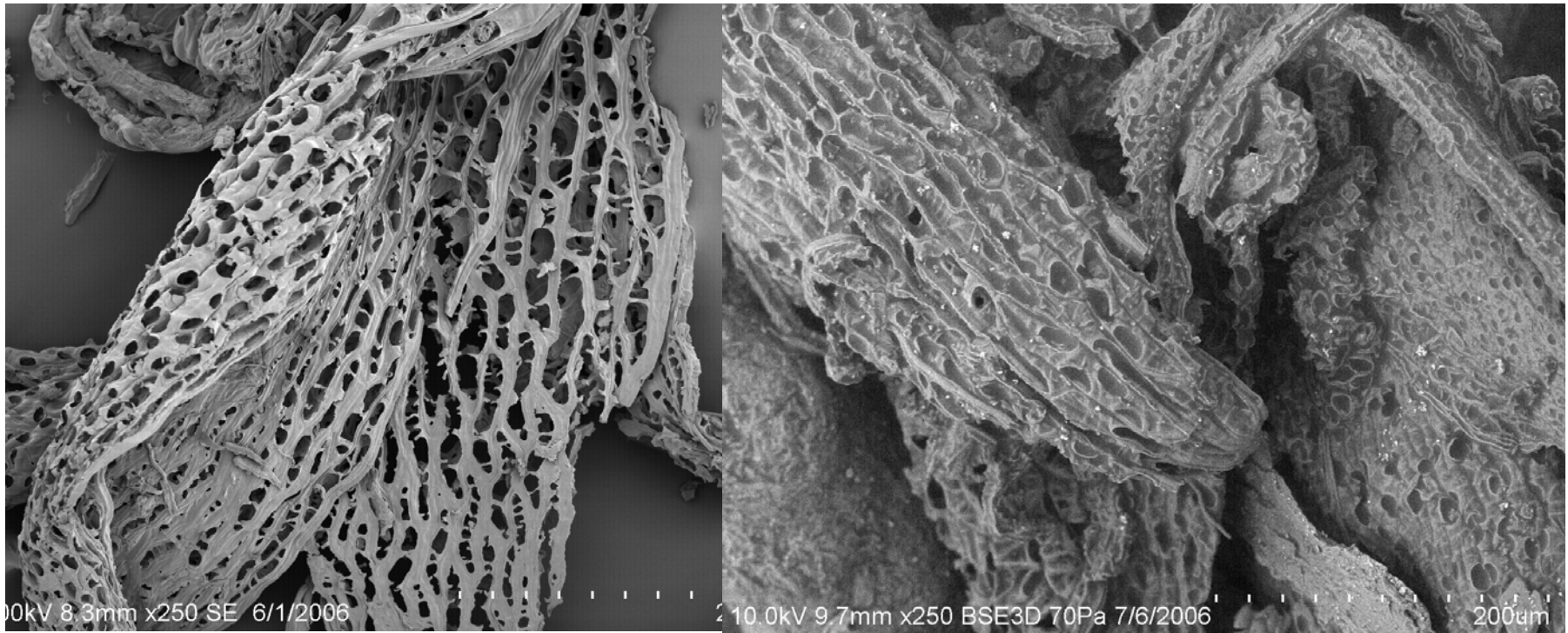
This is NOVA Chemicals

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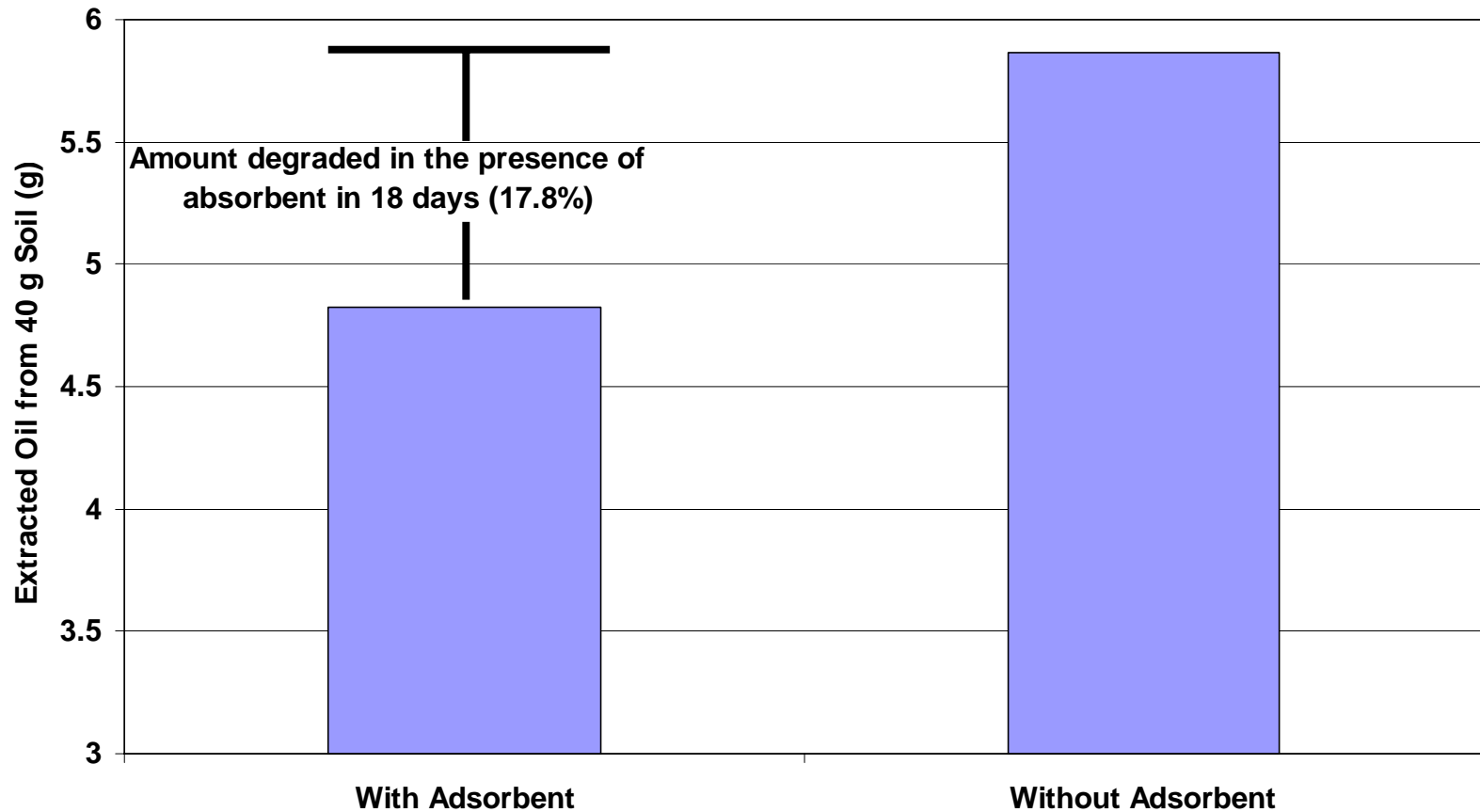
A common problem on most large sites – the “soil treatment area”



