# Multilateral Stimulation Technology - A New Approach to Stimulating/Revitalizing Production in Carbonate Reservoirs*

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## Abstract

In many cases, carbonate oil wells are stimulated by acidizing methods which can be inaccurate, inefficient, and otherwise complicated. The results of acid flushes and acid fracturing can vary widely making interpretation and repeatability difficult. A new stimulation solution has been developed to be simple, efficient, and accurate in using acid to create laterals into the formation, making contact with existing natural fractures and bypassing formation damage.

The Fishbones system is installed as a part of a liner string into drilled reservoir section. Fishbones subs are spaced out to target specific parts of the reservoir and each sub contains four small diameter tubes with length up to 40 feet. A typical acidizing fluid system is utilized and when pumped fluid jets of out nozzles at the end of each tube. The formation ahead of the tubes is jetted away with a combination of erosion and acid chemical reaction. Differential pressure across the liner drives the tubes into the formation penetrating the rock until fully extended. All laterals are created simultaneously in a short pumping job, resulting in a fishbone style well completion with multiple laterals extending from the mainbore. The liner with the extended tubes becomes a permanent completion with included production valves, which allow flow to enter the liner.

An overview of the technology will be presented along with field history results from wells in the Austin Chalk and Buda formations.

## Reference Cited

Rice, J.K., T. Jorgensen, and J.W. Waters, 2014, First Installation of Efficient and Accurate Multilaterals Stimulation Technology in Carbonate Reservoir: Society of Petroleum Engineers, Abu Dhabi International Petroleum Exhibition and Conference, 10-13 November, Abu Dhabi, UAE, SPE-171804-MS, 7 p. doi:10.2118/171804-MS

# Multilateral Stimulation Technology

## A New Approach to Stimulating/Revitalizing Production in Carbonate Reservoirs

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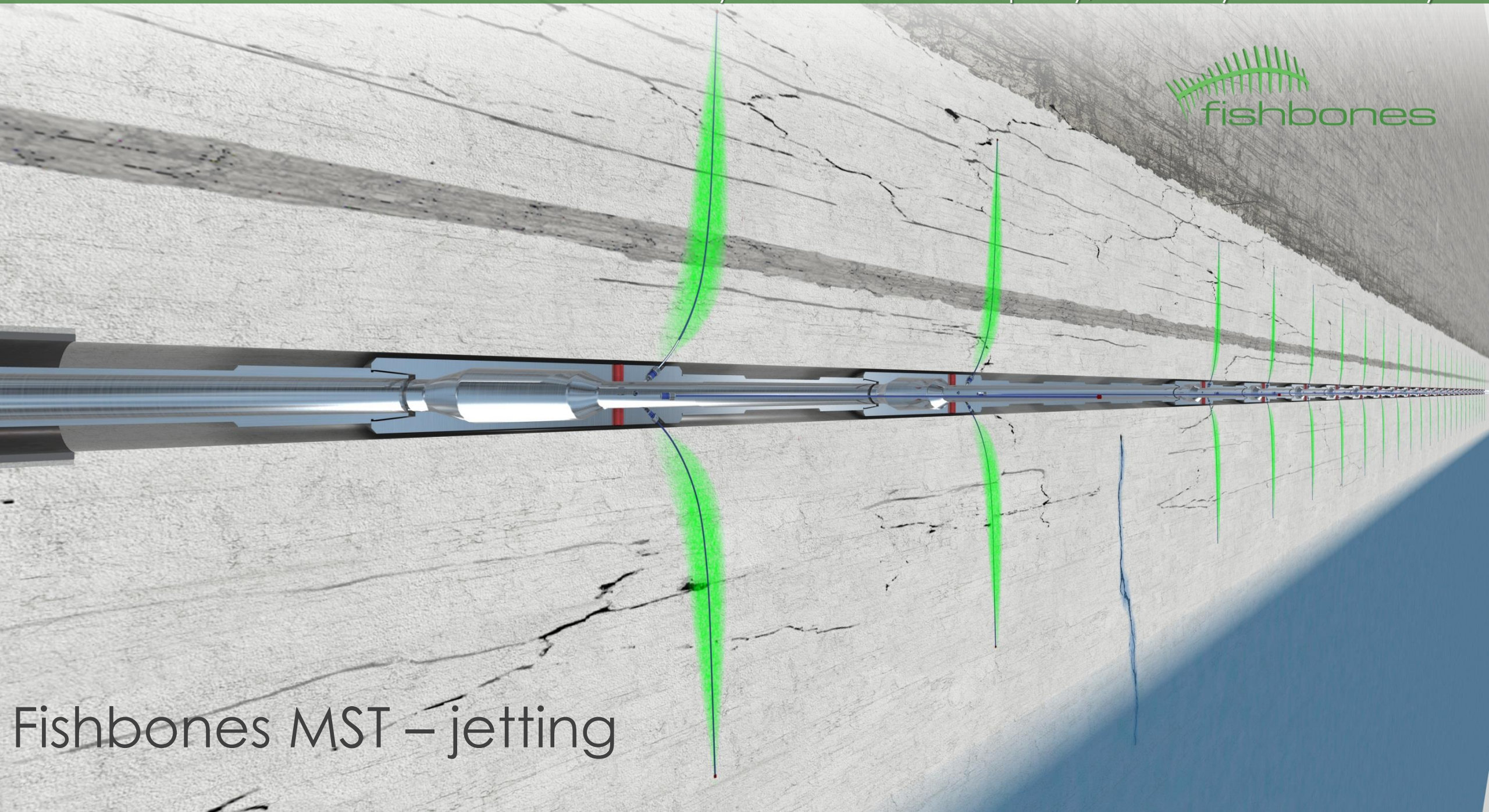
**Winner OTC 2015**
**Spotlight on New Technology**

