Unconventional Reservoir Fracture Design Using FRACPRO

Neill Northington

Matt Conway
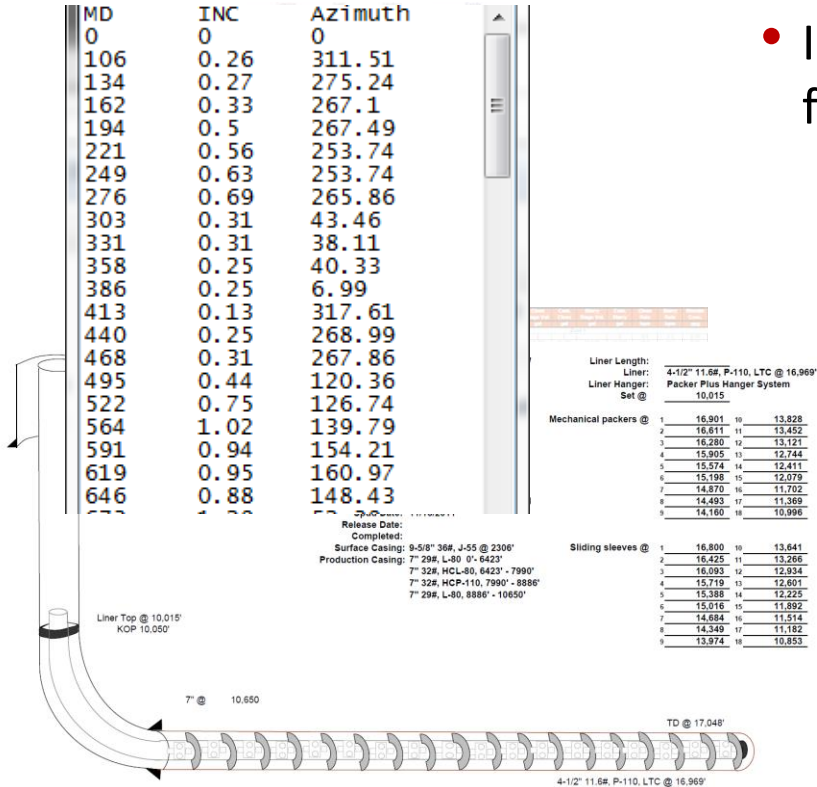
FRACPRO
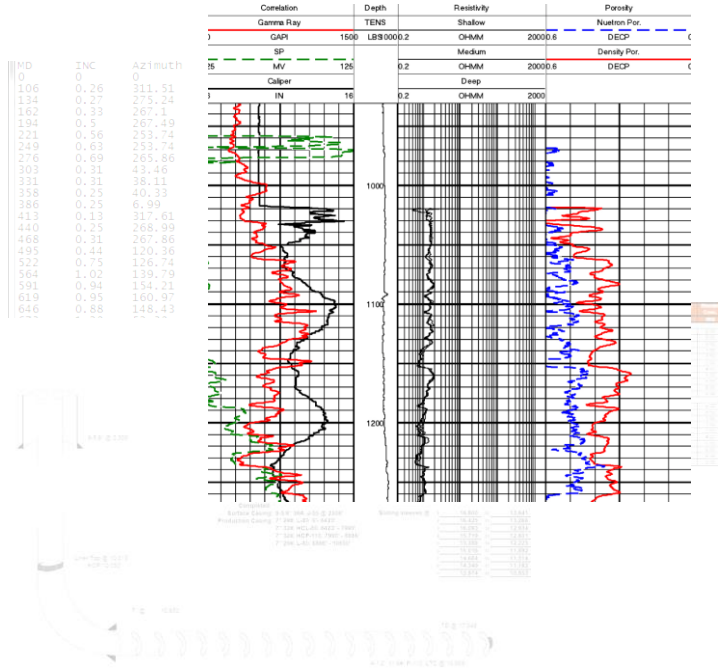A CARBO business

