ITRC and Other Research Initiatives:
Improving Regulatory Acceptance of Innovative Technologies

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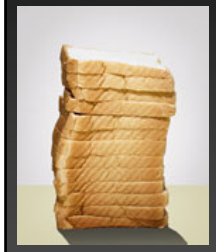
Innovative Technology

Definition: A process that has been tested and used as a treatment, **but lacks**:

- a long history of full-scale use
- information about its cost
- how well it works sufficient to support prediction of its performance under a variety of operating conditions

http://www.brownfieldstsc.org/glossary.cfm?lett=I

Innovative Technologies



Or

Innovative Technologies

The BIG question?

Will the government perm

Overview

- Innovative Treatment Technologies
- Challenges
  - Regulatory
  - Unbiased Information
  - Technological

Innovative Technology Examples for Mining Influenced Water

- Categories
  - Biological
  - Chemical
  - Physical

BioTechnology Examples

- Processes driven by microbial catalysts
  - Oil Emulsion
  - Biological Sulphate Reduction/Sulfide Production
  - Electrobiochemistry

Chemical Technology Examples

- Processes driven by chemical interactions
  - Pulsed Limestone Bed
  - Iron (ZVI/Ferrite/Magnetite)
  - Electrowinning
  - Electrocoagulation

Physical Technology Examples

- Processes driven by physical interactions
  - Reverse Osmosis
  - Nanofiltration
  - Ceramic membranes

Challenges

- Regulatory
- Unbiased Information
- Technological

Challenges: Regulatory

- Regulatory barriers
- Technology guidance
- Lack of Good Samaritan Law

Addressing Regulatory Barriers and Technology Guidance

ITRC–Interstate Technology & Regulatory Council

State led organization

ITRC State Members

Host Organization

ECOS

Federal Partners

DOE EPA DOD

Coordinating Organizations

WGA SSEB

Industry, Academia, Consultants, Citizen Stakeholders

Why ITRC?

- Large cleanups required at Department of Defense and Energy sites
- Conventional technologies were too expensive
- Innovative approaches were needed
- Common problems at sites throughout the country
- Once proven a method to streamline acceptance was needed
  - "Don't reinvent the wheel"
- ITRC started in 1995

Goals

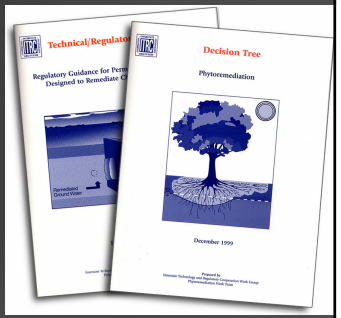
- Increase state acceptance of innovative technologies
- Streamline state permitting processes

Goals

- Achieve better environmental protection through innovative technologies
- Identify and remove technical or regulatory barriers to the use of innovative technologies
- Build confidence about using innovative technologies

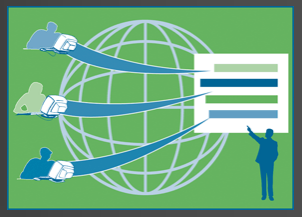
ITRC Process

- Products
  - Case studies
    - Applications
  - Technology overview
    - Team evaluation
  - Guidance document
    - Over 30 produced
    - Constructed Treatment Wetlands
    - Phytotechnology
    - Permeable Reactive Barriers



ITRC Process

- Training
  - Free Internet
    - Over 30,000 participants
  - Classroom



Mine Waste

A BURNING ISSUE

Approach

- identify and evaluate innovative & cost effective technologies
- evaluate regulatory programs to identify barriers
- develop approaches to overcome regulatory obstacles

Interested States

- **Vermont - DEC**
- **Colorado – DPHE**
- **Pennsylvania - DEP**
- **Maine - DEP**
- **Utah – DEQ**
- **South Carolina – DHEC**
- **Oregon – DEP**
- **California – Water Board**
- **Missouri – DHSS, DNR**
- **Oklahoma - DEQ**
- **Minnesota – DNR**
- **New Jersey – DEQ**
- **Alaska – DEC**
- **Michigan – Marquette County**

Federal, Industry and Community Interest

Private Sector

Freeport McMoran
Kennecott - Ridgeway
JRW
Arcadis
ERM
Shaw Environmental
North Wind
Kleinfelder Inc.
TRC Solutions

Federal agencies

US EPA
US Fish and Wildlife
US Army Corp of Engineers
Sandia National Lab

Public Sector

Academic
- University of Georgia
- Colorado School of Mines
- Penn State

Western Research Institute
Texas Engineering Experiment Station
Public stakeholders

Cooperating Organizations

Work cooperatively to avoid duplication

- ADTI: Acid drainage technology initiative
  - Memorandum of understanding
- INAP: International network for acid prevention

Status

- Prepared white paper
  - Described major issues
  - Preliminary list of technologies
  - Suggested priorities for future guidance

Major Issues

- Mining influenced water
  - Acidic and metal laden drainages
  - Long term treatment
- Mine, mill and smelter waste