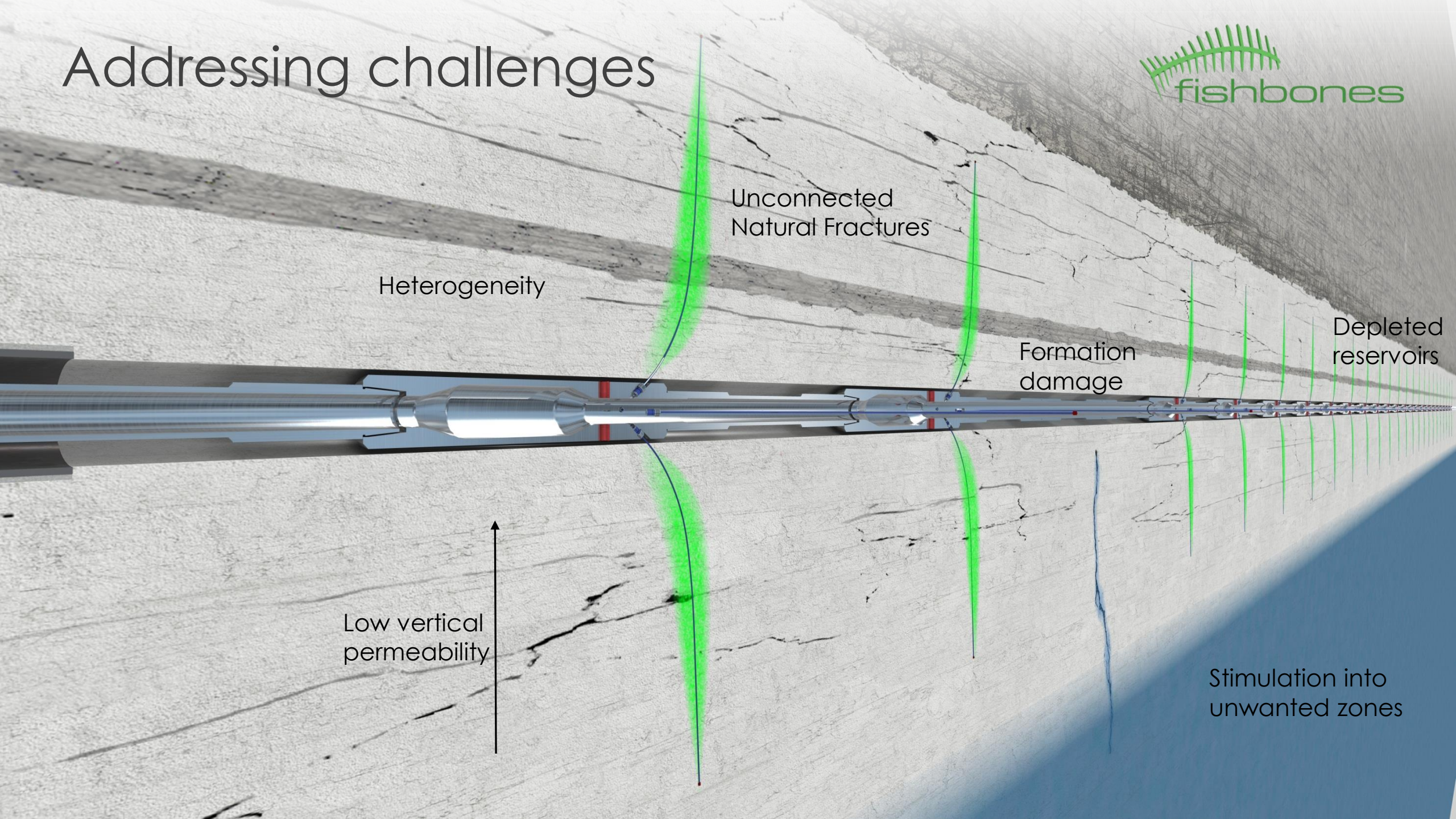
**Winner ONS 2014**
**SME Innovation award**



