Imbiber Beads®
HEROS™
Fast Attack System

Overcoming Logistical
Spill, Leak and Fire Response Obstacles

Imbibitive Technologies

HEROS™

Purpose

* Understand the current spill response industry
* Identify and analyze the limitations and logistical challenges during spill response operations
* Provide industry with an advanced alternative – HEROS™ Treat and Skim™ Fast Attack Response System
* Demonstrate cost effectiveness
* Provide recommendations for the implementation of the HEROS™ system
* Disrupt the current spill response regime

Insanity

“Doing the same thing over & over again and expecting different results”

Historical Outcome

1967 1989 2010

* Response Transformed into costly clean-up operation
* Local environment impacted
* Local economy impacted
* Negative Social & Political Implications for Oil Industry

Understanding the Limitations of Current Spill Response Regimes

* An oil spill will spread six square miles within the first twelve hours with little wind or current assistance (US OTA March 1990)

* Oil and chemical spills often reach UNMANAGEABLE PROPORTIONS before response operations are able to mobilize and reach the spill site

* Leads to long, costly and ineffective RECOVERY operations

Public Review Panel on Tanker Safety & Marine Spill Response Capability (Canada)

* ***"A major research and development effort is urgently needed to develop more effective spill clean-up equipment and technology because what is now available is essentially primitive and largely ineffectual".***
* ***Dr. David Brander-Smith, 1990.***

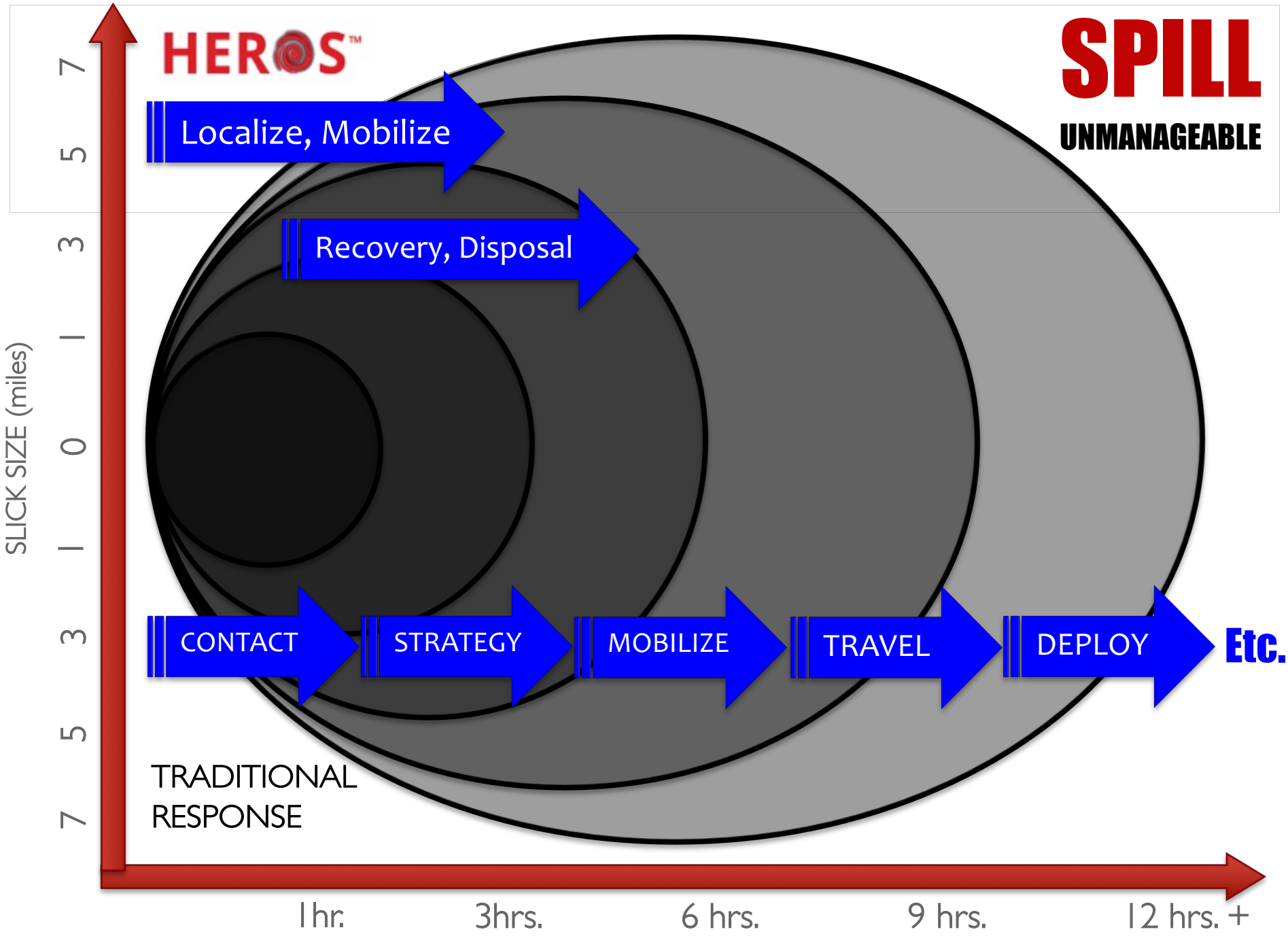
ITOPF – Cost of Oil Spills
IOSC – Savannah, GA (2003)

