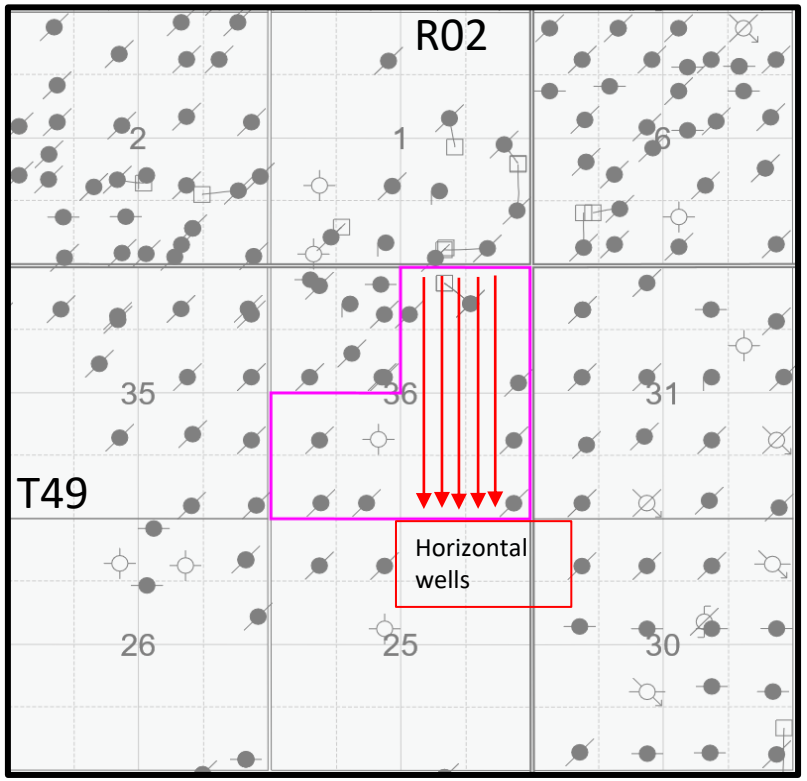
Development and Investment Opportunity of Heavy Oil Horizontal Well in Section 36-049-02W4(NE, SE,SW)

Basic information

- Name: 36-049-02W4
- Location: about 400Km in Northeast of Calgary, 5 Km in West of Lloydminster
- Area: 3/4 Section, 1.92 km2 (Map 1)
- Completed drilling Wells : 9
- Well ID: 16-36-049-02W4, and 8 wells
- Target Formation: K-Sparky
- TVD of Oil Interval: 640 m
- Elevation of Oil Interval: 71 m
- Gross Pay: 6 m/ 1 (Map 2)
- Viscosity: 4401 m Pa. s (20C), API : 14 (15C)
- Density: 0.97kg/ m3
- Porosity: 30% (from density logs)
- Resistivity of oil interval: 10-30 ohm/s
- Lithology of oil interval: sandstone



Map 1　Location map of section 36-49-02W4 （NE,SE,SW）

Production data

Cumulative oil production was 6,008 m3 (37810 barrels) from in October 1983 to Dec 1996 in the well 08-36-049-02 W4 (Table 1), and cumulative water production was 1604 m3 (10091 barrels) in the well 08-36-049-02 W4. The average oil production of the well 08-36-049-02 W4 was 10 barrels/day in the well 08-36-049-02 W4 in the beginning (Table 1). The production is lower for the vertical wells in the section. The oil production of other wells in the section are similar to the well of 08-36-049-02W4