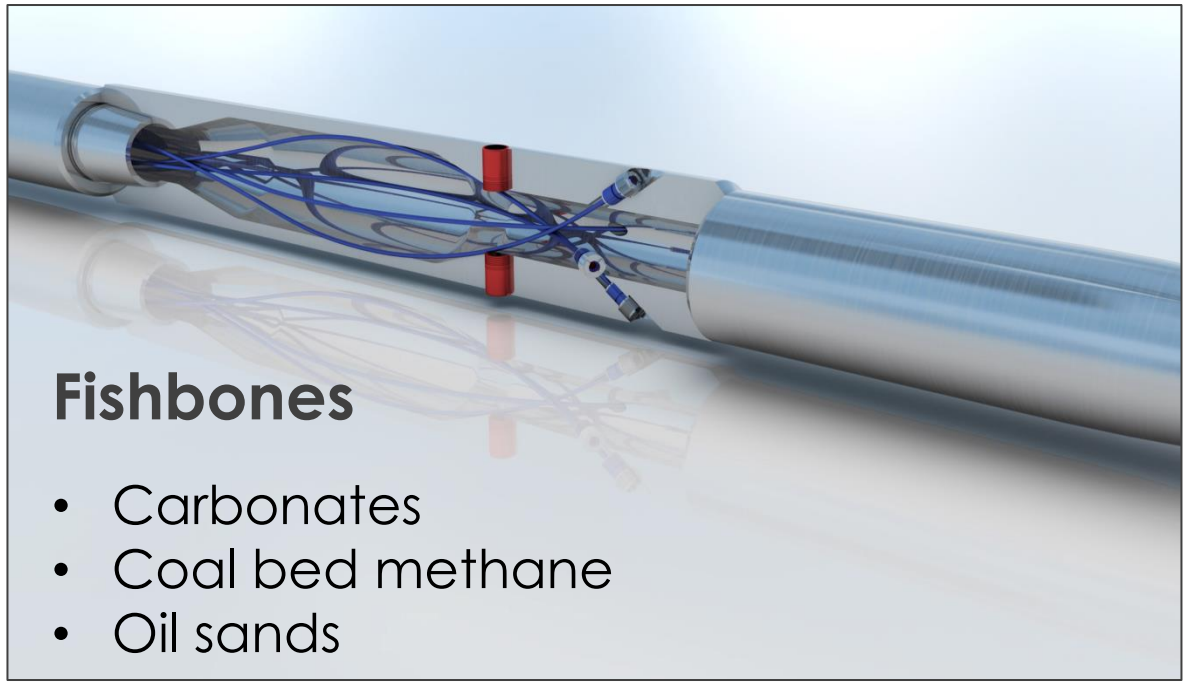

# Fishbones MST – jetting

# Dreamliner MST - drilling

# Addressing challenges



# Product portfolio