* ***"An active response is therefore often adopted even when technical opinion is agreed that it is unlikely to have a significant benefit. This is usually due to the fact that oil spilled on the surface of the sea spreads rapidly, thereby extending over an area that is too great to be countered effectively by available techniques. Added to this are the limitations on containment and collection systems imposed by winds, waves and currents and the severely reduced effectiveness of chemical dispersants on high viscosity oils and water-in-oil emulsions (mousse). Responding in such circumstances can lead to high cleanup costs for little or no benefit in terms of mitigating the oil's impact on coastlines and sensitive resources".***

Understanding the Limitations of Current Spill Response Regimes

50 Yrs.
AVERAGE RECOVERY RATE

FIVE TO FIFTEEN
PERCENT
5-15%


HEROS™
SPILL
UNMANAGEABLE
Localize, Mobilize
Recovery, Disposal
CONTACT
STRATEGY
MOBILIZE
TRAVEL
DEPLOY
Etc.
TRADITIONAL RESPONSE
SLICK SIZE (miles)
7 5 3 1 0 1 3 5 7
1hr.
3hrs.
6 hrs.
9 hrs.
12 hrs. +

Multi-Million Dollar Question?

HOW CAN WE REDUCE THE TIME, EFFORT AND COST ASSOCIATED WITH CLEANING UP OIL AND CHEMICAL SPILLS?

PREVENT IT FROM SPREADING

Understanding the Limitations of Current Spill Response Regimes

* The capability to **"respond"** to oil spills has progressed over the past few decades
  * Improvements in command & control
  * Improved aerial & underwater surveillance
  * Improved computer trajectory modeling & software
  * Improved strategic planning
  * **Increased reliance on disposal technologies**

HOWEVER …

RECOVERY STATISTICS REMAIN UNCHANGED

WHY?

- **The slick will spread to unmanageable proportions.**
- **Trajectory models identify where the oil is headed.**
- **Deploy skimmers and booms in an attempt to recover the oil.**
- **Ineffective containment booms and sorbent booms will be deployed in an attempt to protect eco-sensitive areas near-shore and on-shore.**
- **Oil will start coming ashore.**

- **Local environment impacted. Local economy impacted.**
- **Responsible Party and their underwriters billed excessive amounts relative to the volume of oil actually recovered.**
- **Responsible Party fined for damaging the environment in contravention of Clean Water Act.**
- **A report of the incident will be written with a section entitled "Lessons Learned".**

