



## **PROJECT FACT SHEET**

### **Emerging Technologies...**

### **and Approaches to Minimize Discharges into Lake Michigan**

June 5, 2008

#### **Overview**

The Purdue University Calumet Water Institute (PWI) and Argonne National Laboratory have been working collaboratively since November 2007 to identify emerging technologies that may help reduce wastewater discharges into Lake Michigan. The project was initiated at the request of U.S. Rep. Pete Visclosky (D-Ind.) and U.S. Rep. Judy Biggert (R-Ill.).

Energy company BP is underwriting the research. The study is expected to provide BP with a database of emerging technologies and processes that might improve wastewater treatment options as BP modernizes its Whiting refinery over the next several years to process more Canadian crude oil. These potential technologies also could have applications for other industries around the Great Lakes. In addition, this project is expected to provide a comparative analysis of discharges of selected pollutants into Lake Michigan.

#### **Objectives**

The study's major objectives are:

- To screen emerging technologies that could address wastewater treatment challenges, including:
  - Increased removal of ammonia and total suspended solids (TSS) from refinery wastewater that result from processing more Canadian heavy crude oil; and
  - Advanced reduction and removal of mercury, vanadium and other heavy metals from industrial wastewater to meet future, stringent regulatory limits.
- To conduct a comparative analysis of related discharge issues from industries around the Great Lakes that may help better understand and address environmental concerns.

#### **Results**

##### **TSS and Ammonia**

- During Phase I of the project (November 2007-June 2008), researchers have screened new and emerging technologies to remove total suspended solids (TSS) and ammonia.
- The study concluded that source treatment, or upstream treatment of wastewater before it reaches the refinery's wastewater treatment plant (WWTP), seems a viable approach to integrate and improve the effectiveness of downstream treatment options.
  - Potential upstream treatment technologies include desalter optimization and brine treatment for TSS control.
  - Recovery of ammonia from sour water could be possible for long-term deployment.

- Biological systems are capable of removing both ammonia and TSS downstream in the wastewater treatment process.
  - Attached and combined growth systems, such as activated sludge, may be an option for short-term development.
  - Membrane bioreactors, which are widely used for treating municipal wastewater, have potential for removing both TSS and ammonia and could be developed over the long term for treating refinery wastewater.
- The treatment options identified in the Phase I study require varying degrees of additional testing and research, and the selection and design of the best fitting technologies will require detailed engineering analysis.

#### Comparative Discharge Analysis

- Researchers have conducted a comparative analysis of selected discharges into the southern portion of Lake Michigan by industry, municipalities and others, including non-point sources (such as stormwater runoff from cities and farms, deposition from the air, or sediments).
- The study found that the discharges from BP's Whiting refinery are substantial, but are not the highest or the only contributor to wastewater challenges in southern Lake Michigan.

#### Next Steps

- A final report of screened emerging technologies for TSS and ammonia will be provided to BP by the end of June 2008. BP will then make further decisions about the applicability of these technologies to meeting future discharge permit limits at the Whiting Refinery.
- During Phase II of the project (through November 2009), the researchers will conduct a search for and screen emerging technologies that may address wastewater discharges of metals (e.g. mercury). This screening information will be provided to BP, which will make further decisions about the applicability to meeting future discharge permit limits at the Whiting Refinery.
- Promising technologies will be tested during Phase II.
- A final report on the Phase I Comparative Discharge Study also will be provided to BP by the end of June 2008. During Phase II, researchers will complete a comparative analysis of overall discharges throughout the entire Lake Michigan region. This information will facilitate a broader understanding of discharges to the lake, which may in turn improve public information and policy making, and highlight technology development needs.

#### For More Information

Purdue University Calumet Water Institute Web Site  
<http://www.calumet.purdue.edu/pwi/emergtech/>

Argonne National Laboratory Energy Systems Division  
[http://www.es.anl.gov/Energy\\_systems/index.html](http://www.es.anl.gov/Energy_systems/index.html)

BP Whiting Refinery Modernization Project  
<http://whiting.bp.com>

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