**Fishbones**

- Carbonates
- Coal bed methane
- Oil sands

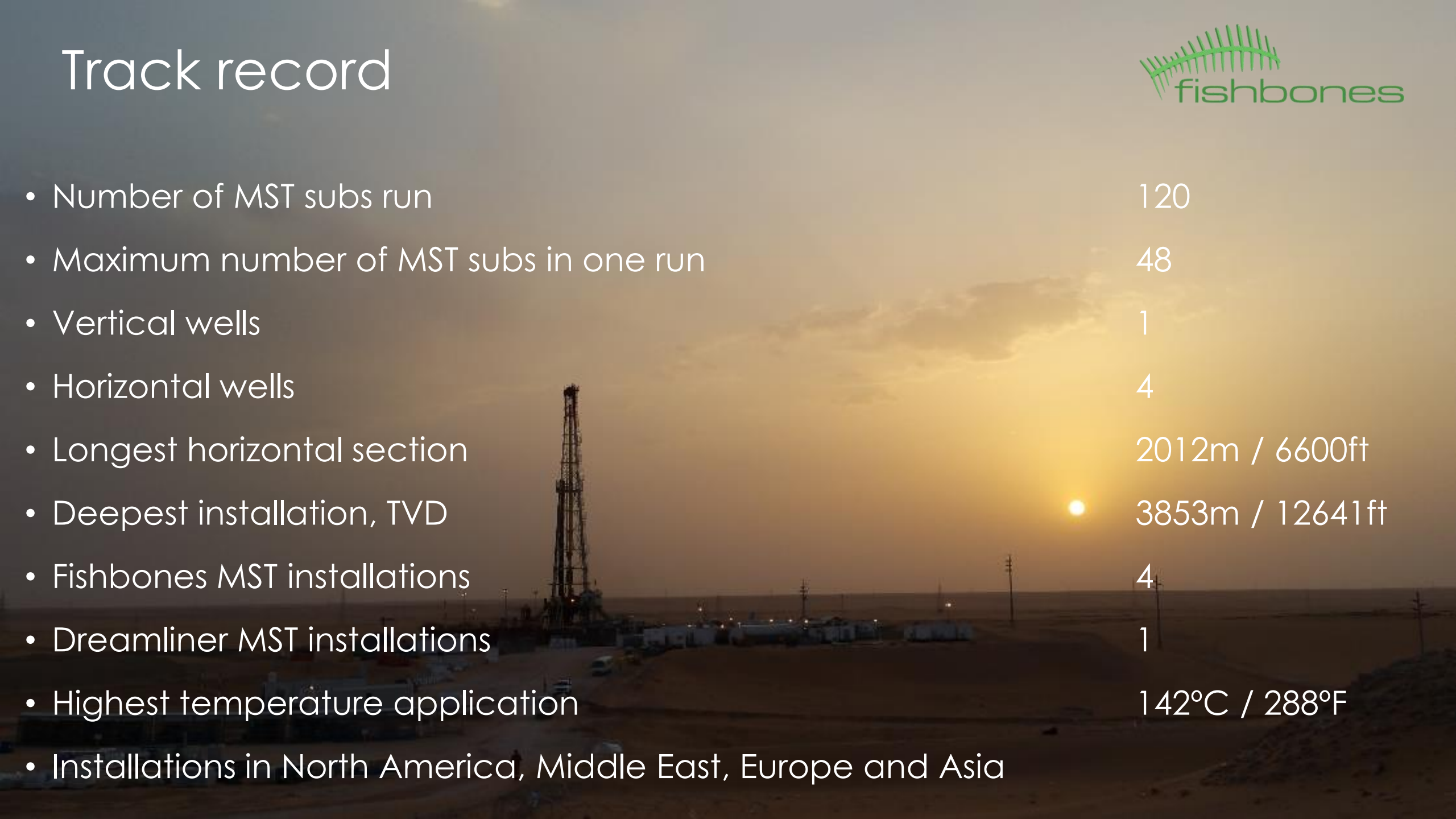
**Dreamliner**

- Sandstones
- Shale

Other products:

**Backbone anchor - Float shoes - Catcher screen - Fishbasket**

# Track record



| | |
|---|---|
| Number of MST subs run | 120 |
| Maximum number of MST subs in one run | 48 |
| Vertical wells | 1 |
| Horizontal wells | 4 |
| Longest horizontal section | 2012m / 6600ft |
| Deepest installation, TVD | 3853m / 12641ft |
| Fishbones MST installations | 4 |
| Dreamliner MST installations | 1 |
| Highest temperature application | 142°C / 288°F |

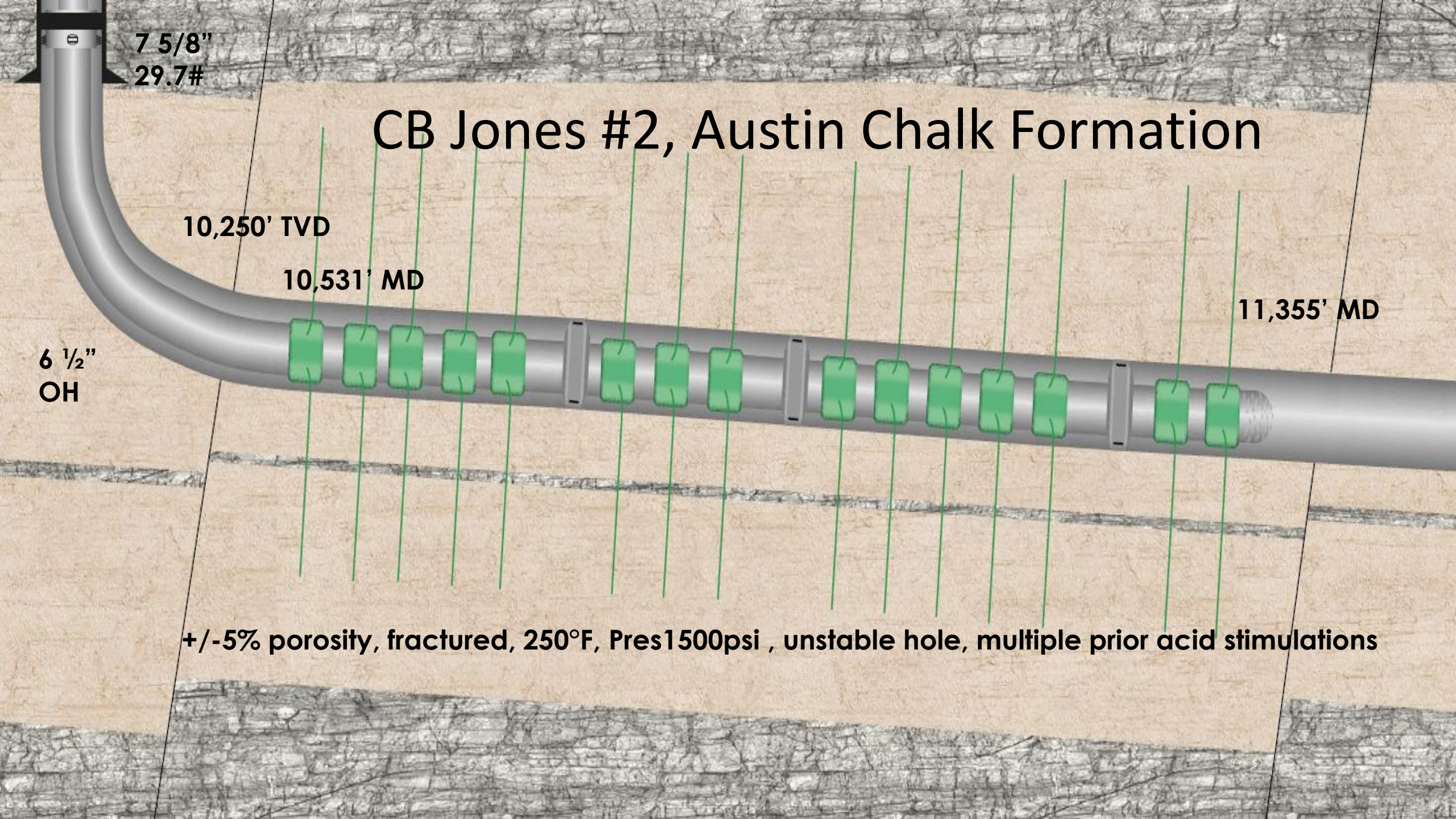
- Installations in North America, Middle East, Europe and Asia

