Oil & Gas Research
ISSN: 2472-0518
Abdulsadig, Oil Gas Res 2024, 10:4
Expert Review
Open Access

Alfa-Temp-cfs Spinner Reservoir Production Evaluation

Abdulsadig*
Faculty of Petroleum Engineering, Zawia University, Libya

Abstract

In this paper, ALFA-TEMP-CFS SPINNER logs were carried out in a well-A at a Libya oil field. The intervention objectives were to identify the production profile across the perforation intervals, determine casing integrity, evaluate any flow behind the casing to identify any source of leakage within the wellbore and evaluate the cross-flow profile (if any), under shut-in conditions. The data was acquired through the interval from 9,800 to 10,144 ft.MD. The interpretation results indicated that there is formation activity and a possible casing leak is detected within the interval 10,051 – 10,058ft. In addition, the pressure and temperature at 10,082 ft. MD under shut-in long term 3,446.8 psi, flowing low rate 3,394.3 psi and Flowing High rate 3,386.0. Moreover, the PLT calculation was determined by KAPPA Ea. MERAUD utilizing water hold-up sensor with 0-5% (air) and 100% (water) calibration values with correlation for the water-hydrocarbon vertical producer as well as PVT data provided by the client. Spinner data shows a huge production rate across the two bottom perforations with approximately equal rate distribution. The qualitative water hold-up analysis demonstrates a very weak hydrocarbon response across perforation interval number 6 and drastic hydrocarbon presence across interval 5 with almost equal rates as mentioned above. Across production zones above perforation, interval number 5 and 6 water hold-up shows a response change towards hydrocarbon with a production rate of 30% from the total value only. KAPPA calculation results match with qualitative data analysis. In addition, the Temperature and Spectral Noise tool confirmed PLT sensor results. According to the flowing ALFA and Temperature data, there is approximately equal production from PERF5 and PERF6. Long-term-shut-in temperature shows the same heated gradient within the interval 11,814 – 11,840ft this might be associated with through formation communication between the bottom water saturated reservoirs, this job has been completed successfully by PETECS company (www.petecs.com).

Keywords: Reservoir Evaluation; PLT tools; Alfa tools

Introduction

Alfa-temp-cfs spinner logs were recorded in well A-05 on 25th – 26th and 29th January 2020, across the Barremian S st. formation under 2 production conditions (32/65 & full choke) and time-lapse shut-in conditions. The time-lapse shut-in survey was done after 15 min, one and two hours after closing the well [1]. The intervention objective was to identify the production profile across the perforation intervals, to determine casing integrity and to evaluate any flow behind casing [2]. The data was acquired through the interval from 11,530 to 11,852 ft MD. This report details the Alfa-Temp-Cfs Spinner interpretation results and main findings of the flow geometry [3]. The main objective of Alfa-Temp-Plt in this well is to:

- To evaluate the production profile across the perforation intervals.
- To evaluate the cross-flow profile (if any), under shut in conditions.
- To evaluate the presence of behind casing channeling.
- To identify any source of leakage within the wellbore.

Alfa-temp log interpretation results

Two flowing passes were done under different choke sizes (32/65 and full choke), three transient passes (short-term shut-in) and a long-term shut-in survey [4]. The shut-in and flowing temperature surveys were carried during down passes at a speed of 15 ft/min. ALFA data was performed during up-pass stationary measurements for 40 seconds at each station as per the sequence of events in the attachment chapter [5]. The data is of good quality and shows good Repeatability throughout the whole survey [6]. Data was correlated using CCL across tubing with completion items provided (Table 1).

Job Performance

Alfa-temp log main findings

- Cross flows/channelings and behind-casing formation activities (Table 2) [7].
- Slower relaxation of transient temperatures and localized high amplitude Noise data associated with behind casing formation activity within the interval 11,694-11,700ft and channeling through behind casing towards the top perforation.
- There is no temperature anomalies and specific localized noise across top water saturated formation within 11,655-11,688ft which suggests no formation activity and no crossflow or channeling.
- Temperature matching below the depth 11,838ft in all good conditions and no localized noise suggest there is no behind casing channeling and inside wellbore fluid flow [8]. CFS spinner data confirms no fluid flow below the depth of 11,838ft.
- Formation activities/Production intervals from ALFA-TEMP data

***Corresponding author:** Abdulsadig, Faculty of Petroleum Engineering, Zawia University, Libya, E-mail: m.abdulsadig@zu.edu.ly

Received: 01-Jul-2023, Manuscript No: ogr-24-132025, **Editor assigned:** 04-Jul-2023, PreQC No: ogr-24-132025 (PQ), **Reviewed:** 18-Jul-2023, QC No: ogr-24-132025, **Revised:** 23-Jul-2023, Manuscript No: ogr-24-132025 (R), **Published:** 29-Jul-2023, DOI: 10.4172/2472-0518.1000356

Citation: Abdulsadig MAGH (2024) Alfa-Temp-cfs Spinner Reservoir Production Evaluation. Oil Gas Res 10: 356.

Table 1: Data Quality.

Run#	Survey	CCL	PRES	TEMP	CFS	ALFA	YW
1	Flowing	good	good	good	good	good	good
2	Transient	good	good	good	good	good	good
3	SHUT-IN	good	good	good	good	good	good

Table 2: Job Performance.