Excessive Costs Unsustainable

* March 1989 (Exxon Valdez) 6% of 11-million gallons @ $2.5 Billion operational cost plus fines and social/environmental impact
* April 2010 (DWH) 3% of 200-million gallons @ $7.5 Billion operational cost plus fines ($26 Billion) and social/environmental impact
* May 2019 (Houston Ship Channel) 450K gallons of fuel additive @ $1 Billion
* No Measurable Performance Criteria (OPA'90)

Super-Absorbent Polymers

* 1966 Victor Mills (P&G) water-sensitive SAP
* Brand name “Pampers”
* Premium priced versus cloth diapers
* Eliminated the “liquid phase”
* Baby’s bottom kept dry and free from rashes and infections
* Revolutionized the personal hygiene industry

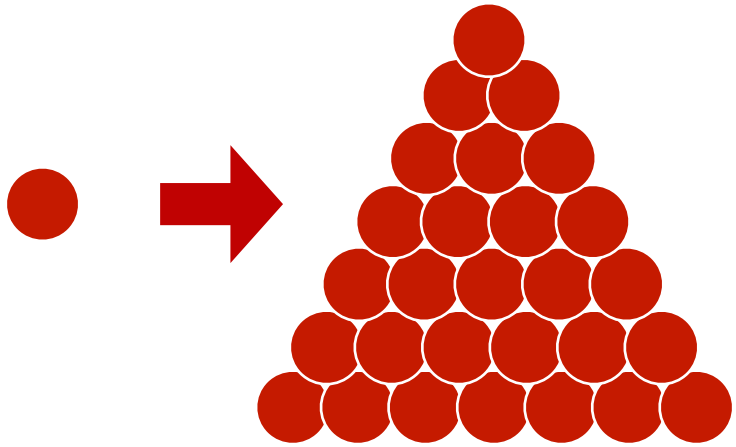
"Expansive Imbibition for Practical Pollution Particulation"

Dr. Richard Hall (The Dow Chemical Company 1970)

* **Imbiber Beads®** The world's only Super Absorbent Polymer "engineered" for organic compounds

Liquids diffuse into the IMBIBER BEADS® and bind with their solid structure

The process causes them to swell "up to" 27x their original volume.



* The result is a revolutionary absorption capability and the ONLY product that can offer complete capture and containment

How Do Imbiber Beads® Work?