# Case histories

# First carbonate installation – USA

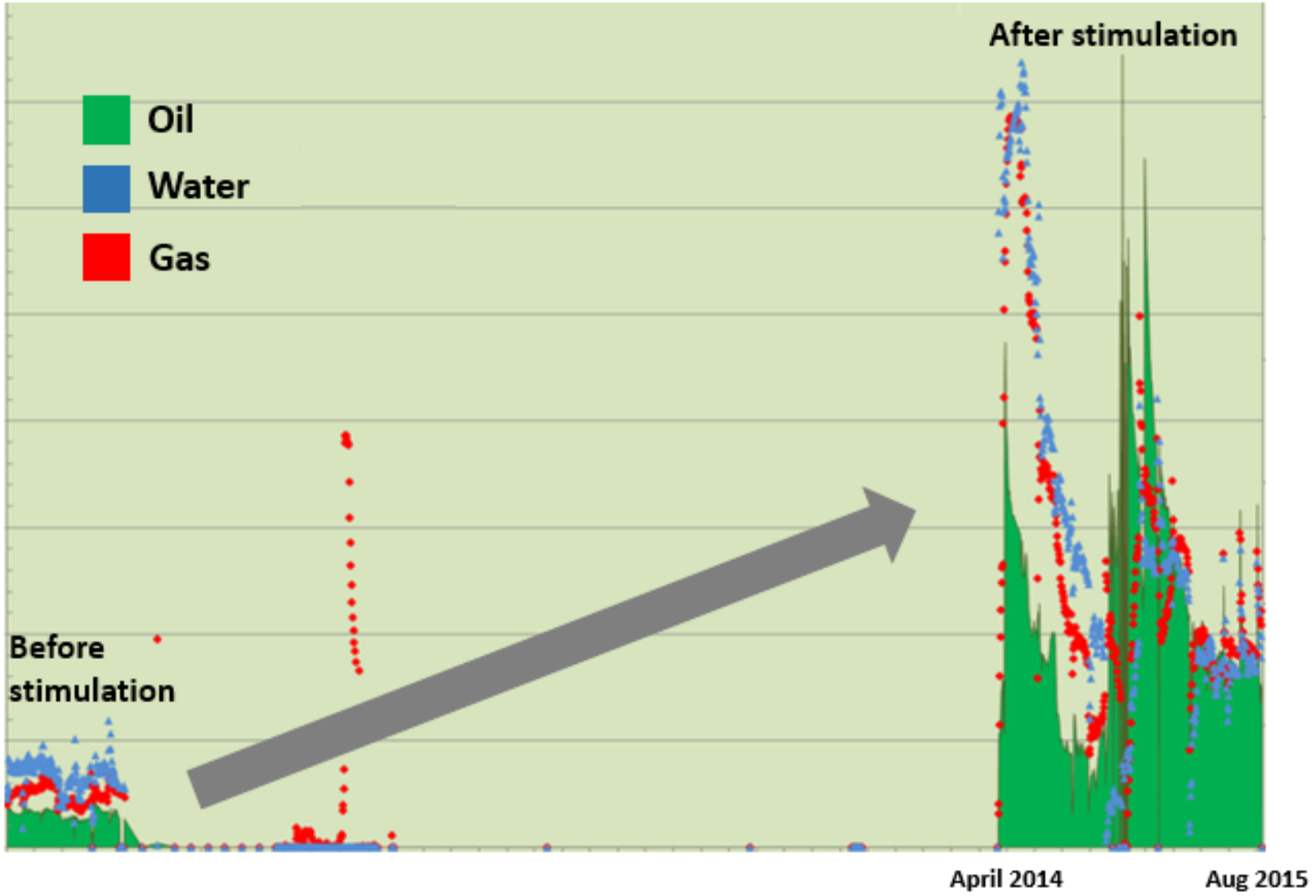
- JCR installation #1, April 2014
- Tight limestone formation in the Austin Chalk, Texas
- Horizontal well, 6.5” open hole
- 15 ea. Fishbones subs and 3 ea. Backbone anchors
- Successful installation
  - Run to TD
  - Needle extension confirmed
- 60 laterals created, 5 hrs total pumping time
- SPE 171804