Well Condition	Log	Abbreviation
SHUT-IN	Alfa-temp-pres-ccl-yw	SI
Low Flow Rate (32/65)	Alfa-temp-pres-ccl-yw	LF
15 min after SHUT-IN (Transient)	Alfa-temp-pres-ccl-yw	T1
1 hour after SHUT-IN (Transient)	Alfa-temp-pres-ccl-yw	T2
2 hours after SHUT-IN (Transient)	Alfa-temp-pres-ccl-yw	T3
High Flow Rate (Full Choke)	Alfa-temp-pres-ccl-yw	HF
High Flow Rate (Full Choke)	Cfs spinner	CFS_high_flow
Low Flow Rate (32/65)	Cfs spinner	CFS_low_flow

- 11,694-11,700ft – Behind casing formation activity [9]. Detected from ALFA (localized high amplitude noise) and Temperature data.

- 11,715-11,720ft – across PERF1 formation activity. Detected from ALFA (localized high amplitude noise) and Temperature data [10].

- 11,727-11,730ft and 11,733-11,739ft - across PERF2 formation activity. Detected from ALFA (localized high amplitude noise) and Temperature data.

- 11,748-11,762ft – across PERF3 formation activity. Detected from ALFA (localized high amplitude noise) and Temperature data.

- 11,771-11,780.5ft – across PERF4 formation activity. Detected from ALFA (localized high amplitude noise) and Temperature data.

- 11,806.5-11,817.5ft – across PERF5 formation activity. Detected from ALFA (localized high amplitude noise) and Temperature data [11].

- 11,820-11,833.4ft – across PERF6 formation activity. Detected from ALFA (localized high amplitude noise) and Temperature data.

- PLT calculation was done in KAPPA EMERAUD using water hold-up sensor with 0-5% (air) and 100% (water) calibration values with correlation for the water-hydrocarbon vertical producer as well as PVT data provided by the client [12]. Spinner data shows a huge production rate across the two bottom perforations with approximately equal rate distribution. Qualitative water hold-up analysis shows a very weak hydrocarbon response across PERF6 and drastic hydrocarbon presence across PERF5 with almost equal rates as mentioned above [13]. Across production zones above PERF5 and PERF6 water hold-up shows a response change towards hydrocarbon with a production rate of 30% from the total value only. KAPPA calculation results match with qualitative data analysis [14]. In addition, PLT sensor results were confirmed by the Temperature and Spectral Noise tool. According to the flowing ALFA and Temperature data, there is approximately equal production from PERF5 and PERF6. Long-term-shut-in temperature shows the same heated gradient within the interval 11,814 – 11,840ft this might be associated with through formation communication between the bottom water saturated reservoir, PERF6 and PERF5 intervals [15]. In addition, there is no fast-transient temperature relaxation towards the geothermal gradient between the PERF5 and PERF6 that suggests communication between these intervals. Based on the above-mentioned points it was decided to use production distribution outputted from the KAPPA EMERAUD [16].

- Fracture/ Matrix flow: Theoretically, a big-size aperture (fracture) creates low-frequency noise and a small-size aperture (matrix) high-frequency noise [17]. In the downhole condition, everything is complicated, and it is not possible to differentiate micro-fractures from matrix flow [18]. High permeable fractures/faults can be differentiated from matrix flow by integration of PLT-TEMP-ALFA qualitatively. In this particular well a based on the integrated data package no high permeable fracture/fault flow is detected [19].

Well Bore Flow

The spinner flow meter was calibrated in intervals 11,551.9-11,570.4 ft. (multiphase flow zone) and 11,831.6 11,839.5ft (no flow zone) [20]. The calibration was done in 7" casing and 2 7/8" tubing. The calibration cross-plot is shown below in figure and calibration parameters in the Table 3. Based on production logging results, the total Production rate was 2,879.5 STBPD with 34% of WC (at surface condition) when the well was at full choke production [21]. The main production interval is 11,807-11,816.8ft with around 59% of the total production value [22]. A detailed distribution determined by CFS is shown in Table 4.

Based on production logging results, the total Production rate was 2,170.9 STBPD with 51% of WC (at surface condition) when well was at 32/65 choke production. Main production intervals are 11,806.6-11,814.3ft and 11,820.9-11,824.8ft with around 77% of total production value [23]. A detailed distribution determined by CFS is shown in Table 4.

Alfa-temp (high & low production) – inflow zone (Figure 1)

Alfa-temp-spinner (high & low production) (Figure 2)

Alfa-temp-spinner (high & low production) – zoom – top zone (Figure 3)

Alfa-temp-spinner (high & low production) – zoom – bottom zone (Figure 4)

Alfa-Temp (Shut-In) (Figure 5)

Table 3: Production distribution according to CFS data (High Rate – Full choke).

Production distribution according to CFS data (High Rate – Full choke)												
Top	Bottom	RU	Working Thickness,H	Oil (Res. Cond)	Oil (Surf. Cond)	Oil	Gas	Water (Res. Cond)	Water (Surf. Cond)	Water	Production Profile	Production Profile
ft	ft		ft	bpd	stbd	%	Mscf/d	bpd	stbd	%	bpd	%
11,716.6	11,720.0	Barremian S st.	3.4	211.0	164.1	100.0	96.5	0.0	0.0	0.0	211.0	6.1
11,728.0	11,739.0	Barremian S st.	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11,748.0	11,762.0	Barremian S st.	14.0	559.2	435.1	100.0	255.9	0.0	0.0	0.0	559.2	16.1
11,767.0	11,780.0	Barremian S st.	13.0	145.5	113.3	100.0	66.6	0.0	0.0	0.0	145.5	4.2
11,807.0	11,816.8	Barremian S st.	9.8	1,276.5	993.5	61.8	588.2	788.4	745.0	38.2	2,064.9	59.4
11,820.9	11,824.8	Barremian S st.	3.9	249.9	194.5	50.2	115.6	247.7	234.1	49.8	497.5	14.3
Below HUD				~	~	~	~	~	~	~	~	~
Total				2,442.1	1,900.5		1,122.8	1,036.0	979.0		3,478.1	100.0

Table 4: Production distribution according to CFS data (Low Rate – 32/65 choke).