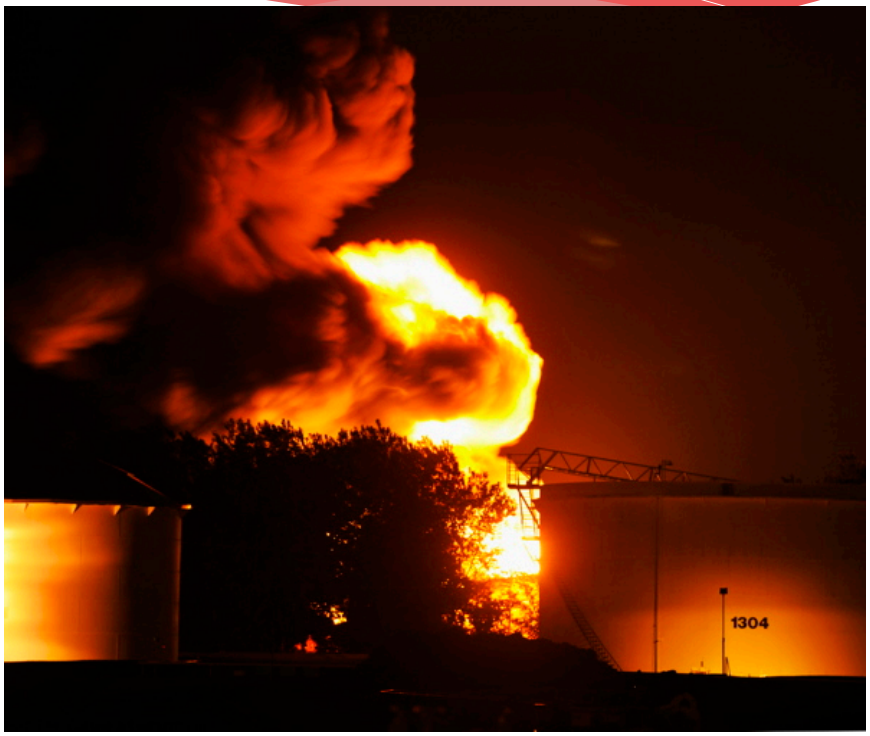
Fuel & Solvent Spills
The Problem

Intercontinental Terminals

March 2019 – Houston, TX

Liability Considerations

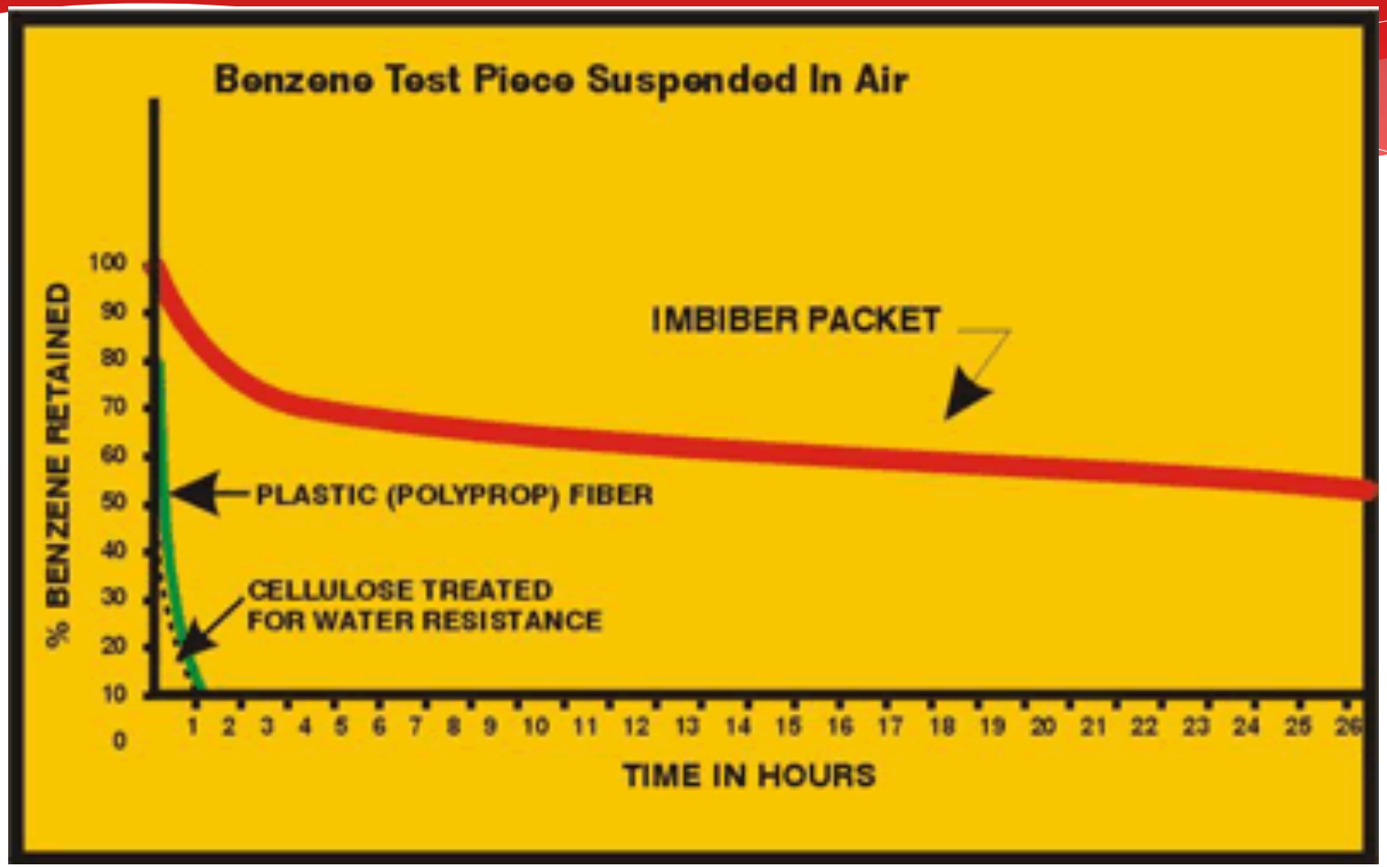
- Spreads quickly.
- Colorless? Odours?
- Explosive/toxic vapors?
- Foams ? Clean-up?
- SOP – evaporate, evacuate or dissipate?
- Other Considerations - Fuels & solvents near urban centers?