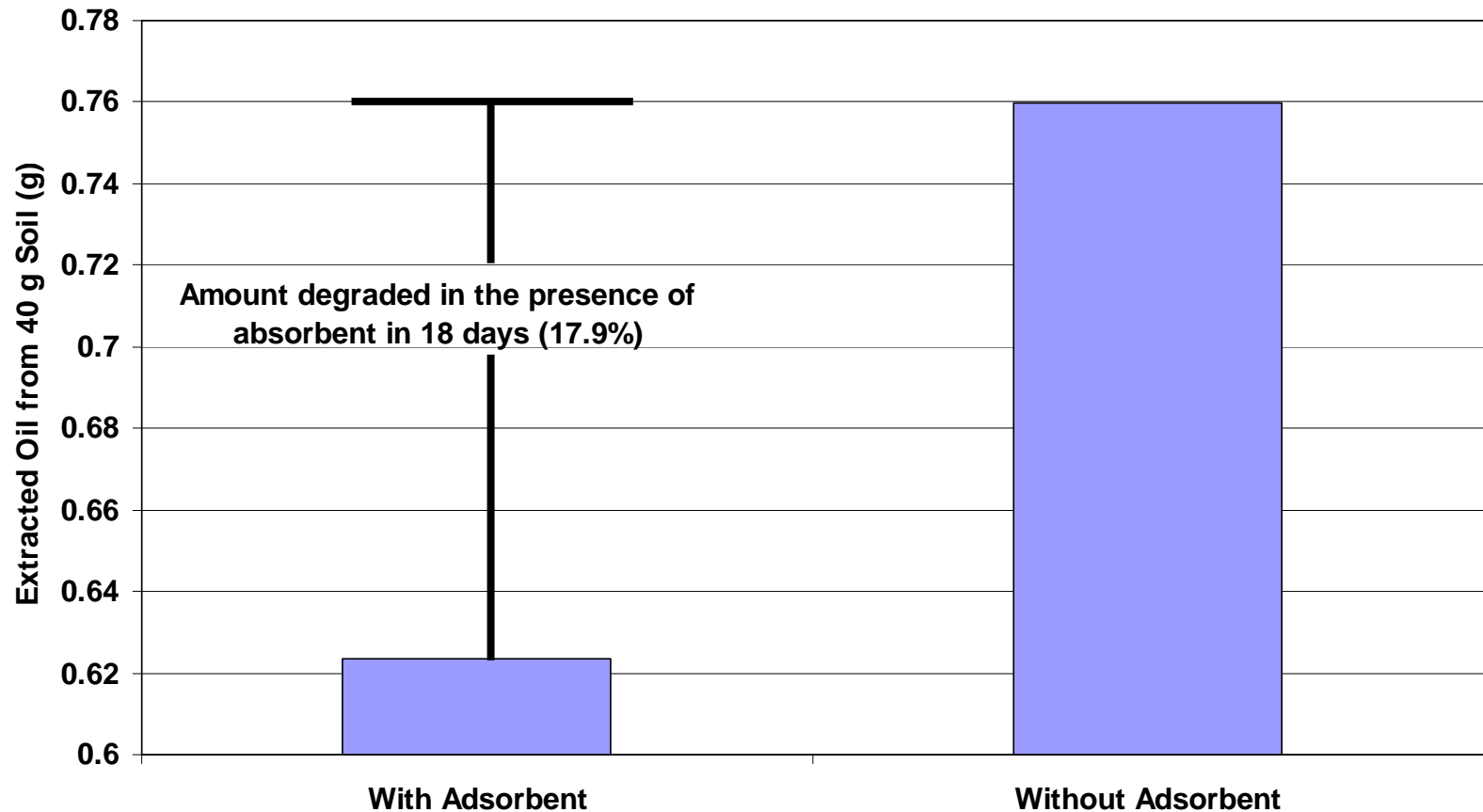
Heat-treated peat exposes pores and increases surface area for adsorption and absorption of hydrocarbons (left side). The heat-treated peat with oil encapsulated within the pores (right side).