# CB Jones #2, Austin Chalk Formation



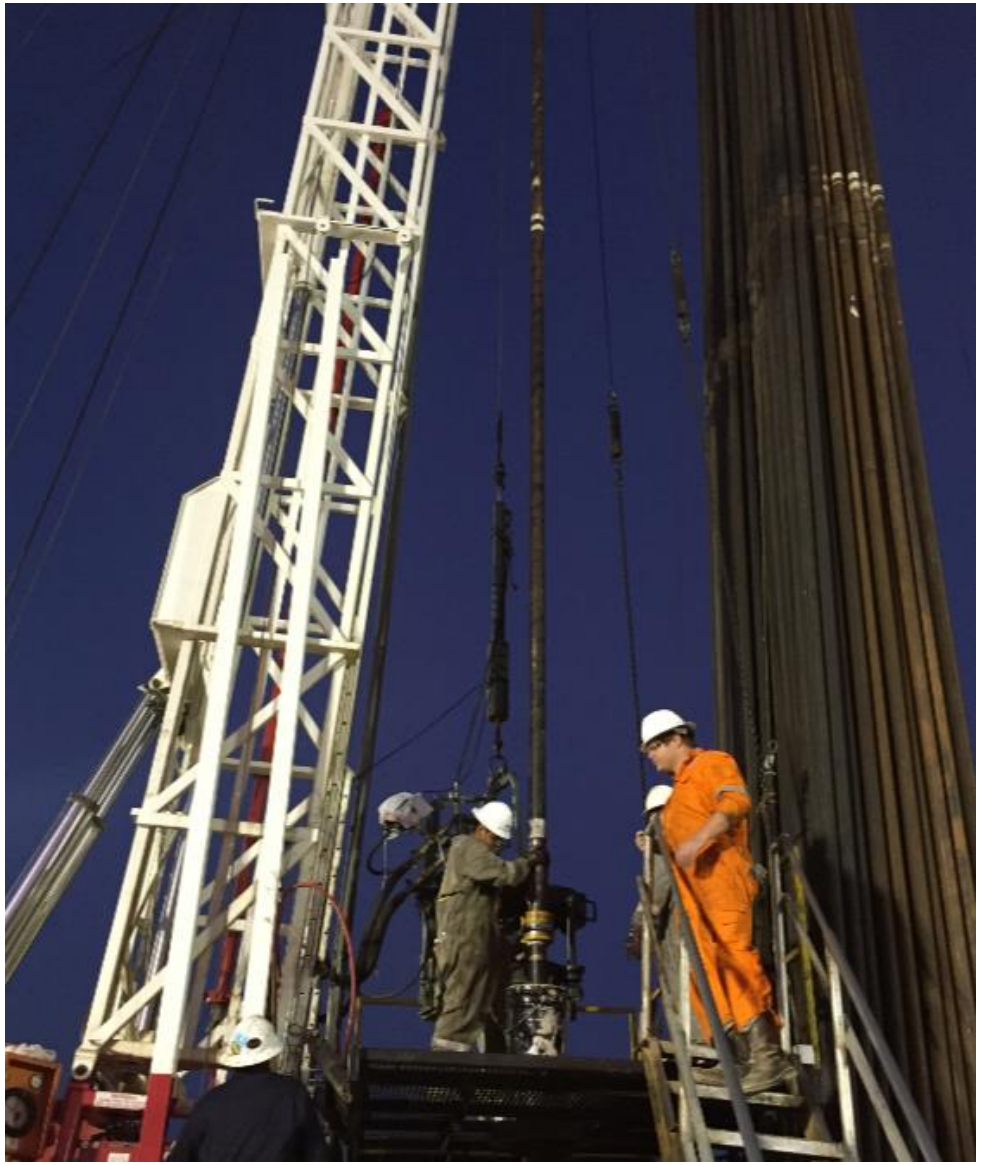

+/-5% porosity, fractured, 250°F, Pres1500psi , unstable hole, multiple prior acid stimulations