Map 2 16-36-49-02W4

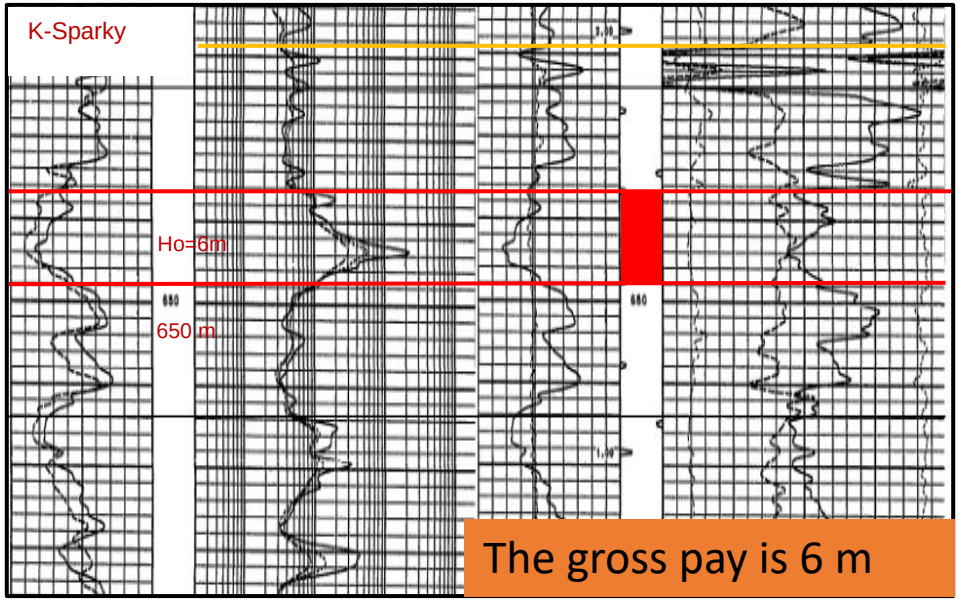


Table 1 Production data Section of 08-36-49-02W4

Report Month	PRD Cal-Day Avg OIL (Bbl/Day)	PRD Cal-Day Avg GAS (Mcf/Day)	PRD Cal-Day Avg WTR (Bbl/Day)	PRD Percent: WTR Cut (%)	PRD Ratio: GAS/OIL (Scf/Bbl)	PRD Monthly Hours (hrs)
10-1983	0.00	0.00	0.00	0.00	0.00	696.00
11-1983	4.66	0.24	0.06	1.33	50.56	720.00
12-1983	11.90	8.32	0.04	0.34	699.09	744.00
1983	**5.52**	**2.85**	**0.03**	**0.56**	**249.88**	**2160.00**
01-1984	10.82	5.70	0.02	0.19	526.44	740.00
02-1984	12.11	7.92	0.02	0.18	653.71	696.00
03-1984	14.35	8.20	0.02	0.14	571.50	744.00
04-1984	9.40	8.12	0.00	0.00	864.33	719.00
05-1984	11.27	9.57	0.04	0.36	849.36	744.00
06-1984	12.19	10.36	0.06	0.51	849.99	720.00
07-1984	8.20	7.18	0.00	0.00	875.12	744.00
08-1984	14.78	14.13	0.16	1.09	955.87	744.00
09-1984	7.82	14.13	4.24	35.13	1805.42	720.00
10-1984	11.16	28.25	0.06	0.54	2530.44	744.00
11-1984	8.01	10.24	0.04	0.52	1278.09	720.00
12-1984	10.98	20.39	0.02	0.18	1856.79	744.00

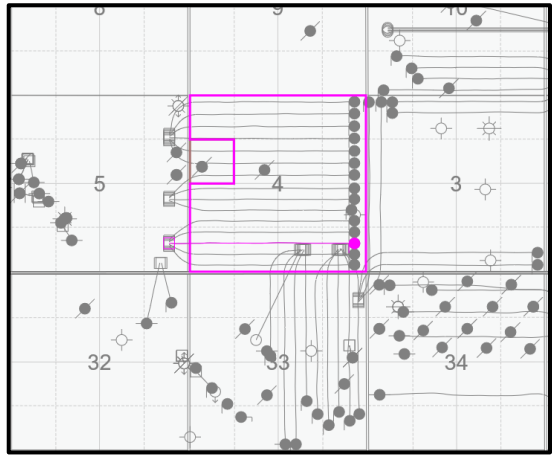
Technology of horizontal well will increase efficiently heavy oil production

- In the past 20 years, horizontal wells have been widely used in heavy oil production in Western Canadian Sedimentary Basin. The techniques of horizontal well plus progressive cavity pump plus slotted liner can efficiently improve the heavy oil production and recovery by expanding the oil displacement area.
- Horizontal wells will be in the same well site, which effectively reduces the costs of drilling, completion, pipelines, facilities, and transportation
- Slotted liner : no perforation
- Associated gas will be used for electrical power and tank heating in the site

Successful examples in adjacent oil fields for heavy oil horizontal well production

Well 11-04-49-01W4 is about 8.7 km in southeast of well 08-36-49-02W4. The target formation of the well 11-04-49-01 is also K-Sparky (map 3, 4), and its net pay is 3.1 m. Its cumulative oil production was 3,543 m3 (22,295 barrels) from in December 1974 to January 1994 in the Well 11-04-49-01 W4 , and cumulative water production was 5,936 m3 (37,338 barrels). The API of the well 11-04-49-01W4 is 13-14. The oil production of this well 11-04-49-01W4 is low (table 2). The oil production is also lower in another 2 wells in the section. However, the oil production horizontal wells is high in the section. Total 14 horizontal wells drilled in the section in 2018 . Cumulative oil production was 79,142 barrels from in Feb 2018 to Feb 2021 in the well 102/01-04-49-01W4, and cumulative water production was 1,604 m3 (10,091 barrels). Its average oil production was 125 barrels/day in 2018 (table 3). its average daily water production of 9.5 barrels per day in this well. Significate success in production due to horizontal wells.

