DISCOVERY THINKING
A NEW EXPLORATION MODEL FOR
STRATIGRAPHIC TRAPS, 1950’s

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OUTLINE of TOPICS

• STRATIGRAPHIC CODES
• NEW EXPLORATION MODEL
  – ANALOGUES
    • SAN JUAN BASIN
    • API PROJECT 51 - SHORELINE SS.
• WAMSUTTER ARCH PLAY
  – GEOLOGY - SURFACE & SUBSURFACE
  – LAND WORK
  – SELLING THE DEAL
  – DISCOVERIES
• SUMMARY -- LESSONS LEARNED
### 1933 STRATIGRAPHIC CODE

<table>
<thead>
<tr>
<th>TIME</th>
<th>ROCK UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERA</td>
<td>________________________</td>
</tr>
<tr>
<td>PERIOD ---------------</td>
<td>SYSTEM</td>
</tr>
<tr>
<td>EPOCH ---------------</td>
<td>STAGE</td>
</tr>
<tr>
<td>GROUP</td>
<td>FORMATION*</td>
</tr>
</tbody>
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**EMPHASIS ON SURFACE GEOLOGIC MAPPING, ROCK DESCRIPTION AND VERTICAL ACCUMULATIONS**

**PROMOTES LAYER CAKE GEOLOGY**
DUAL CLASSIFICATION

1. TIME
2. TIME-ROCK

ERAS
PERIOD --------------- SYSTEM
EPOCH --------------- STAGE*
ZONE ---

GROUP FORMATION*

INTEGRATES FACIES ANALYSIS:

- DEF. – LOCAL LITHOLOGIC OR BIOLOGIC ASPECT OF TIME-ROCK UNIT

RECOGNITION OF TWO TYPES OF SURFACES: TIME AND FORMATION BOUNDARIES

* 1961 & LATER CODES FOLLOW ABOVE SCHEME
Time Surfaces

Old Land Surface

Landward

Flood Plain

Coastal

Near Shore

Marine

Seaward

from Sears, et al., 1941
SAN JUAN BASIN

TRAP AREA: 3600 sq.mi.
TOTAL GAS: 5000 ft.
AVERAGE NET PAY: 300 ft.
TOTAL RESERVES: 25 TCF
PATRICK DRAW FIELD, WYOMING

DISCOVERY: 1959
OIL IN PLACE: 250 MILLION BBLS

STRATIGRAPHIC AND STRUCTURAL TRAP; EAST FLANK OF UPLIFT

LENGTH: 8 MILES
WIDTH: 3 MILES
PRODUCING DEPTHS: 3500-6500 FEET

NET PAY: 20 FEET
POROSITY: 20%  PERMEABILITY: 36 MD
WATER SATURATION: 30-50%

ENVIRONMENT OF DEPOSITION:
MARINE SHORELINE SANDSTONE
SUMMARY OF CONCEPTS IN 1950's EXPLORATION

• K SHORELINE MOVEMENT WAS SPASMODIC
• STEPS IN THE SHORELINE SANDS FORM:
  • LINEAR BARRIER BAR RESERVOIR TRENDS
  • STRATIGRAPHIC TRAPS WHERE BARRIER BARS ARE ENCLOSED BY SHALES
• ANALOGIES OF PRODUCING TO NON-PRODUCING AREAS
• Major structural arches as favorable exploration areas w/ reasonable Ø depths

• Land availability and market outlets essential to discoveries

• Favorable government policies

• Always hope for surprises:
  • Larger producing area than envisioned
  • Oil instead of gas
ATTRIBUTES FOR SUCCESSFUL PLAYS

• BE INNOVATIVE & CREATIVE

• CONTINUALLY INTEGRATE NEW INFORMATION INTO DATA BASE -- SEARCH FOR GUIDE POSTS
  – CHALLENGE DOGMA
  – NEW IDEAS ARE THE FUEL FOR EXPLORATION

• USE DISCOVERIES FOR COMPETITIVE ADVANTAGE
- ACCEPT HIGHER RISK IN VENTURES FOR BIGGER PAY-OFF

- ADOPT NEW TOOLS AND APPROACHES

- HAVE LUCK

  (LUCK IS GEOLOGIC FACTORS UNKNOWN AT START OF DRILLING)
SUMMARY OF BASIN CENTER FIELDS

• SOURCE ROCKS
• GENERATION – MATURATION
• MIGRATION
• TRAPS
  • SANDSTONE RESERVOIRS
    • FLUIDS & PRESSURES
• SEALS
  • TIMING
• WHAT HAS BEEN PRODUCED?
• WHAT IS LEFT?
• OBJECTIVE
References