Production distribution according to CFS data (Low Rate – 32/65 choke)												
Top	Bottom	RU	Working Thickness,H	Oil (Res. Cond)	Oil (Surf. Cond)	Oil	Gas	Water (Res. Cond)	Water (Surf. Cond)	Water	Production Profile	Production Profile
ft.	ft.		ft.	bpd	stbd	%	Mscf/d	bpd	stbd	%	bpd	%
11,716.6	11,720.0	Barremian S st.	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11,728.0	11,739.0	Barremian S st.	11.0	279.3	218.1	0.0	128.2	0.0	0.0	0.0	279.3	11.0
11,748.0	11,762.0	Barremian S st.	14.0	236.2	184.5	100.0	108.5	0.0	0.0	0.0	236.2	9.3
11,767.0	11,780.0	Barremian S st.	13.0	59.0	46.1	100.0	27.1	0.0	0.0	0.0	59.0	2.3
11,806.6	11,814.3	Barremian S st.	7.7	572.8	447.4	55.8	265.4	454.1	429.1	44.2	1,026.9	40.5
11,820.9	11,824.8	Barremian S st.	3.9	213.3	166.6	22.9	101.6	718.8	679.2	77.1	932.0	36.8
Below HUD				~	~	~	~	~	~	~	~	~
Total				1,360.6	1,062.6		630.7	1,172.8	1,108.3		2,533.4	100.0

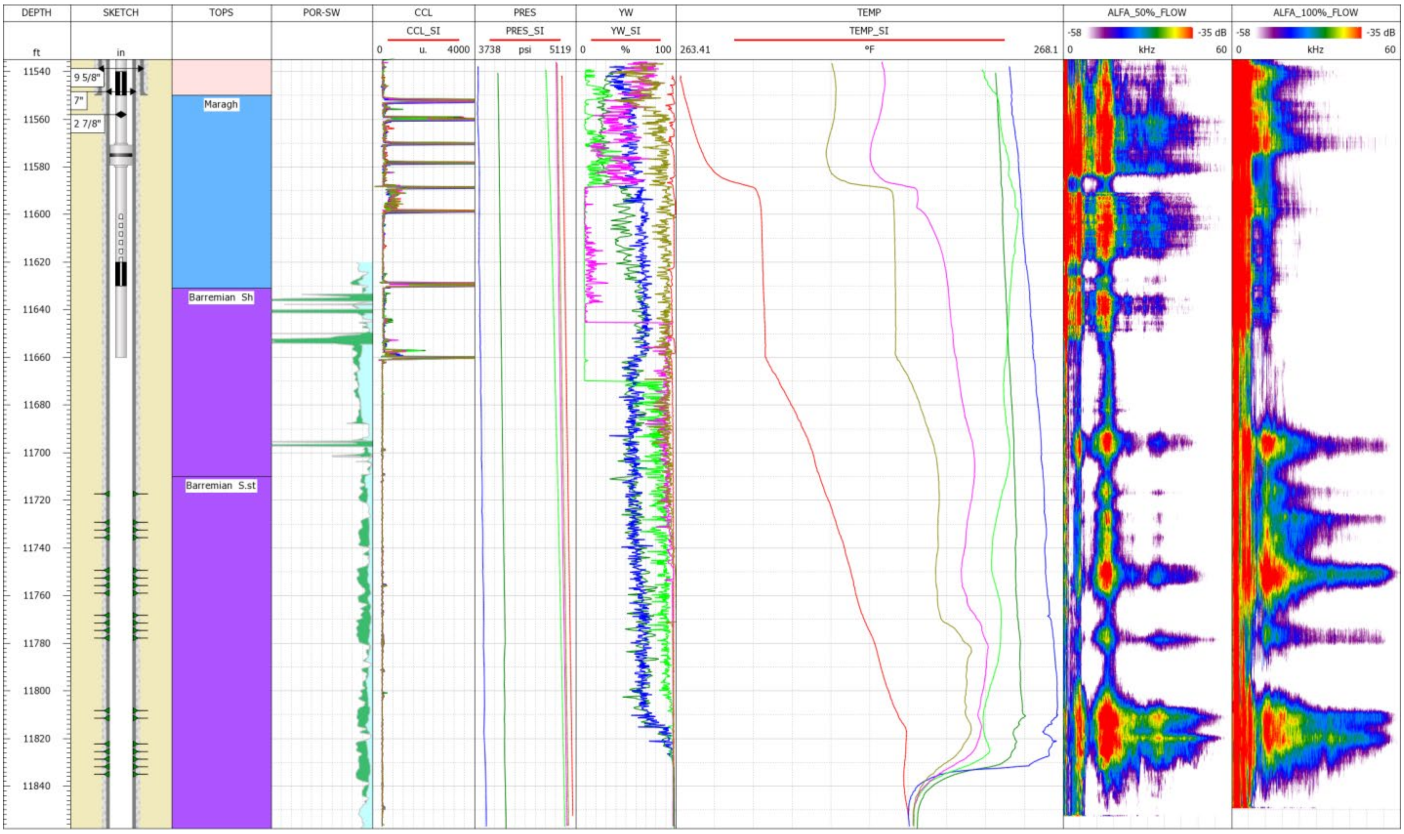

Figure 1: ALFA-TEMP (High & Low Production) – Inflow Zone.

Citation: Abdulsadig MAGH (2024) Alfa-Temp-cfs Spinner Reservoir Production Evaluation. Oil Gas Res 10: 356.