Absorbent or Adsorbent?

- It is the vapors that we inhale that are toxic.
- It is the vapors that support combustion.

Vapor Release
(Safety of Public/Personnel)




Hurricane Harvey – Houston, Texas
August, 2017

Understanding the Limitations of Current Spill Response Regimes

* In spite of best intentions, the fundamental issue remains:

To date, there is currently NO TECHNOLOGY, PRODUCT, OR SYSTEM being utilized to help prevent an oil spill from becoming unmanageable before responders have a chance to arrive at the site

The Solution: HEROS™ Treat and Skim™ System

HEROS™ features several response technologies featuring IMBTEC's flagship product Imbiber Beads® plus state-of-the-art delivery and recovery systems which make up the components for a completely integrated system solution

Proof of Concept

2001 - 2007

HEROS™ template was created by the Maritime Disaster Prevention Centre (MDPC – Yokahama) under the guidance of the Commandant of the Japanese Coast Guard.

As a Result …

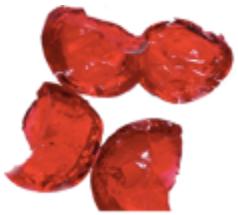
MDPC placed strategic inventories

23

HIGH RISK LOCATIONS

HEROS™ Treat and Skim™ – Components

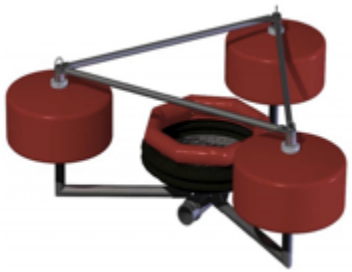
Imbiber Beads®



HEROS™ Wrap

Delivery Systems

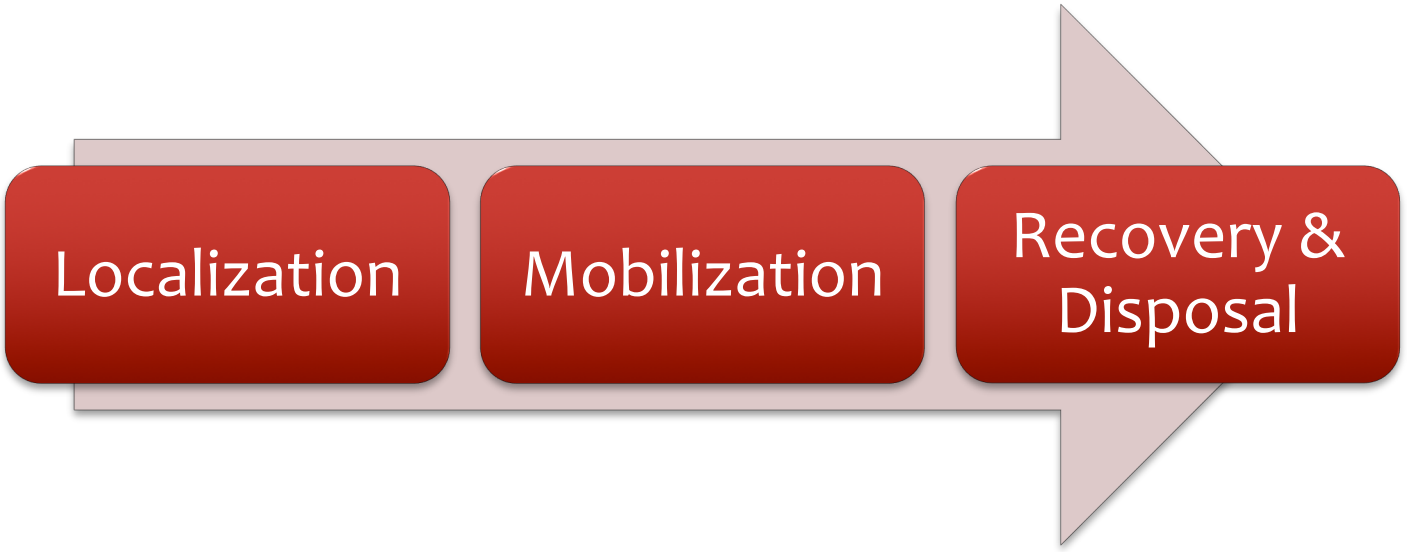
Recovery



HEROS™ Treat and Skim™ – How it Works

- Strategic Inventories of Imbiber Beads®
- Quick Deployment of HEROS™ Wrap
- Delivery via Monitor or SEAMAT
- Recovery via Existing Equipment
- Disposal via Incineration

