Environmentally Friendly Drilling Systems

John D. Rogers, Ph.D., Noble Technology Services Richard C. Haut, Ph.D., Houston Advanced Research Center Tom Williams, Noble Technology Services David Burnett, GPRI, Texas A&M University







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Outline of Presentation

Program Overview

Rig and Platform Systems

Waste Management Issues

Environmental Issues





Environmentally Friendly Drilling Systems Program

- Replace Conventional Operations
- Develop Advanced, Low-Impact Technology for Oil & Gas
 - Drilling
 - Transportation
 - Production
- Access
 - Focus on environmentally sensitive areas
 - How to access with minimal impact
 - How to measure effect of low-impact practices



Environmentally Friendly Drilling Systems Program

Objectives

- To incorporate current and emerging technologies into a clean drilling system with no or very limited environmental impact
- To demonstrate a viable drilling system used for the exploration and exploitation of oil & natural gas primarily in the ecologically sensitive areas of the lower 48 states
- To create a team of industry, academic and government partners with the knowledge to apply the best drilling systems for use in ecologically sensitive areas, with an understanding of the benefit to the environment



Protect Sensitive Ecologies

Cryptobiotic soils in semi arid area

- Found in similar types of environments around the world
- Fix carbon and nitrogen for the semi-arid soil ecologies
- Includes algae, bacteria, lichens, mosses, fungi, liverworts, and cyanobacteria
- Very sensitive and have little mechanical strength. Can be crushed without permanent damage if they are not disturbed or buried or eroded away
- Photosynthetic and cannot be kept in dark
- Increase the stability, fertility, water capture of easily eroded soils
- Challenge is to drill and exploit without significant damage

Cryptobiotic soils are the essential first step in producing arable soils



Filaments of Microcoleus vaginatus (x 3000), the dominant organism in the crust. Individual cells abut each other to form the filaments.

Protect Sensitive Ecologies

Coastal Wetlands

- Transition Zones from fresh waters and land to ocean waters and storms
 - Flow of water, cycling of nutrients and energy of the sun meet
 - Unique ecosystem characterized by hydrology, soils and vegetation
- Usually shallow and require digging canals to explore for oil and gas
 - Creates direct passage of saltwater to damage wildlife habitat









And Produce the Energy Resources in these Areas



Biological Crusts Represent 40% of the Earth's terrestrial surfaces



Super-Region Technical Resources (TCF) (2003 NPC Report)



Environmentally Friendly Drilling Systems Program

Advisory Council Continually Shrink the Surface Footprint and Texas A&M Petroled Texas A&M Pet Friendly Drilling Assessments of Tec **Noble Tecl** 1078 1980 19 Anadarko BP Chevron ConocoPhi 20 12 16 acres acres Shell **Statoil Houston A** Pha Prot ms Pha page 1 of 148 Subsurface Buil **table** area 2.010 acres 502 acres 10.096 acres 32,170 aires 28 sq. miles .8 sq. miles 3 sq. miles 50 sc. miles

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New Rigs Shrink the Physical Footprint





Rig Manufacturer	Foot Print Area			Depth Rating	
	Sq Ft	acres	HP	Drill Pipe	Casing
Huisman	7500	0.17	1000	11,500	18,000
Rapid Rig	10,290	0.24	1000	11,000	15,000
Ideal Rig	39,474	0.9	1500	18,000	
H&P	36,200	0.83	1500	18,000	
DrillMec	6375	0.15	1500	<11,000	



Platform and Mats can Reduce the Ecological Footprint



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Current Approaches

Total Waste Management Programs

- Incorporates other aspects in addition to drilling fluids/cuttings
 - Contaminated water, water runoff
 - Material and chemical packaging
 - Air emissions such as carbon dioxide and oxides of nitrogen
 - Scrap metals
 - Fuel, lubricants and other oils
 - Usual human/industrial wastes associated with operations
- Benefits
 - Overall improvement in general housekeeping
 - Reduced health and safety exposure
 - General increase in environmental awareness and concern



Best Practices



Bioremediation

Goals include:

Biological Metabolism



Technical Metabolism



ental implications, product uses and ental laws and regulations associated with



e optimized treatment process that can be Dild mobile, small footprint biological

: from technical, the turning

bioiogicalanutrients to Earth, ling sites where treatment process can be used tiened reuse/recycle/redeploy

Bioremediation



Bioremediation



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Roads Have Significant Impact



Jonah Field: 2002, 40-Acre Spacing Impact of Oil and gas development on the Permian Basin of New Mexico.





Disappearing Roads Competition

Develop innovative concepts for reducing the footprint of transporting equipment and materials to drill sites in environmentally sensitive areas

Rotating Ecosystems

- Desert
- Coastal Margin
- Boreal (Arctic)







Summary

Main points covered include:

- A multidisciplinary academic, industry and government partnership has been established to demonstrate oil and gas industry technical environmental stewardship.
- Industry has significant technology to demonstrate environmental stewardship but needs to integrate the various technologies into a systems process.
- Implementation of best practices needs to be prioritized with respect to project economics.
- Biotreatment methods are a promising, cost effective way of treating waste and impacted areas.

Questions?



Richard C. Haut, Ph.D. Houston Advanced Research Center 281-364-6093 rhaut@harc.edu