Workflow

Design → Analyze → Optimize

Enhanced fracture design

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Design

Design

- Import wizards and copy/paste functionality for well survey's and completion data.
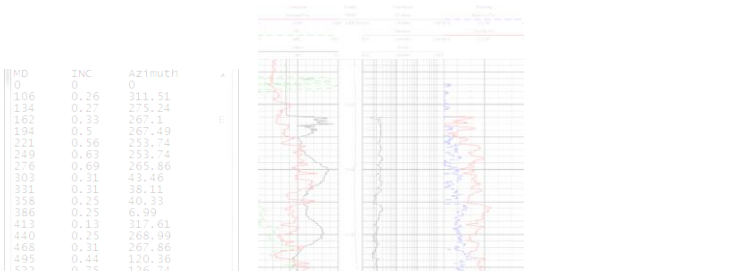 - All perfs go into same file

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Design

- Import wizards and copy/paste functionality for well survey's and completion data.
  - All perfs go into same file
- Full Log Analysis toolkit to transform raw log files into an earth model.

Design

Stage	Description	Fluid	Proppant	Stage Time hh:mm:ss	Cumul. Time hh:mm:ss	Clean Stage Vol. gal	Cum. Clean gal	Slurry Stage Vol. gal	Cum. Slurry gal	Clean Rate bpm	Slurry Rate bpm	Blender Conc. ppg
Zone 1												
1					0:00:00	0	0		0	0.0	0.0	0.00
2	Pad	Slick Frac		0:06:48	0:06:48	10,000	10,000	10,000	10,000	35.0	35.0	0.00
3	Proppant	Slick Frac	100 Mesh	0:03:29	0:03:29	5,000	5,000	5,131	5,131	34.1	35.0	0.50
4	Proppant	Slick Frac	100 Mesh	0:03:35	0:07:04	5,000	10,000	5,262	10,393	33.3	35.0	1.00
5	Proppant	Linear BORAjel-7(4TL	100 Mesh	0:03:40	0:10:44	5,000	15,000	5,393	15,785	32.5	35.0	1.50
6	Proppant	BORAjel-7(4TL)	20/40 Mesh Sand	0:02:15	0:12:59	3,000	18,000	3,301	19,086	31.8	35.0	2.00
7	Proppant	BORAjel-7(4TL)	20/40 Mesh Sand	0:03:41	0:16:40	4,500	22,500	5,403	24,490	29.1	35.0	4.00
8	Proppant	BORAjel-7(4TL)	20/40 Mesh Sand	0:04:05	0:20:45	4,800	27,300	6,004	30,494	28.0	35.0	5.00
9	Proppant	BORAjel-7(4TL)	20/40 Mesh Sand	0:03:59	0:24:44	4,500	31,800	5,855	36,349	26.9	35.0	6.00
10	Preflush	BORAjel-7(4TL)		0:01:22	0:26:05	2,000	33,800	2,000	38,349	35.0	35.0	0.00
11	Drop Ball	Slick Frac		0:01:01	0:27:06	1,500	35,300	1,500	39,849	35.0	35.0	0.00
Zone 2												
1	Pad	Slick Frac		0:06:48	0:33:55	10,000	45,300	10,000	49,849	35.0	35.0	0.00
2	Proppant	Slick Frac	100 Mesh	0:03:29	0:37:24	5,000	50,300	5,131	54,980	34.1	35.0	0.50
3	Proppant	Slick Frac	100 Mesh	0:03:35	0:40:59	5,000	55,300	5,262	60,241	33.3	35.0	1.00
4	Proppant	Linear BORAjel-7(4TL	100 Mesh	0:03:40	0:44:39	5,000	60,300	5,393	65,634	32.5	35.0	1.50
5	Proppant	BORAjel-7(4TL)	20/40 Mesh Sand	0:02:15	0:46:54	3,000	63,300	3,301	68,935	31.8	35.0	2.00
6	Proppant	BORAjel-7(4TL)	20/40 Mesh Sand	0:03:41	0:50:34	4,500	67,800	5,403	74,338	29.1	35.0	4.00
7	Proppant	BORAjel-7(4TL)	20/40 Mesh Sand	0:04:05	0:54:39	4,800	72,600	6,004	80,343	28.0	35.0	5.00
8	Proppant	BORAjel-7(4TL)	20/40 Mesh Sand	0:03:59	0:58:38	4,500	77,100	5,855	86,197	26.9	35.0	6.00
9	Preflush	BORAjel-7(4TL)		0:01:22	1:00:00	2,000	79,100	2,000	88,197	35.0	35.0	0.00
10	Drop Ball	Slick Frac		0:01:01	1:01:01	1,500	80,600	1,500	89,697	35.0	35.0	0.00