Role of adsorbents in enhancing biodegradation – high concentration.



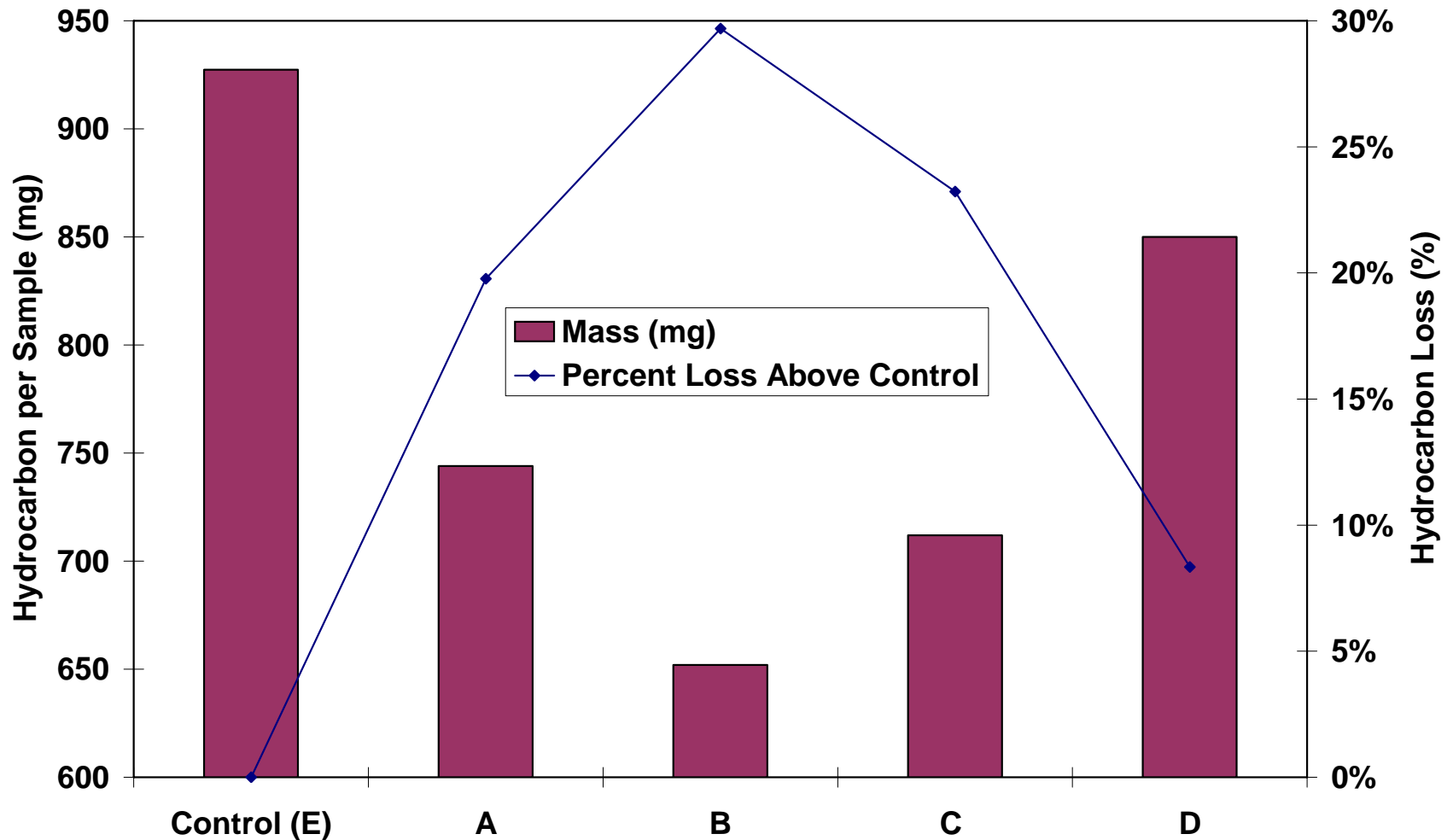
Role of absorbents in enhancing biodegradation – low concentration.