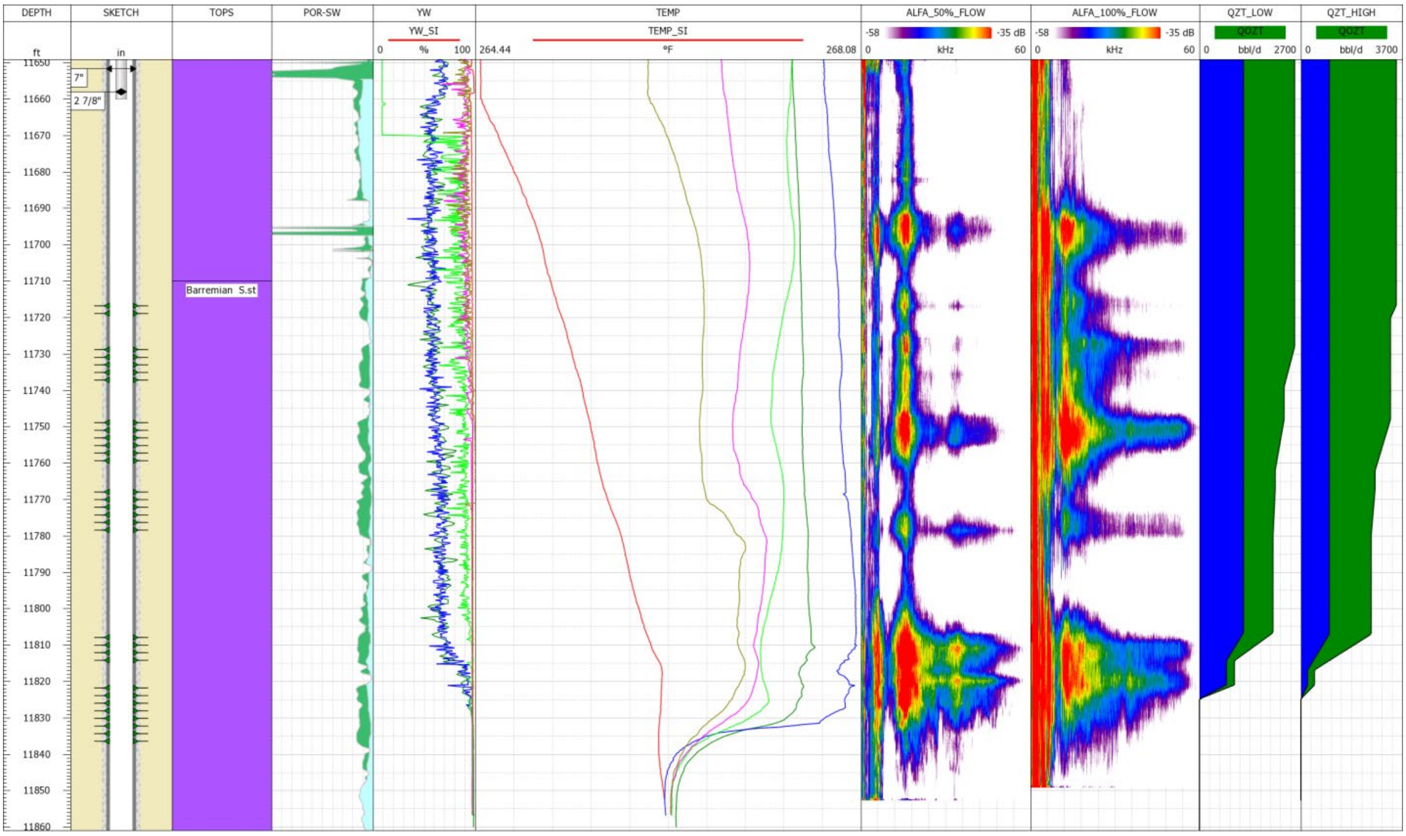

Figure 2: ALFA-TEMP-SPINNER (High & Low Production).