HEROS™ Treat and Skim™ – How it Works



HEROS™

Provide Time for Response Operation

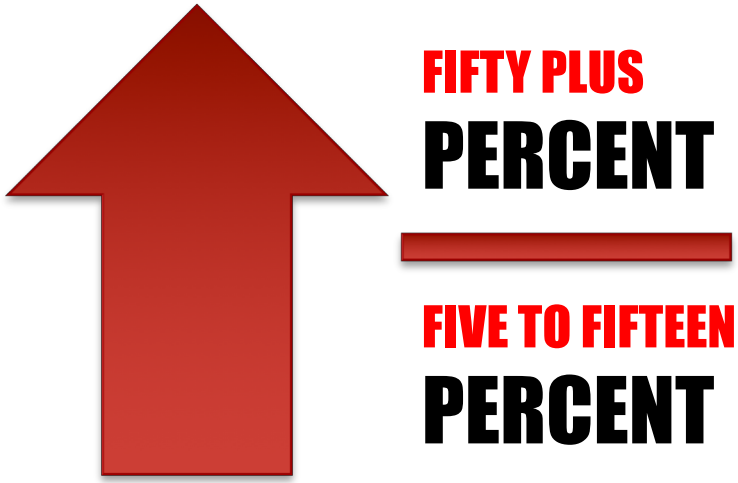
Energy from Waste

HEROS™ Treat and Skim™ – The Result

SPREAD TIME MATERIAL

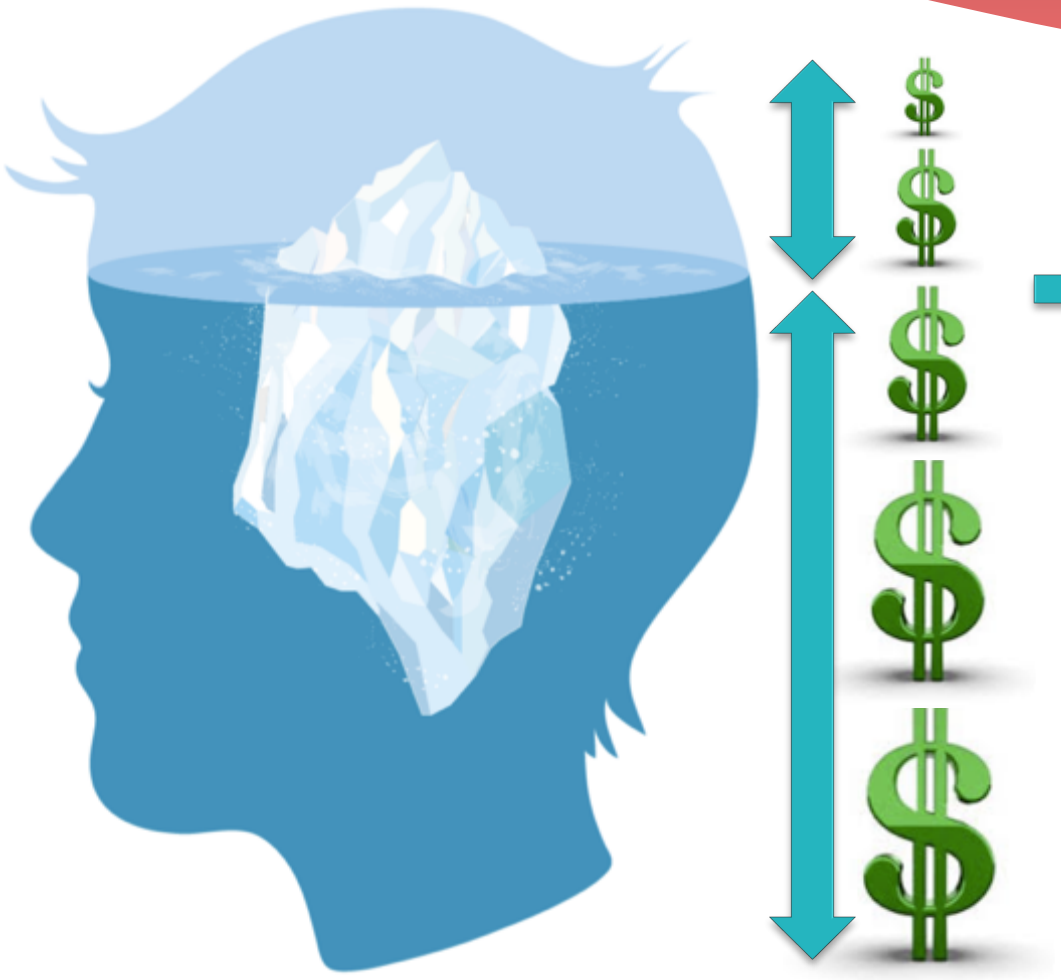
HEROS™ Treat and Skim™ – The Result

COST



RECOVERY

Response Operation Costs – Only the Tip of the Iceberg



Actual Response Costs

ANCILLARY COSTS

* Litigations
* Demurrages
* EPA Fines
* Civil Lawsuits
* Environmental Damage
* Economic Impacts
* Operational Shutdowns

Spread Sheet Comparison (Example: Texas City 'Y' Spill)

	Contractor Response	HEROS™ Response
Spill Size	168,000 gallons	168,000 gallons
Response Cost	$125,000,000	$3,883,177 *
Cost per Gallon Spilled	$744 / gal	$23 / gal
Time Frame	33 Days	1-3 Days
Avg. Spill Recovery Rate	5-15%	50% +
Cost Per Gallon Recovered	$4,960 - $14,880 / gal	$46 / gal