Hydrocarbon degrading bacteria remaining within the pores of the heat-treated peat after the metabolism of encapsulated hydrocarbon.

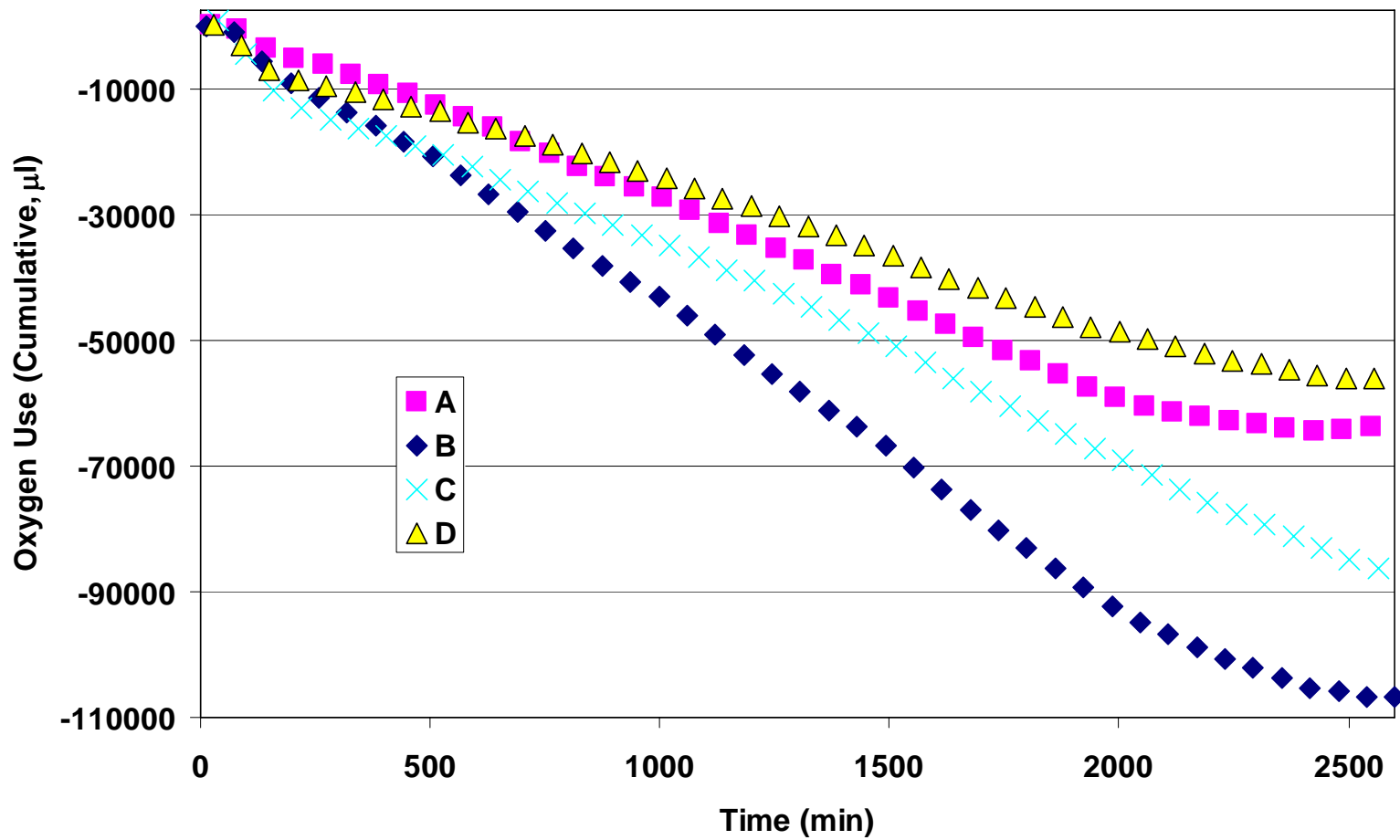


Additional loss of hydrocarbon attributed to amendments added to the contaminated soil