- Import wizards and copy/paste functionality for well survey's and completion data.
  - All perfs go into same file
- Full Log Analysis toolkit to transform raw log files into an earth model.
- Input pumping schedule for entire well
  - Copy tools make this a 2 click operation for entire well

Enhanced fracture design
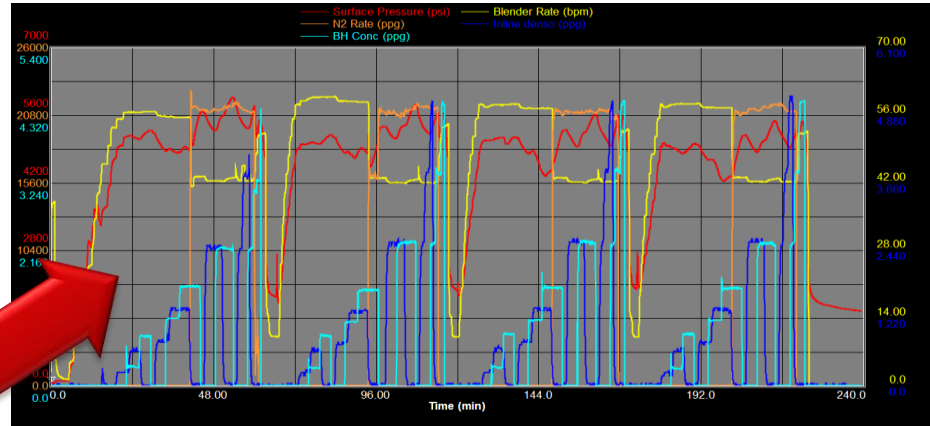
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Design

