DEA Meeting 3Q2002

"The Future of Drilling R&D"
An Independent View

Mike’s Thoughts

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Director - World Wide Drilling
Apache Corporation

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Apache World

* Estimated 2001 Production Distribution after Planned Acquisitions
**Offshore Region**

- Established operations in 1968
- 2nd largest holder of producing acreage on the shelf
- 4th largest producer on the shelf
- Operate 170 platforms
- 4Q00E production: 90 Mboe/d

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**Apache Corporation**

- A Growth Company
Apache Corporation

- A Growth Company
- Past Performance Fueled by Acquisitions

Apache Significant Acquisitions and Mergers

- Repsol - Egypt Western Desert (2001)
- Fletcher Challenge - Canada (2001)
- Phillips (Zama) - Canada (2000)
- Oxy - Gulf of Mexico (2000)
- Collins &Ware - Texas (2000)
- Shell - Canada (1999)
- Shell - Gulf of Mexico (1999)
- Mobil - Australia (1997)
- Phoenix - Egypt (1996)
- Dekalb, Texaco - (1994)
- Hall Houston, Hadson (1993)
- Amoco MW Properties (1991)
Market Capitalization of Some Independents

Apache Corporation

- A Growth Company
- Past Performance Fueled by Acquisitions
- Future Performance Depends on Technology
- Corporate Technology Strategy
  - Identify Appropriate Technology
  - Implement
West Mediterranean Concession Activity

Mediterranean Sea

- Deepwater: 1,488 Sq. km
- Offshore: 740 Sq. km
- Onshore: 140 Sq. km
- Repsol/BPA: 945 Sq. km

Oil Fields
Gas Fields
Prospects
Apache Acreage
3D Seismic

Questions

- What is Technology?
- What is Research?
- Who funds it?
- Who uses it?
Technology

- Greek - "study of know-how"
- Webster - a technical method of achieving a practical purpose
- Old Oil & Gas Professional - Research
- Older Oil & Gas Professional - Something someone else wants me to do that I can't do because I don't want to.

- Our Definition - Make Money with Know-How

Disruptive Technology: The Internet

Online Users In the U.S.

(Nielsen Internet Demographic Survey 1999)
Oil Industry workers vs. Internet Users

Growth in GDP per Worker

Source: Federal Reserve Bank of Dallas, 1999 Annual Report
When Do You Need Technology

• Must Do What We Are Doing DIFFERENTLY

• Must Do Something DIFFERENT - Like Someone Else in the Industry is Doing
  – Homework, sharing best practices, training
When Do You Need Technology

• Must Do What We Are Doing DIFFERENTLY
• Must Do Something DIFFERENT - Like Someone Else in the Industry is Doing
  – Homework, sharing best practices, training

• Must Do Something VERY DIFFERENT - Like No One Else in the Industry is Doing
  – Applied research, creativity, lateral thinking

• Must Do Something RADICALLY DIFFERENT - Like No One Else in the World is Doing
  – True research
When Do You Find Out You Need Technology

• **During Project Stages**
  - Front End Loading
  - Economics (risk mitigation)

• **When Change Occurs**
  - Competition gets better
  - Prices Change (product or supplies, up or down)
  - Nature (encounter what you didn’t expect, expect what you didn’t encounter - risk elimination)
  - Emerging technology emerges
Examples - Product Price Up

- Deepwater - dual activity drill ships
- Dual gradient drilling
- Intelligent completions
- High flow rate test and produce capabilities

Examples - Product Price Down / Supply Prices Up

- Slim Riser Drilling
- Free Standing Risers
- Surface BOP Stacks
Where Do You Get Technology

- At Home
  - Training
- Next Door
  - In house sharing of best practices
- Across the Street
  - Industry sharing of best practices
- Around the World
  - Applying technology from other industries or applications (creativity)
- Out of this world
  - Research

WHO BENEFITS FROM TECHNICAL INNOVATIONS?

- INNOVATOR
  - Benefits by selling or licensing product
  - Impacted by ability to protect idea
  - Where do individual ideas get launched?
- COMPETITORS/COPIERS
  - Benefits by doing something similar
- USERS
  - Usually receives the most benefit by increasing production or lowering costs over time
- SUPPLIERS
  - Benefit by capitalizing innovation
Typical Improvement Economics

Project
• Capex of $350 MM
• Development time 2 years
• 4 years to max production of 15,000 BOPD

Improvement costs
• $3 MM initial investment in innovative improvement
• $500,000/yr increase in operating expense

15% improvement in cycle time and 5% reduction in CAPEX
• ROI from 67% to 82%
• NPV of innovation investment $32 MM

WHAT HAS HAPPENED IN THE LAST 10 YEARS?
• 6000’ + WATER DEPTH DRILLING CAPABILITY
• SYNTHETIC DRILLING FLUIDS
• ADVANCES IN LOGGING WHILE DRILLING
• COILED TUBING DRILLING
• COMPLETIONS TECHNOLOGY
• INCREASED COMMUNICATIONS CAPABILITY
• INCREASED COMPUTING CAPACITY
  – VISUALIZATION LINKS
• COST REDUCTIONS THROUGH
  – PROJECT MANAGEMENT
  – SUPPLY CHAIN MANAGEMENT
WHAT WILL HAPPEN IN THE NEXT 10 YEARS?

- INCREASE IN COMPUTING CAPACITY
- INCREASE IN COMMUNICATIONS CAPABILITY
- Dual gradient drilling
- Less casing strings
- Deeper water completions
- Smarter completions
- Reservoir management tools and techniques
- Look-ahead while drilling tools

WHO IS INVESTING IN INNOVATION (RESEARCH)?

- MOST INDUSTRIES
  - 6% of Revenue Invested in Research
- TODAY’S O&G INDUSTRY
  - 0.5% of Revenue Invested in Research
    - Operators have reduced research
    - Relying on suppliers
    - Suppliers have to see quick return on investment
    - How do we fund small innovators?
**BARRIERS**

- Lack of Time (people or cycle time)
- Lack of Experts (attrition, industry changes)
- Lack of Training (loss of training focus)
- Not Knowing What You Don’t Know
- Fear of Failure
- Fear of Success
- Fear of Sharing
- Price Cycles
- Lack of Research (Money)

**ENABLERS**

- Training
  - Industry Cooperation (Petroskills™, Chevron/BP Drilling, NExT, etc.)
- Joint Research (JIP’S)
  - Successes
  - Failures
- Industry cooperation
  - Research money increase
  - Beta testing cooperation
  - Application of results

- Research partnerships?
Apache Drilling

- 2001:
  - 739 Wells Operated
  - $650 MM
  - Average rig count = 47

- Less than 30 drilling professionals on the beach

- Using applied technology in drilling (more focused in Exploration)

- Using Halliburton, etc. for supplying technology (and deepwater expertise)

Deep Water Drilling Team August 2001

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<th>Source</th>
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<td>Halliburton</td>
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