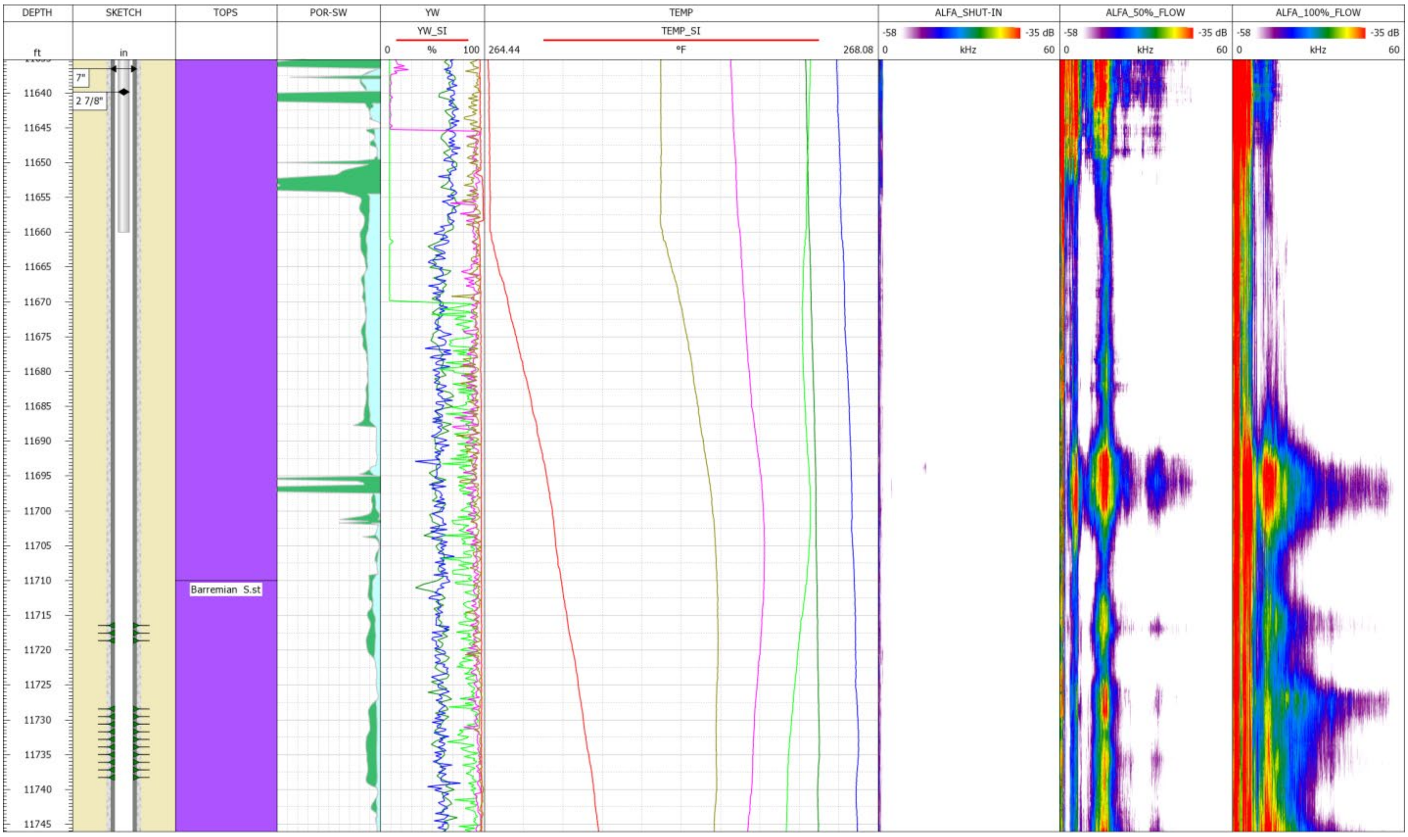

Figure 3: ALFA-TEMP-SPINNER (High & Low Production) – Zoom – Top Zone.

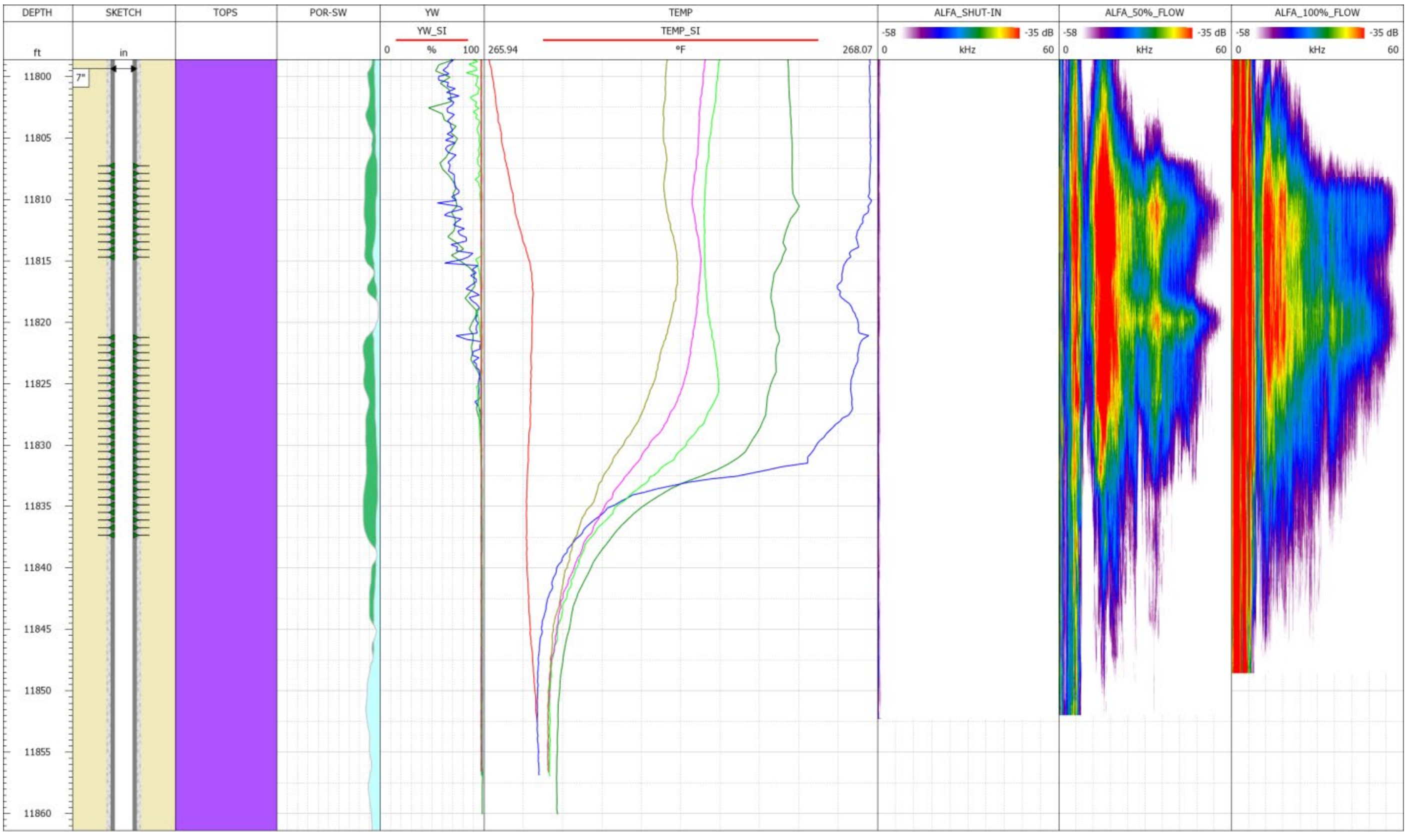

Figure 4: ALFA-TEMP-SPINNER (High & Low Production) – Zoom – Bottom Zone.