Enhanced fracture design
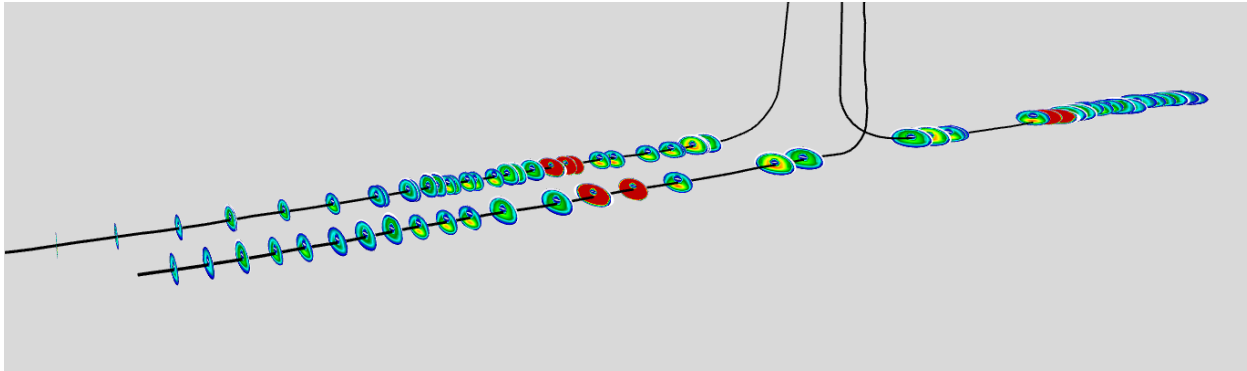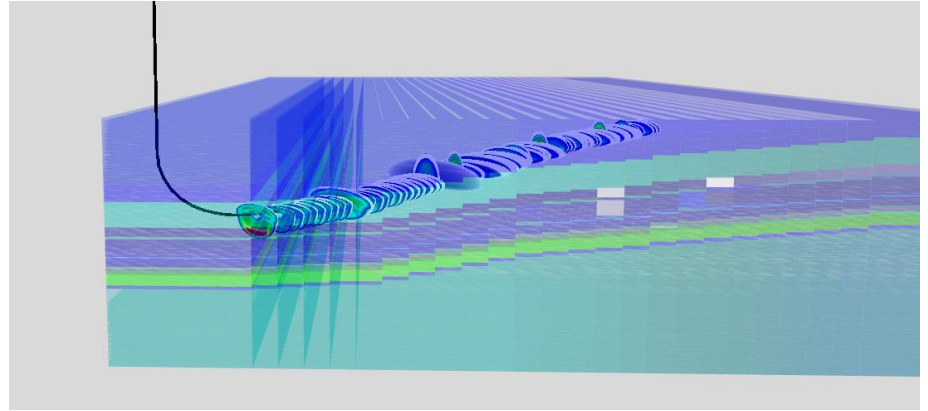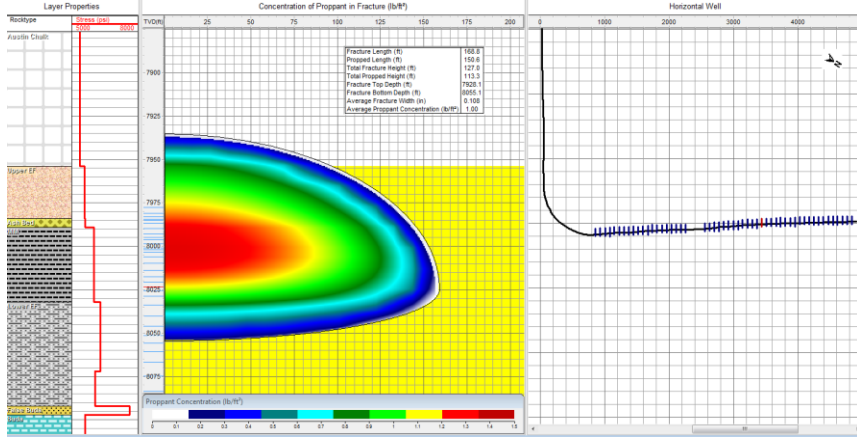
Analyze

- Load pumping data into FRACPRO
  - All data can be loaded into single inp

ASCII	TXT
CSV	Any other format

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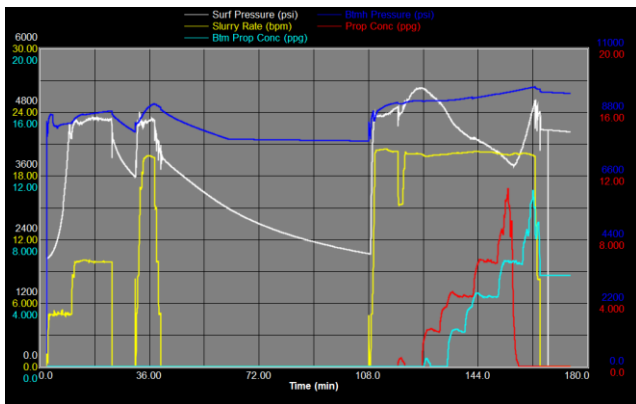
Analyze

- Load pumping data into FRACPRO
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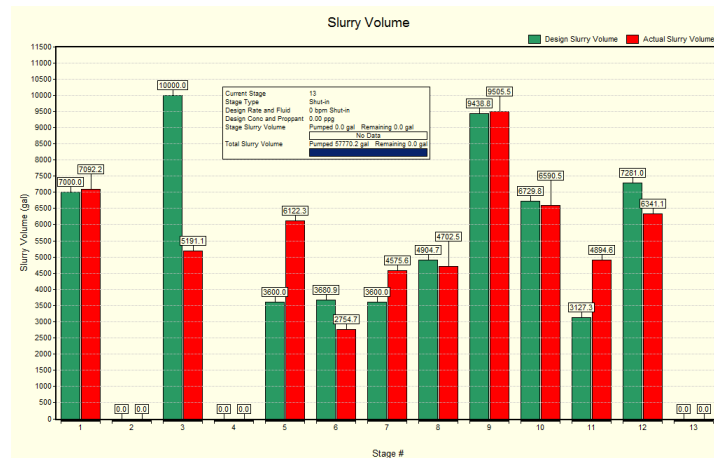- Run model against actual data