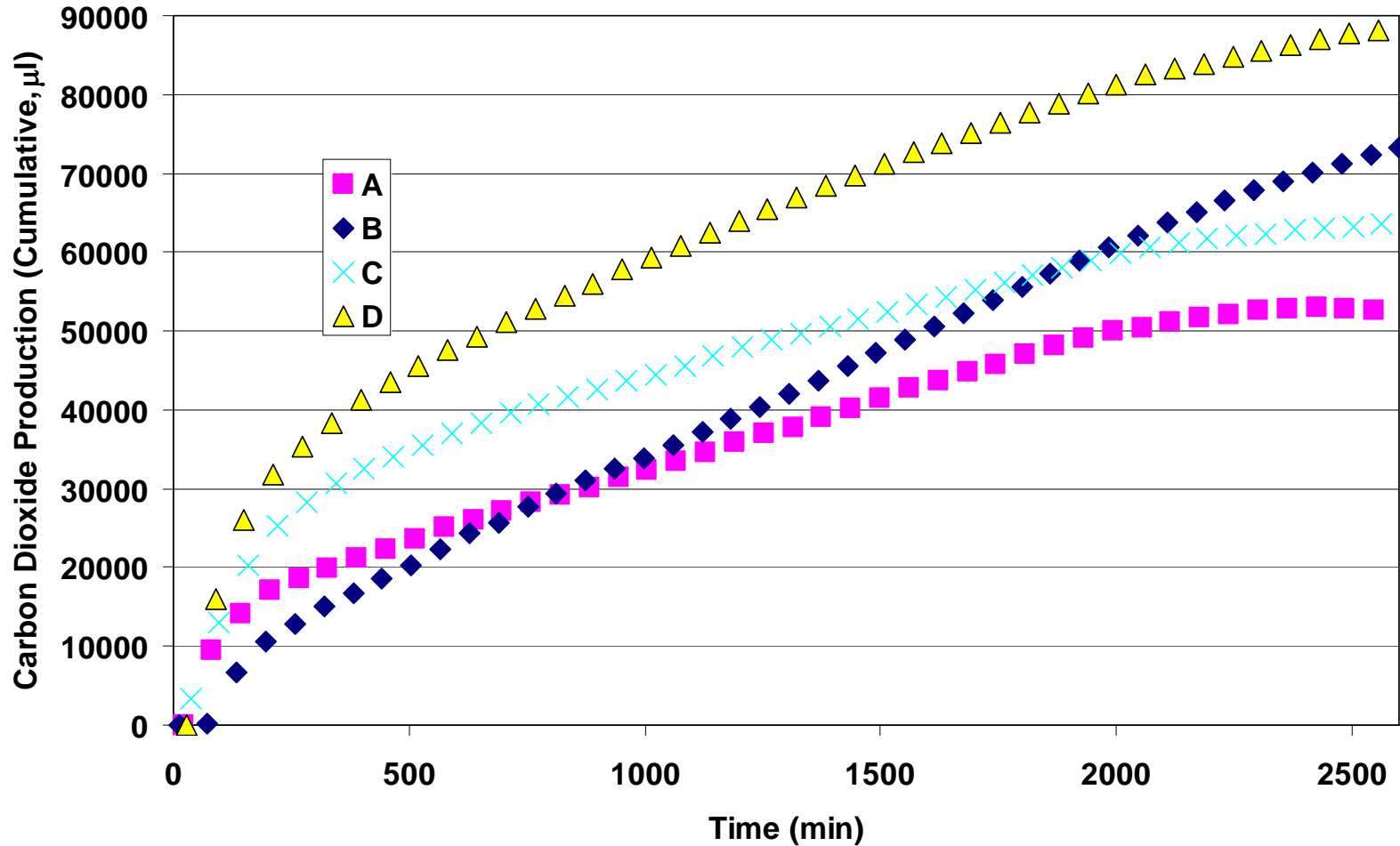
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Cumulative oxygen use determined by a respirometer in the first two days