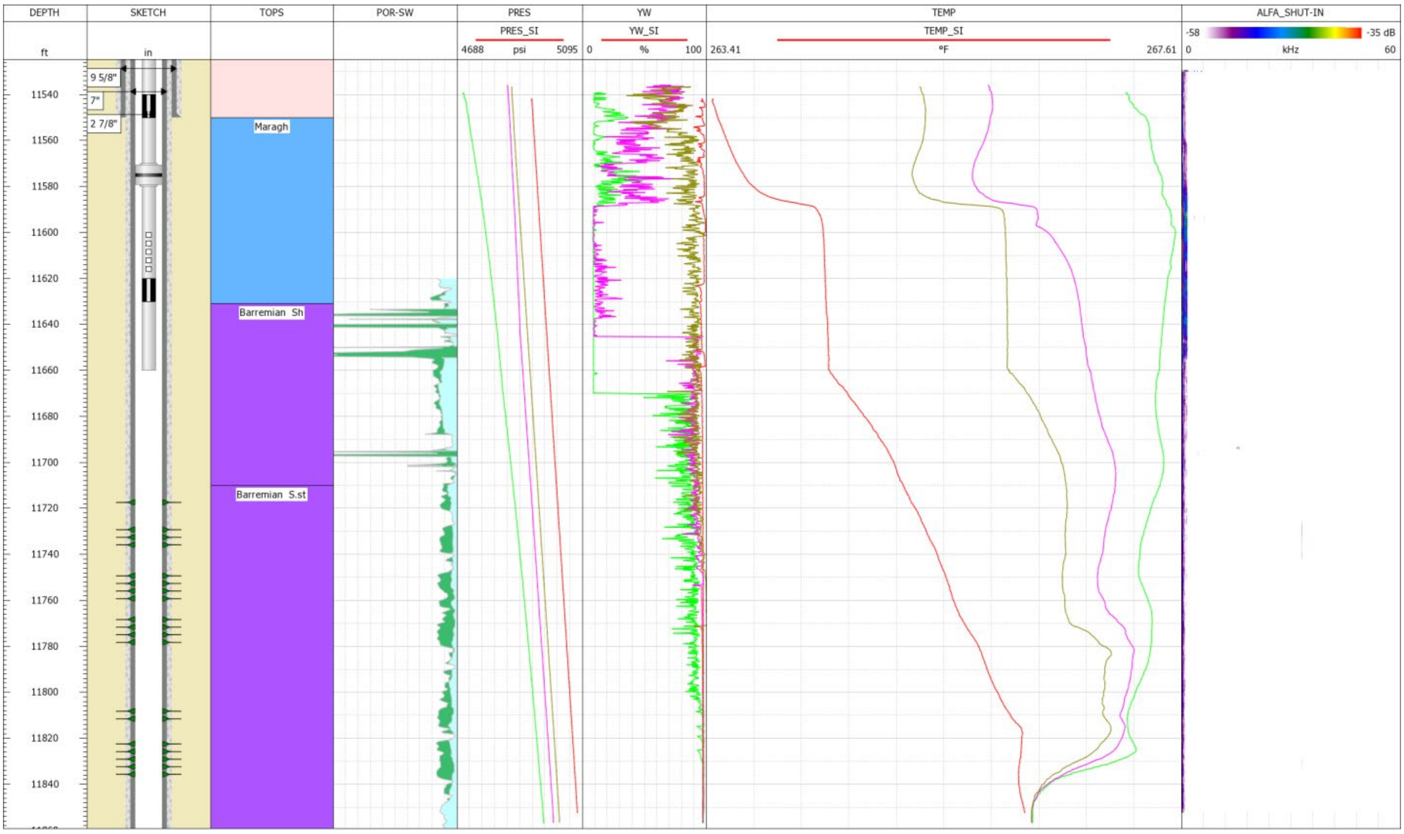

Figure 5: ALFA-TEMP (SHUT-IN).