Fracpro 2014
Hydraulic Fracture Analysis

Date:	Wednesday, October 08, 2014
Well Name:	South Texas #4
Location:	Gonzales County, TX
Formation:	Eagle Ford Shale
Job Date:	4/10/2023
Filename:	Fracpro Oil – South Texas #4

## Treatment #1 (11998 - 12148 ft)

Table 1: Fracture Geometry Summary*

Fracture Half-Length (ft)	382	Propped Half-Length (ft)	346
Total Fracture Height (ft)	194	Total Propped Height (ft)	176
Depth to Fracture Top (ft)	5987	Depth to Propped Fracture Top (ft)	6006
Depth to Fracture Bottom (ft)	6182	Depth to Propped Fracture Bottom (ft)	6182
Equivalent Number of Multiple Fracs	4.0	Max. Fracture Width (in)	0.63
Fracture Slurry Efficiency**	0.42	Avg. Fracture Width (in)	0.35
		Avg. Proppant Concentration (lb/ft²)	1.68

* All values reported are for the entire fracture system at a model time of 93.10 min (end of Stage 11 Shut-in after Main frac flush)
** Value is reported for the end of the last pumping stage (Stage 10, Main frac flush)
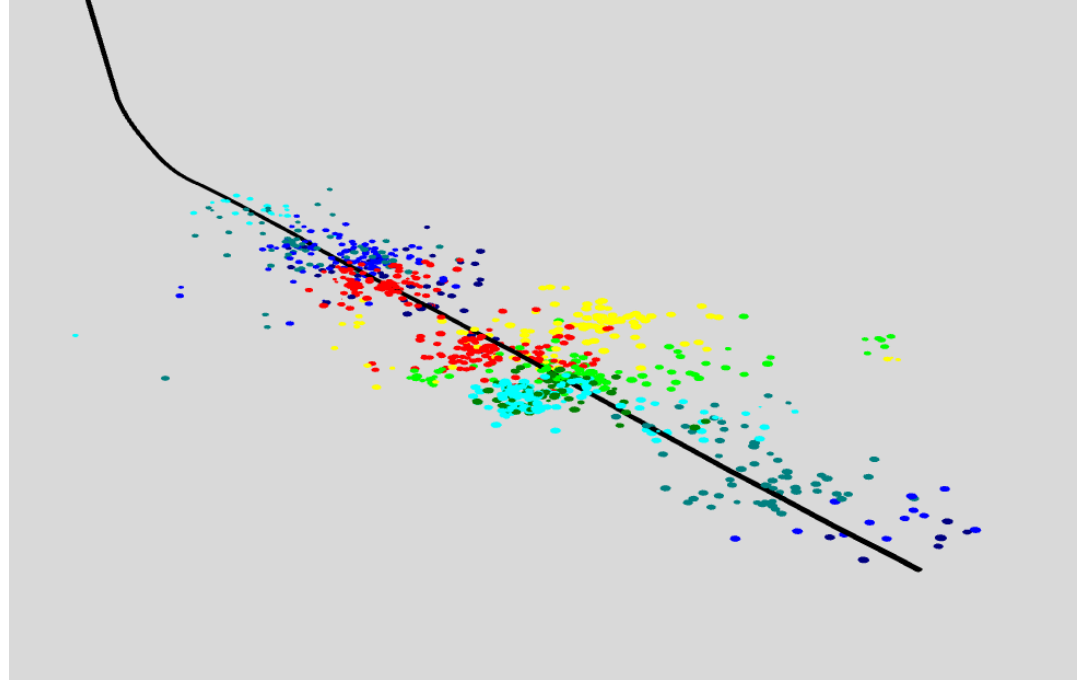
Analyze