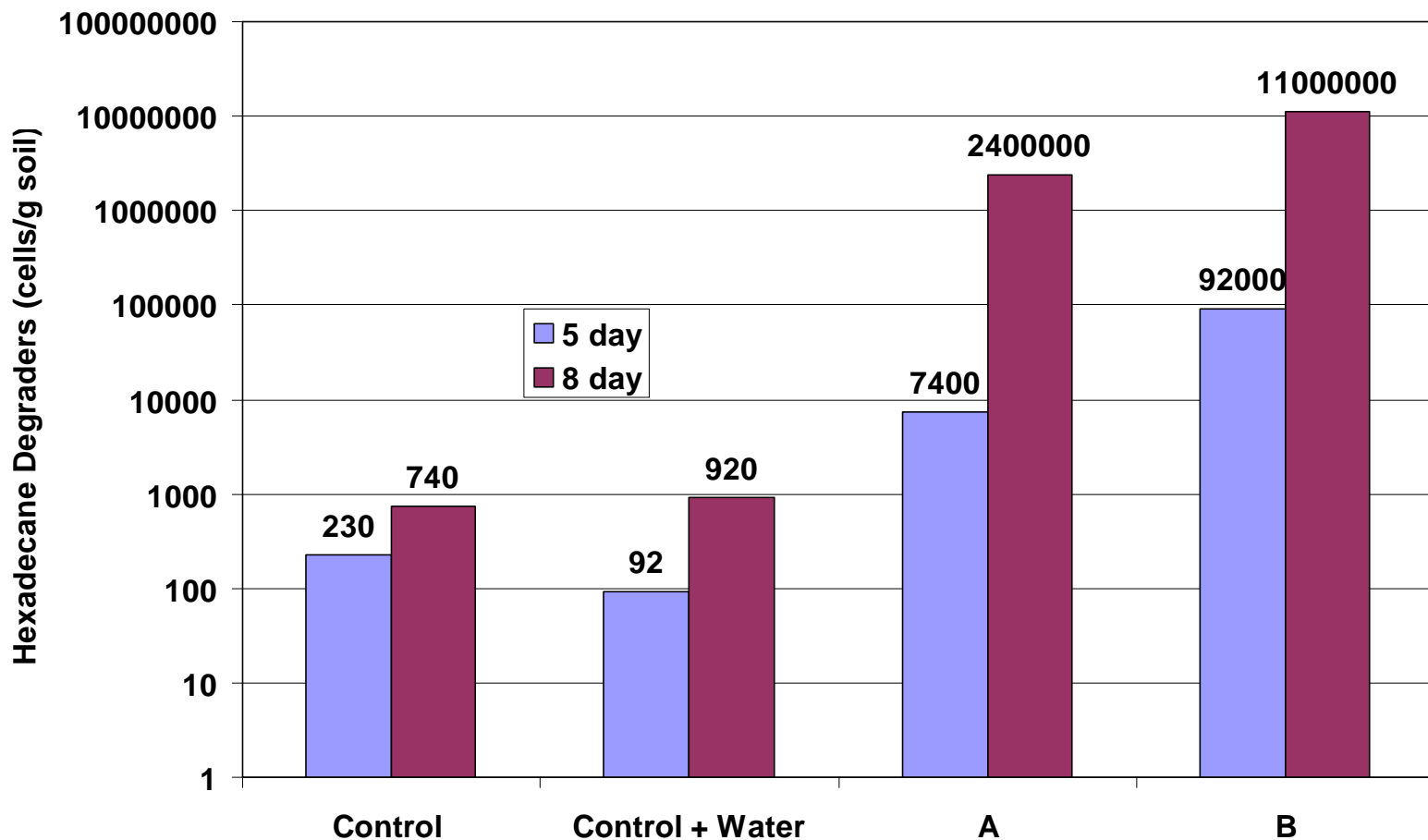


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Cumulative carbon dioxide production determined by a respirometer in the first two days



Most probable number counts of hexadecane degraders stimulated by the environment found in microcosms (A) and (B).



LEARNINGS

- Microcosm (B) resulted in a 30% greater loss in hydrocarbon.
- Microcosm (B) augmented degradation compared to other amendments by approximately 10%.
- Peat absorbents stimulated biodegradation and increased the number of biodegradative organisms by approximately 12,000 fold.