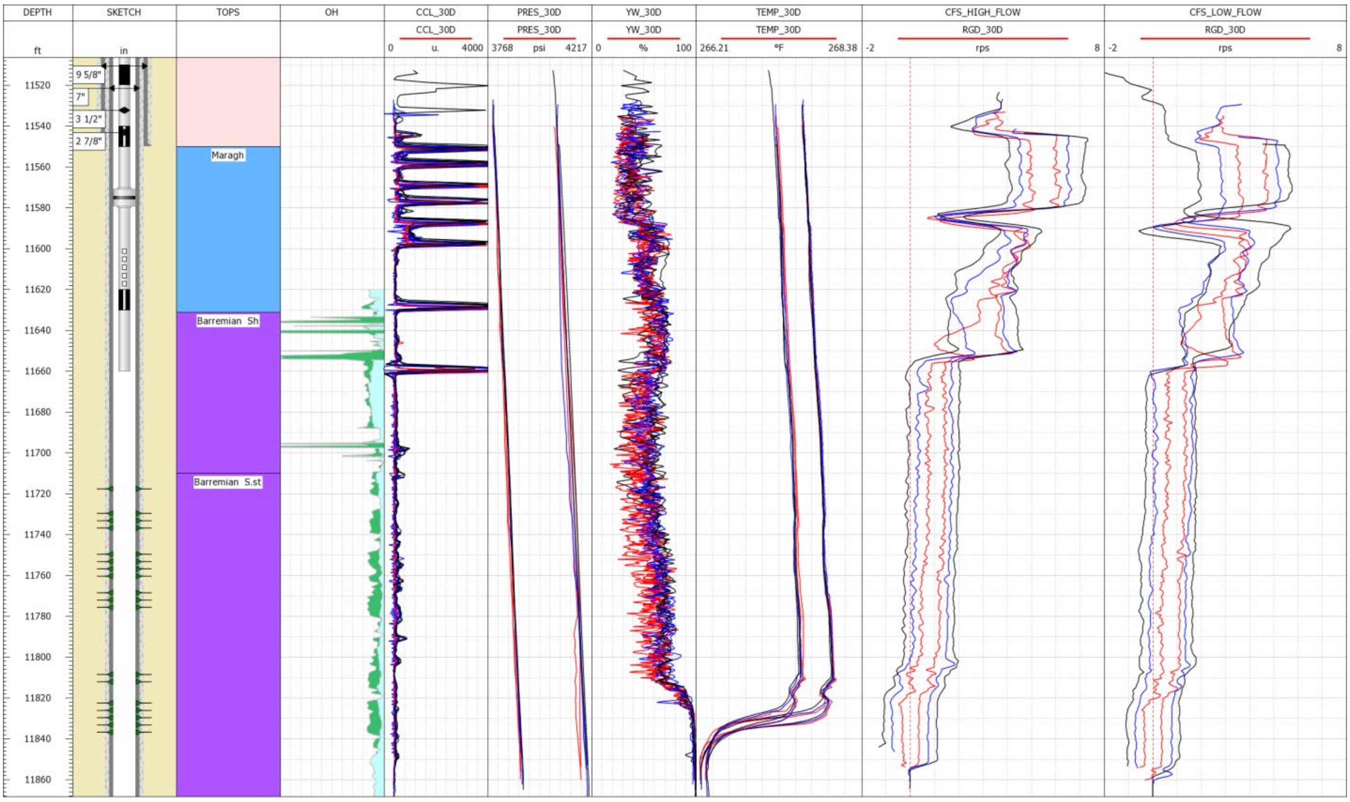

Figure 6: SPINNER (High & Low Production).

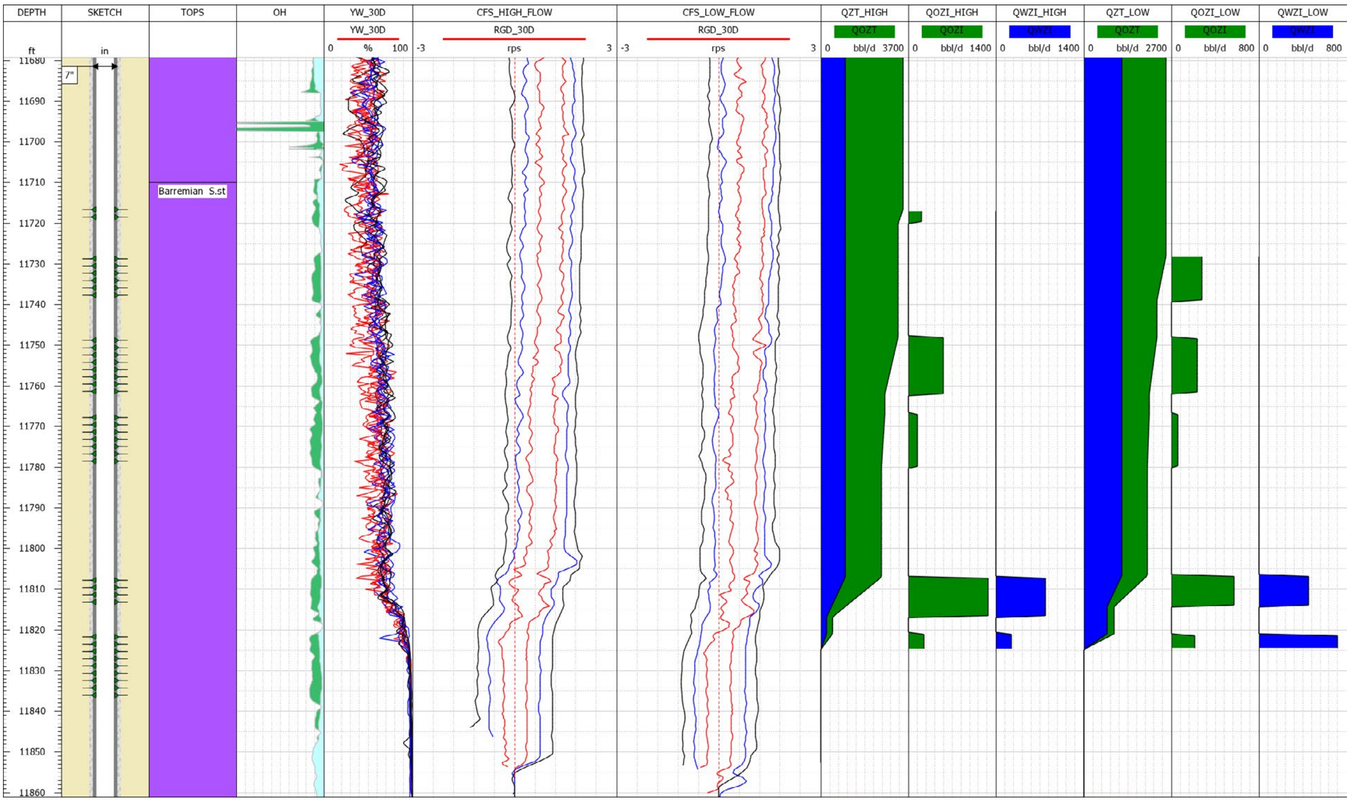

Figure 7: SPINNER (High & Low Production).