- Load pumping data into FRACPRO
  - All data can be loaded into single inp
- Run model against actual data
- Start model calibration with Analysis Tools


Enhanced fracture design

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Analyze
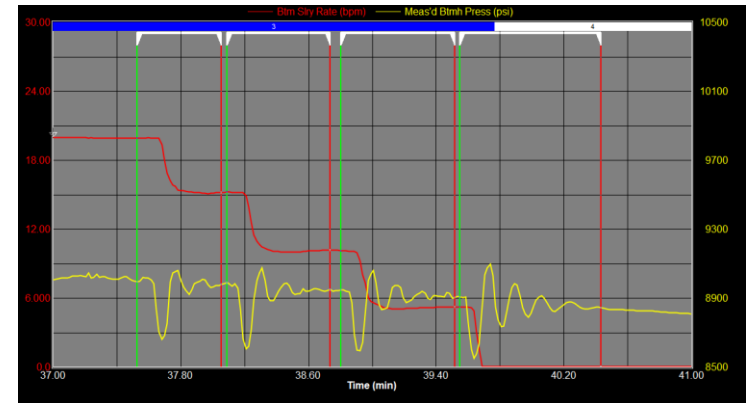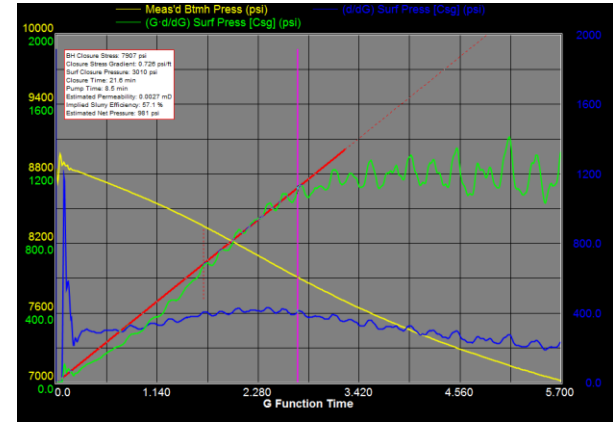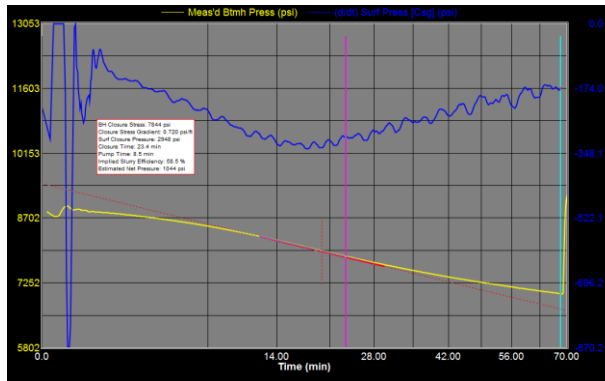
- Load pumping data into FRACPRO
  - All data can be loaded into single inp
- Run model against actual data
- Start model calibration with Analysis Tools
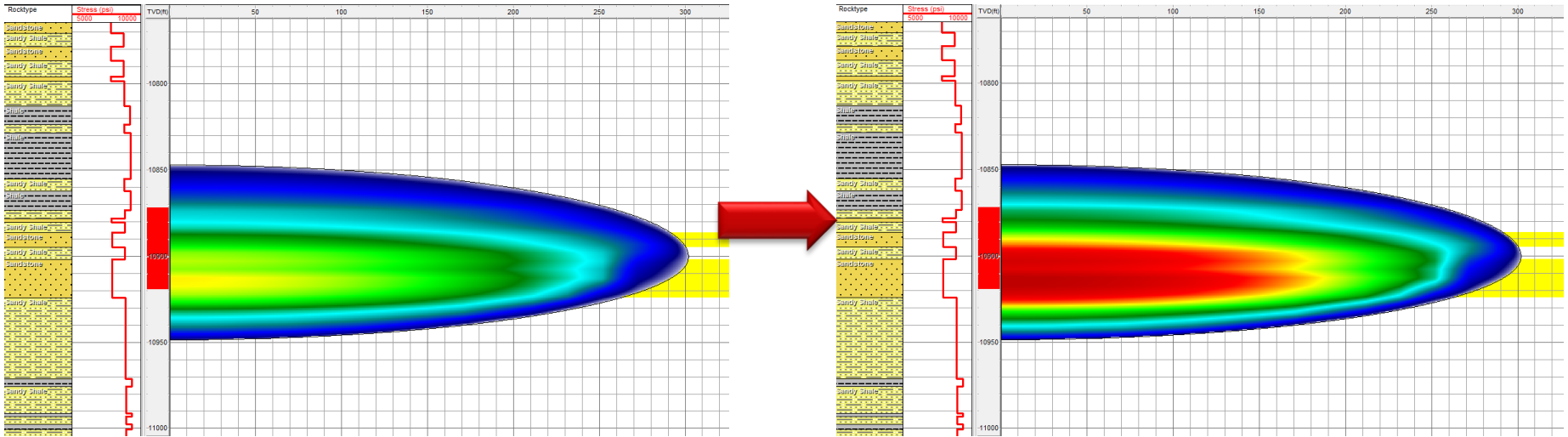- Import Microseismic