NEXT STEPS

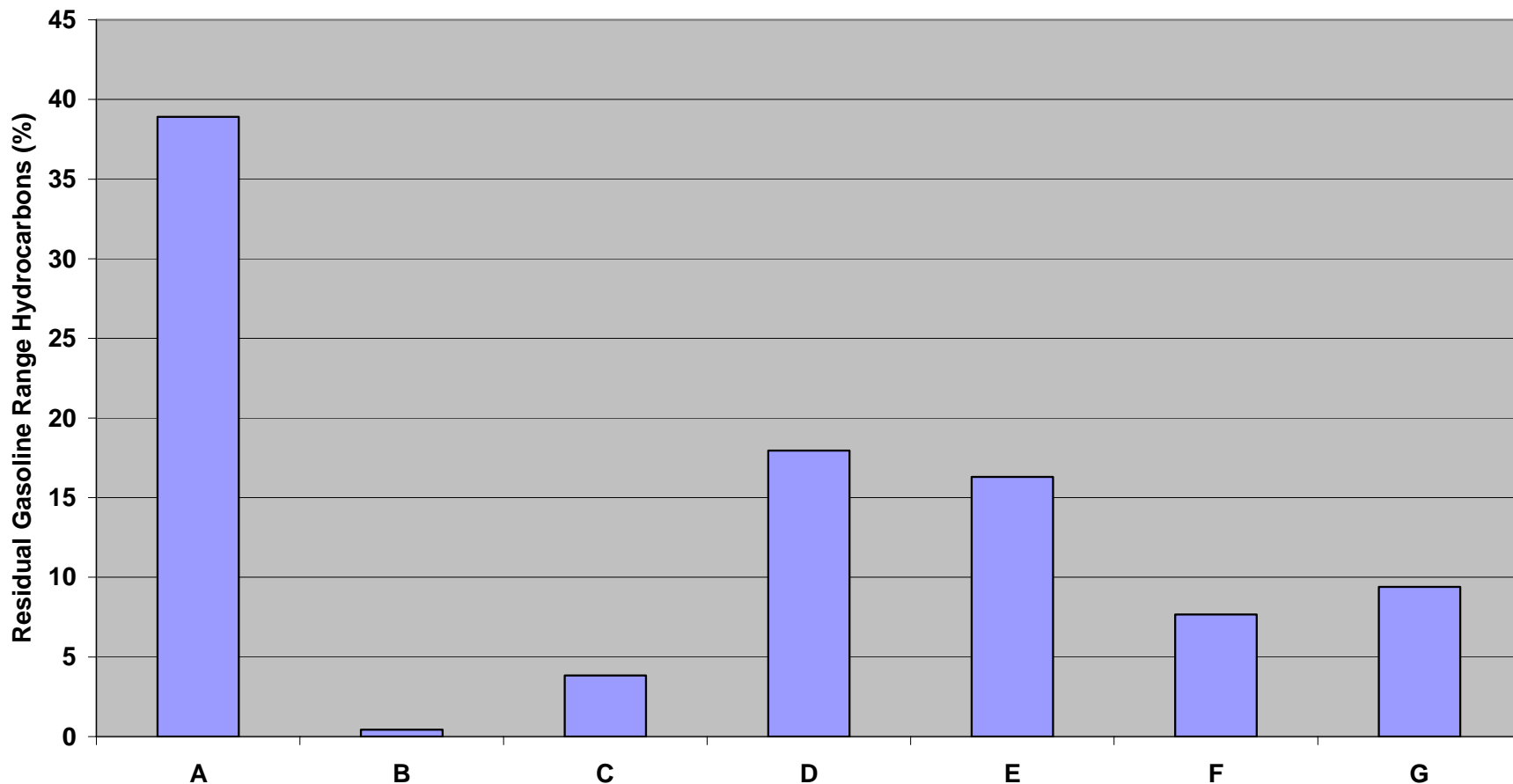


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Field Test Cases

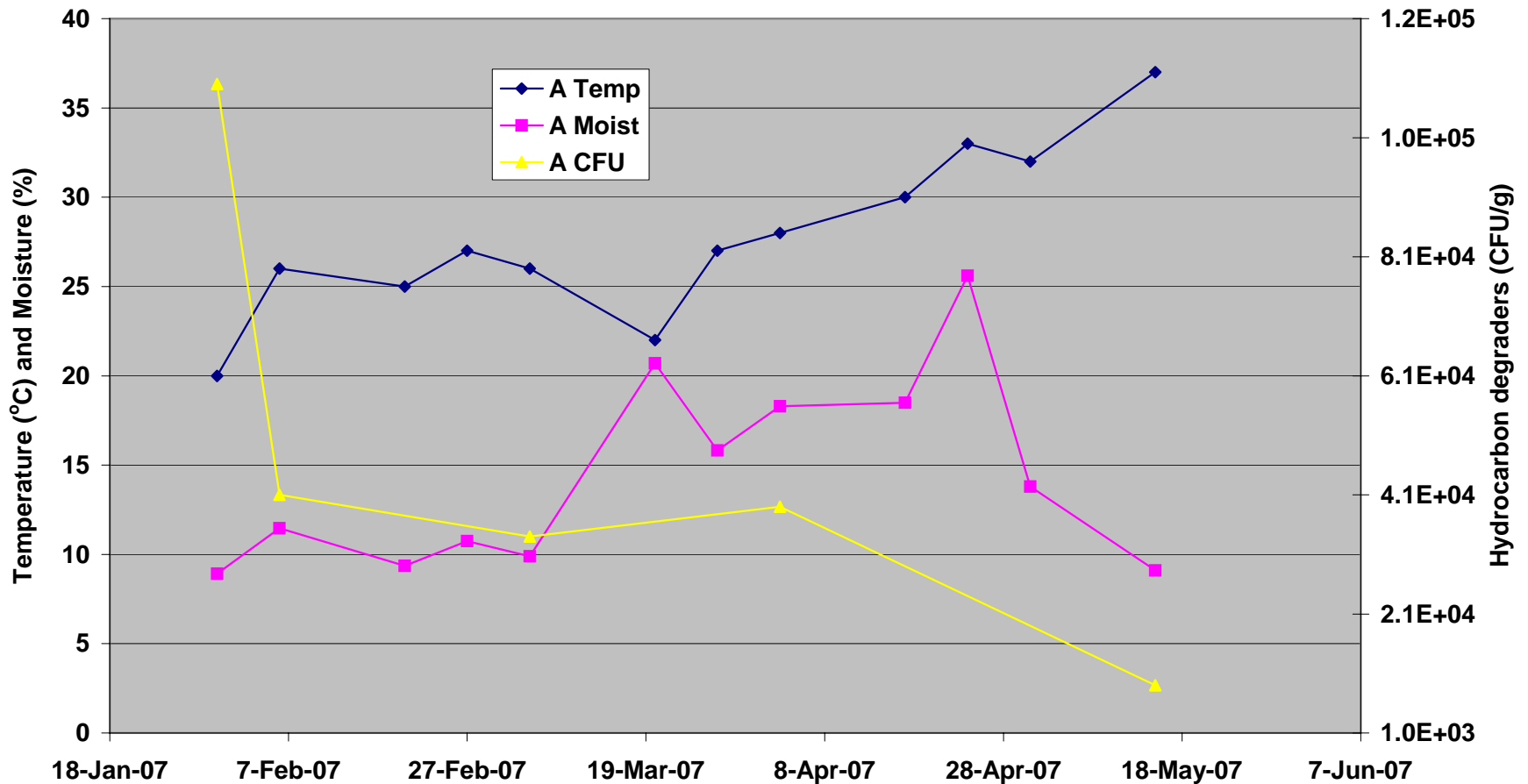
- A. Contaminated soil (2 buckets)
- B. Contaminated Soil (2 buckets) + Peat Absorbent (51 - 13 L bags)
- C. Contaminated Soil (2 buckets) + Peat Absorbent with Amendments (12.5 - 44 L bags)
- D. Contaminated Soil (2 buckets) + Inorganic Nutrients (50kg 20:10:10)
- E. Contaminated Soil (2 buckets) + Natural Fertilizer (5.3 - 25kg bags Dana Modern Poultry, Barka, Oman)
- F. Contaminated Soil (2 buckets) + Peat Absorbent (51 - 13 L bags) + Natural Fertilizer (5.3 - 25kg bags Dana Modern Poultry, Barka, Oman)
- G. Contaminated Soil (2 buckets) + Peat Absorbent with Amendments (12.5 - 44 L bags) + Natural Fertilizer (5.3 - 25kg bags Dana Modern Poultry, Barka, Oman)