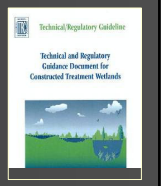
Schedule

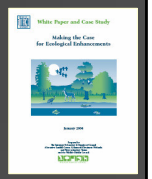
- Team kickoff meeting November 2007
- Collect case studies – 2008
  - evaluate technologies and regulations

We are still accepting case studies!

http://www.surveymonkey.com/s.aspx?sm=AT0v24dMwnjkyxzwICfs1g_3d_3d

- Develop Technical and Regulatory Guidance– 2009
- Offer 2- 4 internet training annually, 2010 and beyond





Challenges: Unbiased Information

- Open Advocates
- Stealth Advocates
- The Good, the Bad and the Ugly

Challenge: Information Needs

- Long-term History
- Capital, Operation and Maintenance Costs
- Operation and Maintenance Activities
- Design details
- Performance details

Challenges: Logistics of Database

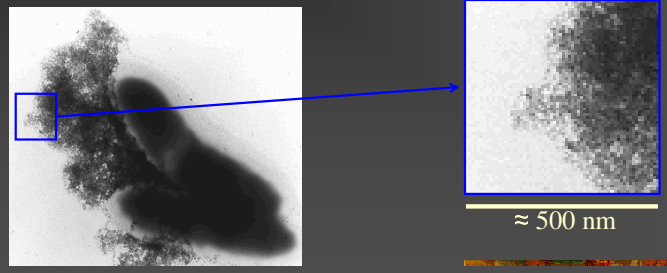
- Natural leaders
  - ADTI
  - INAP
  - ITRC
  - NMA
  - SME

Challenges: Technological

- Nano-particulates (1 to 100 nm)
- Assessment of biotechnologies

Challenges: Nano-particulates

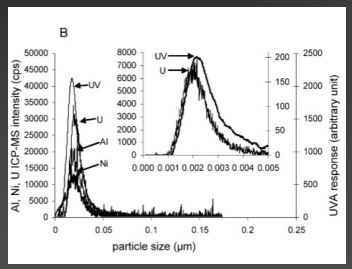
Nano-particulates associate with biotechnology



Spear, J.R. L.A. Figueroa and B.D. Honeyman 1999
Env. Sci. Technol.

Challenges: Nano-particulates

- Nano-particulates in sediment water extracts



Jackson, B.P., **Ranville, J.F.**, Bertsch, P.M., and Sowder, A. 2005. Env. Sci. Technol.

Challenges: Nano-particulates

- Process integration of known removal mechanisms
  - Sorption
  - Aggregation
  - Filtration
  - Sedimentation

Challenges: Biotechnology assessment

- Assessment of biotechnologies
  - Characterization of microbial community structure
    - DNA
    - RNA
    - Enzymes
  - Tracking substrate consumption

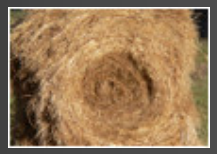
Challenges: Biotechnology assessment

- Tracking substrate consumption (extent and rate)
  - Liquid phase substrates

  - Solid phase substrates
    - Substrate collection
    - Substrate analysis

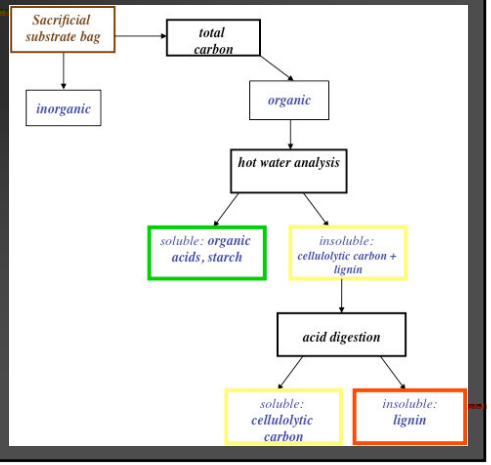
Challenges: Tracking solid phase substrate consumption

- Solid phase substrate examples



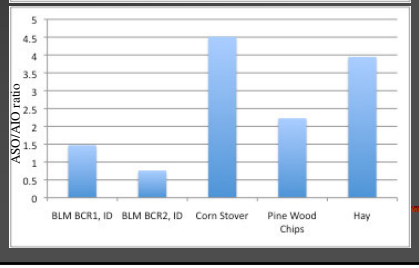
Challenges: Tracking solid phase substrate consumption

- Measurement of solid phase substrate composition in biochemical reactors using operationally definitions based on hot water and acid solubility



Challenges: Tracking solid phase substrate consumption

- Distribution of operationally defined organic composition
- Acid soluble organic (ASO) to acid insoluble organic (ASI) ratio



Key Points

- Challenges
  - Regulatory – ITRC-Mine Waste Team a good start
  - Unbiased Information – Coordinated effort needed
  - Technological – Effective integration of nano-particulate removal and standard assessment methods for biotechnologies are needed

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CSM Mine Waste Team

ITRC Mine Waste Team – May 2008

Questions?