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Analyze

- Load pumping data into FRACPRO
  - All data can be loaded into single inp
- Run model against actual data
- Start model calibration with Analysis Tools
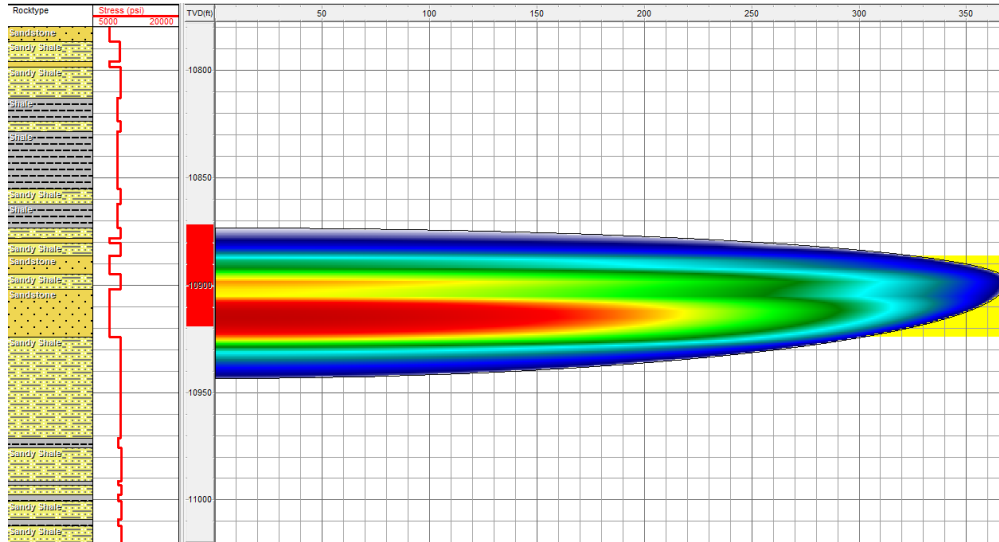- Import Microseismic
- Finalize Calibration
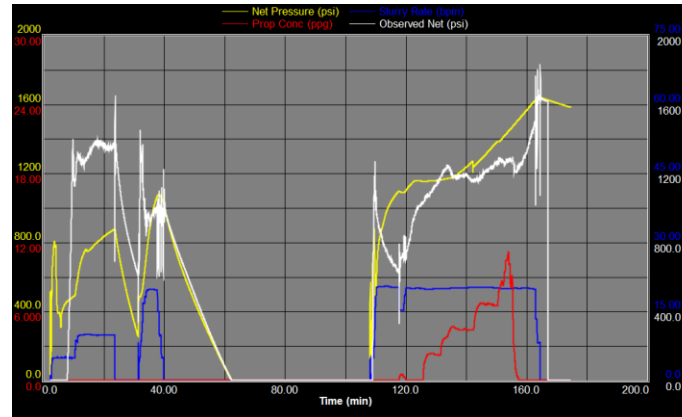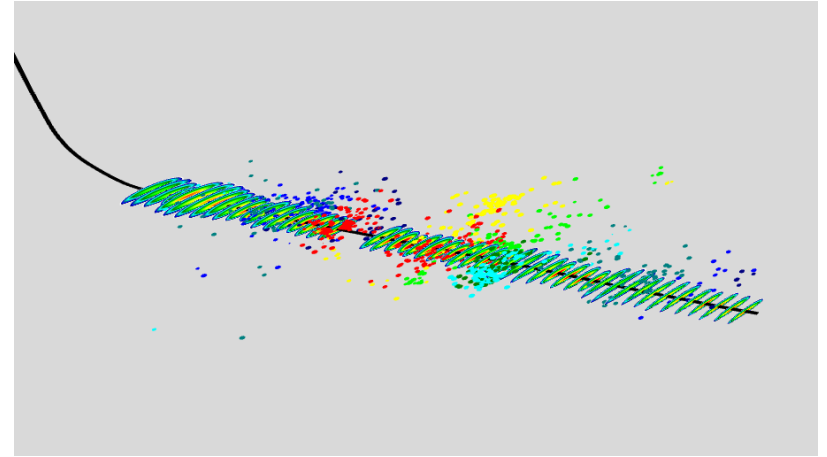
Optimize