* Added 50% of total cost for labour

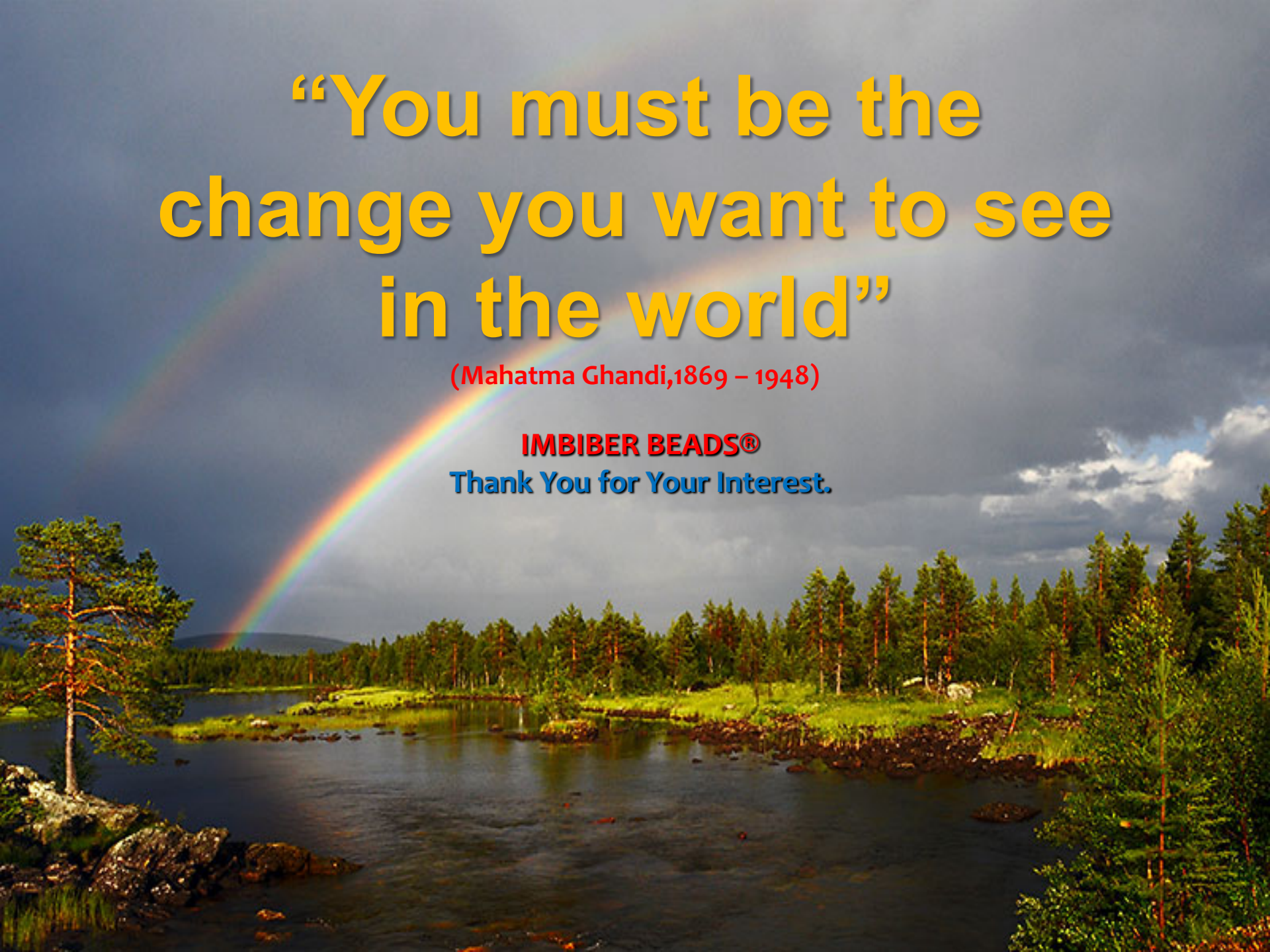
Final Thoughts

The constraints faced by responders for recovering significant volumes of spilled oil CANNOT be used as validation for not improving performance and maintaining the status quo

The SPILL RECOVERY operation, which should be the most critical part of the response plan, has demonstrated that it is in fact the weakest

CHANGE

IS NECESSARY


“You must be the change you want to see in the world”
(Mahatma Ghandi,1869 – 1948)
IMBIBER BEADS®
Thank You for Your Interest.