Spinner (high & low production) (Figure 6)

Spinner (high & low production) (Figure 7)

Conclusions

The total Production rate was 2,879.5 STBPD with 34% of WC (at surface condition) when well was at full choke production. Main production interval is 11,807-11,816.8ft with around 59% from total production value. According to the water hold-up data water is being produced from the intervals 11,807-11,816.8ft and 11,820.9-11824.8ft bottom perforation intervals. A detailed distribution determined by CFS is shown in the table 3.

- The total production rate was 2,170.9 STBPD with 51% of WC (at surface condition) when well was at 32/65 choke production. Main production intervals are 11,806.6-11,814.3ft and 11,820.9-11,824.8ft with around 77% from total production value. According to the water hold-up data water is being produced from the intervals 11,806.6-11,814.3ft and 11,820.9-11,824.8ft bottom perforation intervals. A detailed distribution determined by CFS is shown in the table 4.
- Temperature and Noise data show behind casing formation activity within the interval 11,694-11,700ft.
- No behind casing channeling/crossflow is detected above perforation intervals from the top water saturated formations.
- No behind casing channeling/crossflow is detected below perforation intervals from the bottom water saturated formations.
- No wellbore fluid flow is detected below 11,838ft. No plug integrity issue.
- The pressure and temperature at 11,716 ft MD under shut in (long term), low production and high production are as follows:
- Shut in (long term): 5,013.7 psi and 265.2 degF
- Flowing (32/65): 4,127.1 psi and 267.5 degF
- Flowing (Full choke): 3,843.8 psi and 267.8 degF

References

1. Abualkhir , Eders A (2016) Libya and the Great Challenges of Overcoming Difficulties to Exploring and Producing Shale Gas, and Tight Reservoirs (Shale Oil) Potential. AAPG GEO 2016, The 12th Middle East Geosciences Conference and Exhibition March 7-10 Manama, Bahrain.
2. Aurélien Saussay (2018) Can the US shale revolution be duplicated in continental Europe? An economic analysis of European shale gas resources. Energy Eco 69: 295-306.
3. Charles FM, Lucija AM, Sheila MO (2015) The Economics of Shale Gas development. Resources for the Future, 1616 P St. NW Washington, DC 202: 328-5000.
4. http://www.eia.gov/ oil_gas/natural_gas/ special/ngresources/ngresources.
5. EIA (2011) World shale gas resources: an initial assessment of 14 regions outside the United States. Washington, DC: US Depart Energy.
6. Euzen T (2011) Shale Gas: An Overview. IFP Technologies(Canada) Inc.
7. Hallett D, Daniel CL (2016) Petroleum Geology of Libya. 2nd Edn 9780444635174.
8. Hassan HS, Kendall CCG, Marlow L, Kendall C, Yose L (2014) Hydrocarbon provinces of Libya: A petroleum system study, in Petroleum systems of the Tethyan region: AAPG Memoir 106: 101-141.
9. Ibeda A, Abosith MF, Alemad A, Elkharrim K, Belghyti D (2014) Physicochemical quality of Murzuq groundwater Sabha, Libya. WIT Transact Ecol Environ 178: 1743-3541.
10. Ibrahim Md, Abdul M, Mahazan AA (2013) The over dependency of Libya on oil revenue: Economic vulnerability. Australian J Basic App Sci 7: 537-540.
11. Jauda RJH, Marlia MH, Wan ZWY (2017) Water Resources Management In Libya: Challenges And Future Prospects. Malaysian J Sustainable Agri 1: 2-5.
12. Kamel D, Riadh A, Jamel AO (2019) Organic Geochemical Assessment And Shale Gas Potential Of Lower Silurian Organic Rich Shale In The Ghadames Basin, North Africa. Oil Shale 2: 337-352.
13. Li WNM (2019) Hydraulic Fractures for Shale Gas Production. Int J Scient Res Pub 9: 2250-3153.
14. Marcelo NF, Edson OP, Paulo RJr, Victor Ede MV (2016) Feasibility analysis of the development of an oil field: a real options approach in a production sharing agreement. Rev Bus Manag 19: 574-593.
15. Nuno MCF, Li W (2019) Hydraulic Fractures for Shale Gas Production. Int J Sci Res Pub 9: 2250-3153.
16. Rashrash S, Farag HS (2016) Water Resources Evaluation in Ghadamis Basin, Libya. J Water Res Protect 8: 1191- 1209.
17. Rusk DC, Downey MW, Threet JC, Morgan WA (2001) Libya: Petroleum potential of the underexplored basin centers - A twenty-first-century challenge, in. AAPG Memoir 74: 429-452.
18. Sikander H, Basu S, Ertug K, Wafa F (2010) Atlas of petroleum geology and geochemistry of source rocks and hydrocarbons in Sirt Basin, Libya, SOC's.
19. Stefan L, Matthias A, Sofia C, Zsolt M, Werner W, et al. (2011) Impacts of shale gas and shale oil extraction on the environment and on human health. 2011-2017.
20. Valentina I (2015). Key Determinants Of Shale Gas Impact On Energy Prices. Rom Stat Rev.
21. Wright EP, Benfield AC, Edmunds WM, Kitching R (1982). Hydrogeology of the Kufra and Sirte basins, eastern Libya. Quar J Eng Geo Hydro 15: 83-103.
22. Zhiltsov SS, Semenov AV (2017) Shale Gas: History of Development. S.S. Zhiltsov (edn Shale Gas: Ecol Pol Eco Hdb Env Chem 52: 9-16.