Configuration of Kansas Basement & Subsurface Cross Section

Location of Marion County and Hillsboro Field

Hillsboro Field
Marion County
Surface Geologic Map

Location of Penner #1 well in Hillsboro Field
Section 7 and 12 with O. Penner #1 in Hillsboro Field, Marion County
Hillsboro Field

- Hillsboro Field discovered in 1928 with production from Mississippian chert (oil & gas) and Viola Ls.
- 22 original producing wells, cumulative 560,489 BO
- Currently:
  - Ave. 16 BOPD, 2 remaining wells
  - ~97% water cut
  - Increase total fluid result increase oil production

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual</th>
<th># wells</th>
<th>Cum.</th>
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<tr>
<td>2004</td>
<td>6,105</td>
<td>3</td>
<td>538,363</td>
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<tr>
<td>2005</td>
<td>5,042</td>
<td>3</td>
<td>543,405</td>
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<td>2006</td>
<td>5,465</td>
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<td>2007</td>
<td>5,923</td>
<td>2</td>
<td>554,793</td>
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<tr>
<td>2008*</td>
<td>5,696</td>
<td>2</td>
<td>560,489</td>
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North-South Structural Cross Section in Vicinity of the Penner Lease in Hillsboro Field, Marion County, Kansas.
Target - porosity zone in upper Viola Ls.

Kinderhook-Chattanooga shale interval -- caliper log, light turquoise line in left track, indicates two softer shale intervals; Chattanooga shale is generally hard and organic-rich.

Mississippian Limestone is ~80 ft of hard microporous chert “chat” underlain by ~60 ft of tight limestone (Compton Limestone).

Rempel #5 with modern log suite located 1/4 mile southwest of Penner #1 producing well.

600-foot interval of predominately limestone and thin shales.

Legend

- Chert
- Limestone
- Kinderhook Shale
- Chattanooga Shale

Target - porosity zone in upper Viola Ls.
Tight dolomite – 22 ft.
Porous dolomite – 8 ft.
Porous cherty dolomitic limestone – 8 ft.
Low porosity cherty limestone – 8 ft.

- Porous dolomite is target for lateral
- Relatively thick upper tight zone in contrast to the O. Penner #1 well
- Porous intercrystalline dolomite overlying less porous cherty dolomitic limestone

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**Chattanooga Shale and Viola Limestone (target zone) in Rempel #5 located southwest of O. Penner #1**

PI: 15-115-21154
Lease: REMPEL
Well 5
Original operator: ALADDIN PETROLEUM CORP
Current operator: ALADDIN PETROLEUM CORP
Field: Hillsboro
Location: T19S R2E, Sec. 12 NE SW SE

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- Field: Hillsboro
- Location: T19S R2E, Sec. 12 NE SW SE
Top Viola: 2825 ft. (-1459 subsea)
TD: 2830 ft (5 ft below top of Viola Ls.)
Casing shoe: 2827 ft.

Circulate at 2828: trace dolomite
Circulate at 2830: coarsely crystalline
Dolomite good porosity and even
Oil show (est. 90% saturation)
Structure map Top Viola
Directional Drilling Corridor
(fee acreage under lease by AEC)
Initial Well Potentials for Viola Limestone as reported on scout tickets

- O. Penner #1
  - 7 BO +200 BW
  - Darby Nichols #1
  - Plug date: May 1957
  - Complete: Feb. 1929

- Darby Nichols #3
  - 700 ft
  - Plug date: June 1968
  - Complete: May 1929

Directional Drilling Corridor -- 900 to 1100 ft.
Vitals for Directional Drilling

- Optimal to drill new well with hybrid coiled tubing rig using latest directional drilling technology
  - More cost effective that re-entry of old well – fast drilling, precise
  - Avoid mechanical problems and possible fluid leaks in old casing which could junk new well or water-out lateral
  - Cost effective, short down hole assembly, LWD suite, near real-time data for logging and steering
  - Drill on existing well site right of way with low environmental impact, portable self contained system with small footprint and no or limited in ground pit construction

- Depth for target horizon: ~2900 ft.
- Kickoff point to begin lateral: ~2600 ft. in dense Mississippian Compton Ls., avoiding overlying water and gas in Mississippian ‘chat’
- Build interval for lateral: estimate 200 to 250 ft vertical depth to achieve flat entry into pay
- Length of lateral: 600 to 1100 ft.
- Pay: Sucrosic dolomite with scattered dense chert nodules
- Porous interval: 10-25 ft.
- Overlying formation: hard Chattanooga shale
Viola Petrophysics

Petrophysical Properties (from Dave Newell)

**Permeability**
- Normally between 15 to 55 md
- Average 25 md
- May be as 80 md (due to fractures)

**Porosity**
- Normally between 12 to 14%
Detail log of the Rempel #5

- Extending from top of the Missisippian chert to the Viola Limestone

Compton Limestone (casing point for vertical Portion of well and depth for start build for lateral)

Build rate 20-40 degrees/100 ft Vertical to horizontal in 200-250 ft (within hard shale)

: Porous zone in the Viola Limestone
O. Penner #1

Mississippian “chat”

Mississippian Compton Ls.
- tight limestone
- kickoff for lateral

Devonian Chattanooga Sh.

Top Viola Ls.

Estimated oil:water contact = -1480 ft

~20’ maximum thick pay interval

400 ft

1140 ft
Hillsboro Field and surface topography with location of O. Penner and directional drilling corridor

Directional drilling corridor on fee acreage
Drill new well near location of Penner producing well
1st “offshore” Kansas well

O. Penner #1

Alternate surface location
Bottom hole pressure from nearby wells

Penner BHP is half that of other Viola wells in area.
Remple lease, adjacent to Penner on south
Increase in production in 2008 to 2660 bbls.
Similar elevation as Penner, off structure

Viola -1443
Remple #3 in se se se
Shut-in BHP: __________
Cumulative production: 59,000 bbls

Viola -1459
Penner #12-1 in c ne se
Shut-in BHP: ~ 400 psi??
Cumulative production: 84,000 bbls
Conclusions

- Low pressure encountered in Penner well suggest limited reservoir without a strong water drive.
- Locations updip from Penner on crest of anticline may be drained by Penner well.
- Gravity drainage of oil downdip from crest of structure may account for increase in oil production in Penner well and nearby lease to south.
- Drilling lateral on crest of anticline east of the Penner well deemed unnecessary since oil is probably being drained by downdip wells.
- Moved on to study Unger Field.