Map 3　Location of section 04-49-01W4



Map 4　11-04-49-01W4

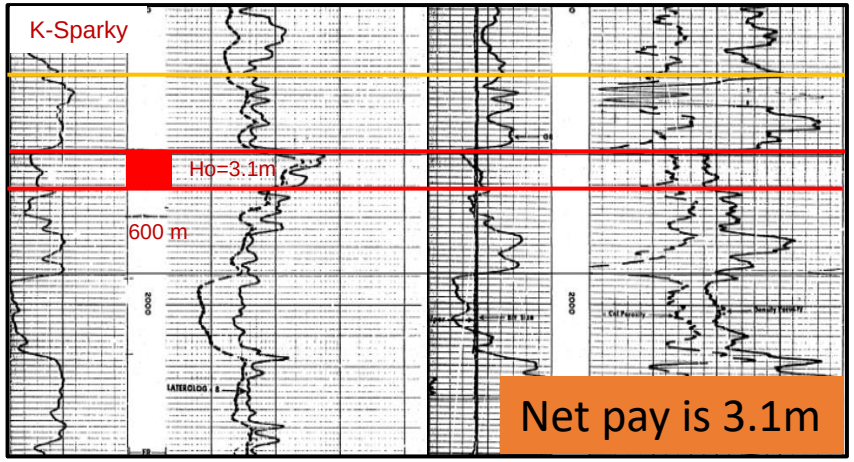


table2 production data 11-04-49-01W4井(vertical well)

Report Month	PRD Cal-Day Avg OIL (Bbl/Day)	PRD Cal-Day Avg GAS (Mcf/Day)	PRD Cal-Day Avg WTR (Bbl/Day)	PRD Percent: WTR Cut (%)	PRD Ratio: GAS/OIL (Scf/Bbl)	PRD Monthly Hours (hrs)
12-1974	13.84	1.37	0.20	1.45	98.74	744.00
1974	**13.84**	**1.37**	**0.20**	**1.45**	**98.74**	**744.00**
01-1975	11.77	1.14	0.06	0.51	96.76	744.00
02-1975	4.36	0.38	0.04	1.02	86.78	648.00
03-1975	12.06	1.14	0.10	0.83	94.48	744.00
04-1975	0.00	0.00	0.00	0.00	0.00	0.00
05-1975	10.09	1.03	0.06	0.60	101.62	744.00
06-1975	8.83	0.94	0.10	1.17	106.64	720.00
07-1975	12.06	1.14	0.12	1.00	94.48	744.00
08-1975	0.00	0.00	0.00	0.00	0.00	0.00
09-1975	15.69	1.53	0.17	1.06	97.53	720.00
10-1975	7.06	0.68	0.43	5.69	96.76	408.00
11-1975	8.16	0.82	0.52	6.04	100.98	720.00
12-1975	4.43	0.46	0.32	6.84	102.97	744.00
1975	**7.88**	**0.77**	**0.16**	**2.06**	**81.58**	**6936.00**

table3　production data 102/01-04-49-01W4 horizontal wells

Report Month	PRD Cal-Day Avg OIL (Bbl/Day)	PRD Cal-Day Avg GAS (Mcf/Day)	PRD Cal-Day Avg WTR (Bbl/Day)	PRD Percent: WTR Cut (%)	PRD Ratio: GAS/OIL (Scf/Bbl)	PRD Monthly Hours (hrs)
02-2018	118.53	34.56	3.86	3.16	291.55	616.00
03-2018	70.52	20.62	1.32	1.84	292.38	743.00
04-2018	88.46	46.62	5.60	5.95	526.98	720.00
05-2018	194.73	102.64	2.98	1.51	527.08	719.00
06-2018	196.11	40.38	9.12	4.45	205.89	720.00
07-2018	185.40	38.39	5.84	3.06	207.07	732.00
08-2018	155.35	39.99	9.64	5.84	257.38	732.00
09-2018	122.82	44.73	19.14	13.49	364.22	720.00
10-2018	60.51	29.73	9.33	13.37	491.34	418.00
11-2018	91.25	42.26	14.89	14.03	463.14	677.00
12-2018	98.92	56.39	23.52	19.21	570.05	729.00
2018	**125.69**	**45.12**	**9.57**	**7.81**	**381.55**	**7526.00**

Development plan and investment

- Oil wells: 5 (horizontal oil wells) will be drilled, The well spacing is 100 meters, horizontal length is 1400 meter
- Cost of each well (drilling and completion): 0.6 million
- Total cost of drilling and completion: $4.0-4.5 million for 5 wells
- Battery for 5 wells: $0.7 million
- Total cost: $5.2 million

Expected income (4 years)

- Oil production per well: 50 barrels/day* 330 days * 4years=66,000 barrels
- Oil production for 5 wells: 50 barrels/day * 330 days * 4 years * 5 wells = 330,000 barrels
- Total sales revenue: 330,000 *$85 / barrel = $ 28.1 million
- Operating cost: based on $25 / barrel
- Net profit: 19.80million

Implementation in the 2022

- Oil well: one horizontal well will be drilled, horizontal length 1400 meters
- Cost of drilling and completion: 0.8 million
- Cost of battery: 0.15 million
- Total cost: 0.95 million

Expected Profit in 1 year

- Oil production: 50 barrels/day* 330 days= 16.500 barrels
- Total sales revenue: 16,500 *$85 / barrel = $ 1.40 million
- Operating cost: based on $25 / barrel
- Net profit: $0.99 million