Exploration and Development Strategies for Low Permeability Gas Reservoirs — Technical Challenges And Solutions: Discussion

Thomas A. Blasingame, Texas A&M U.
Department of Petroleum Engineering
Texas A&M University
College Station, TX 77843-3116
+1.979.845.2292 — t-blasingame@tamu.edu
Discussion Topics:

Q. What are the objectives of this session on tight gas reservoirs?
A. Exploration and development strategies for low permeability gas reservoirs — technical challenges and solutions:
  - Low permeability gas resource assessment.
  - Identification of sweet spots and fracture prediction.
  - Identifying risks and rewards.
  - Drilling, fracturing, underbalanced drilling, horizontal wells, etc.
  - Production technologies and future outlook.
  - Case studies.

From: Rushing, J.A. (private communication).
Discussion: Resource Assessment

• Low permeability gas resource assessment.

■ Challenges:
  — Economics (always marginal).
  — People (get the right team assembled).
  — Technical issues.
  — Data (legacy projects (quality and quantity), new projects (type of data and data quality).
  — How to define prospects — how to define/evaluate/utilize input data for a particular low permeability gas project?
  — Project timing — there is a risk of a company "sitting" on prospect waiting for better economic times.
  — Need flexibility in development plans.

■ Opportunities:
  — High gas prices/high demand/good transportation infrastructure.
  — Possibility of VERY big plays.
  — Must have staff prepared to explore/acquire tight gas prospects.
  — High discovery costs/low development costs.
  — Development/deployment of new technologies (exploration, development, production).
  — Government policy — incentives for development (tax credits, royalty relief, etc.).
  — Globalization — cooperative environment to share and work together.
Discussion: Sweet spots and fracture prediction

- Identification of sweet spots and fracture prediction.
  - Technology.
    - Seismic identification may be questionable.
    - Look for thick sequences of sand/shale in logs/seismic.
    - Fracture identification can be very difficult, can use well logs and tracer surveys.
Discussion: Identifying risks and rewards

*Identifying risks and rewards.*

**Risks:**
- Poor reservoir quality and production problems can ruin economics.
- Government policy (high taxes, etc).
- Geology, geography, people.
- Very high competition once trend is established.
- Impediments to development of the play not obvious (government, population, social priorities).

**Rewards:**
- Potential for high to very high revenue.
- High probability of success in an established trend.
- Provides indigenous gas supplies (less imports).
- Environmental improvement.
- Less exploration costs than other types of plays.
Discussion: Drilling, fracturing, horizontal wells, etc.

- Drilling, fracturing, underbalanced drilling, horizontal wells, etc.
  - Stimulating horizontal wells is an issue.
  - Stimulation of fracture system (if it exists) is an issue.
  - Underbalanced drilling is a facilitating technology.
  - Access to technology is very good for low permeability gas reservoirs.
Discussion: Production technologies and future outlook

- Production technologies and future outlook.
  - Well stimulation remains a critical issue for ALL low permeability gas systems.
  - Identify high water zones.
  - Multilayer monitoring.
  - Specific technologies: (areas for improvement)
    - Metering and pressure acquisition.
    - Fluid lifting/liquid loading.
    - Water shut-off.
    - Corrosion.
    - Mitigation of environmental impact.
    - Monitoring of hydraulic fracture treatments (microseismic).
Discussion: Case studies

**Case studies (what can we talk about next year?).**

- Vietnam: Coalbed methane, and maybe (?) a tight gas sand.
- Philippines: Small gas deposits (exploitation and exploration).
- China:
  - Tight carbonates (East Sichuan province).
  - High sulfur (high H2S and CO2).
  - Condensate reservoirs (high pressure).
  - Coalbed methane (in development).
  - Marginal gas fields (Western Sichuan, North Ordus basin)
- Malaysia: CO2, CO2, and CO2 — and sometimes hydrates.
- Cambodia: Depends on politicians
- Korea: ?

*Everybody loves hydrates…*
Exploration and Development Strategies for Low Permeability Gas Reservoirs — Technical Challenges And Solutions: Discussion

Thomas A. Blasingame, Texas A&M U. Department of Petroleum Engineering Texas A&M University College Station, TX 77843-3116 +1.979.845.2292 — t-blasingame@tamu.edu