- Improve FcD values by adjusting proppant schedule

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Optimize

- Improve FcD values by adjusting proppant schedule
- Evaluate effect of stress layers that can alter fracture height growth
  - More Rate?
  - More Viscosity?
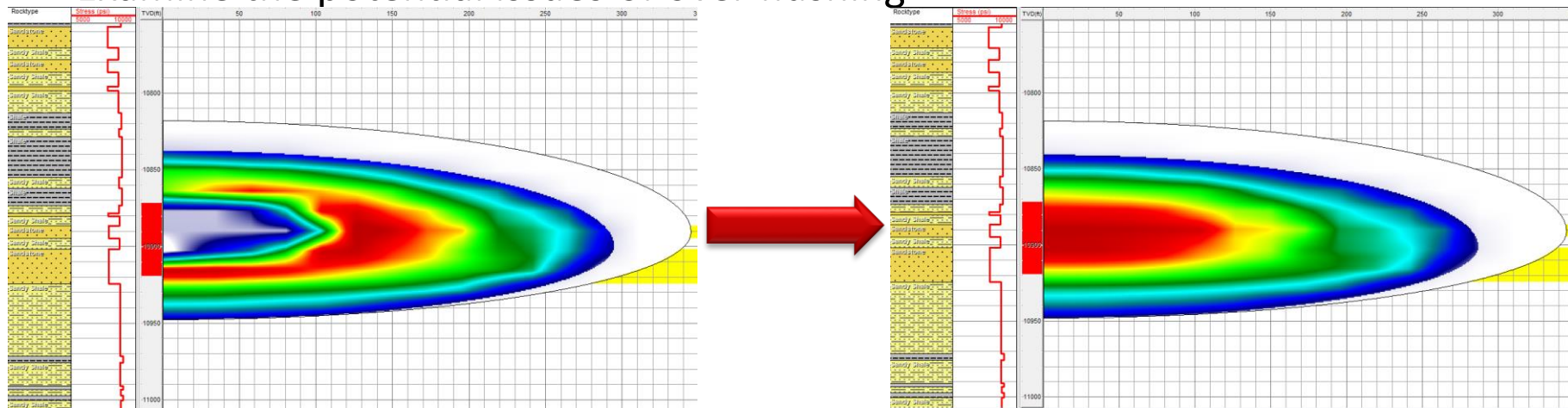
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Optimize

- Improve FcD values by adjusting proppant schedule
- Evaluate effect of stress layers that can alter fracture height growth
  - More Rate?
  - More Viscosity?
- Examine the potential issues of over flushing

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Summary

Design → Analyze → Optimize

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Thank you!

QUESTIONS?

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