Residual gasoline range hydrocarbons after five months of treatment

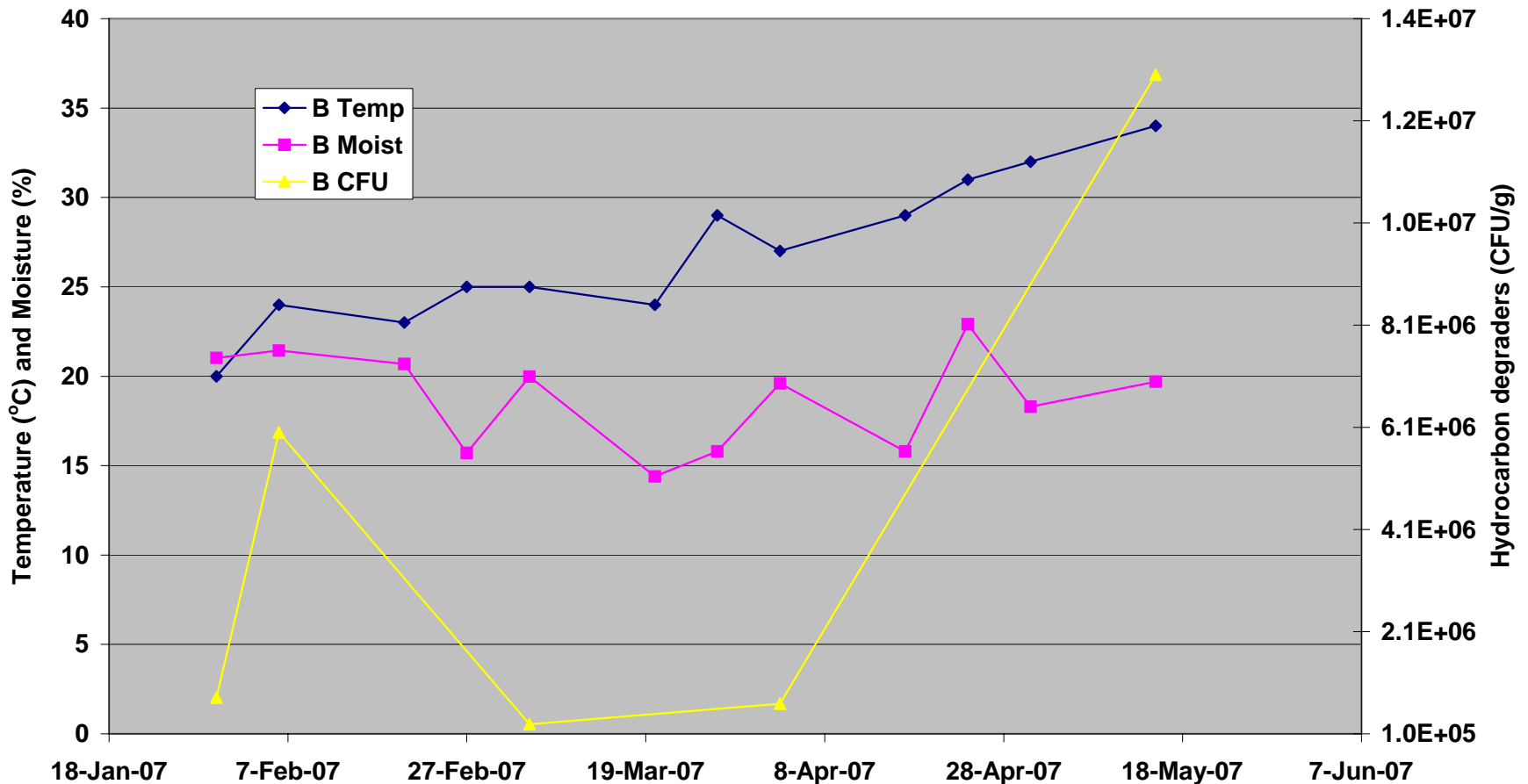


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Moisture, temperature, and CFU's for contaminated soil alone



Moisture, temperature, and CFU's for contaminated soil with peat absorbent



LEARNINGS

- Field test (B) resulted in the lowest residual hydrocarbon concentration.
- Peat absorbent helped maintain moisture content as temperature increased.
- Peat absorbents stimulated biodegradation and the growth of biodegradative organisms (>1400 X's).