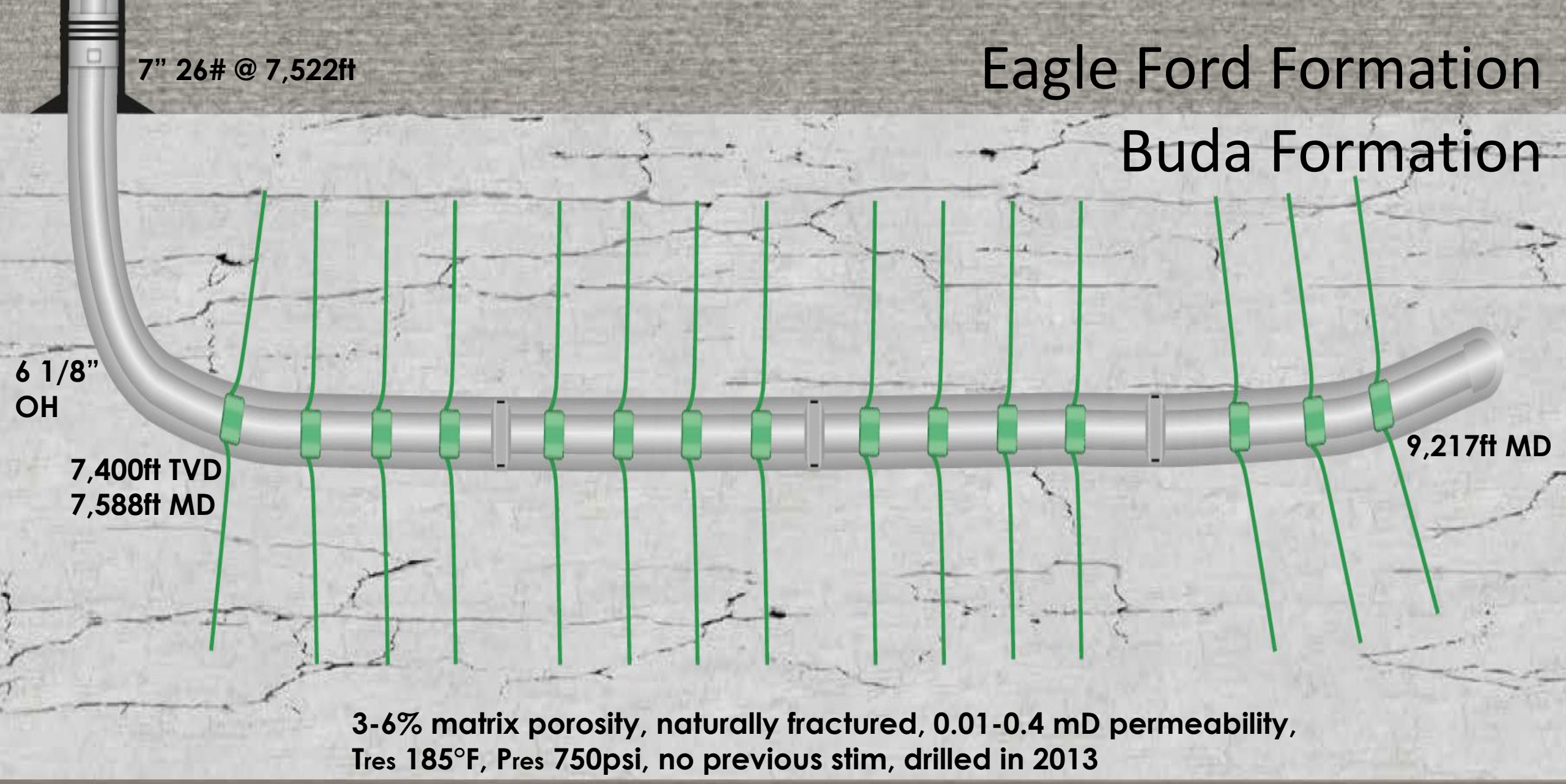
# 16 months' production

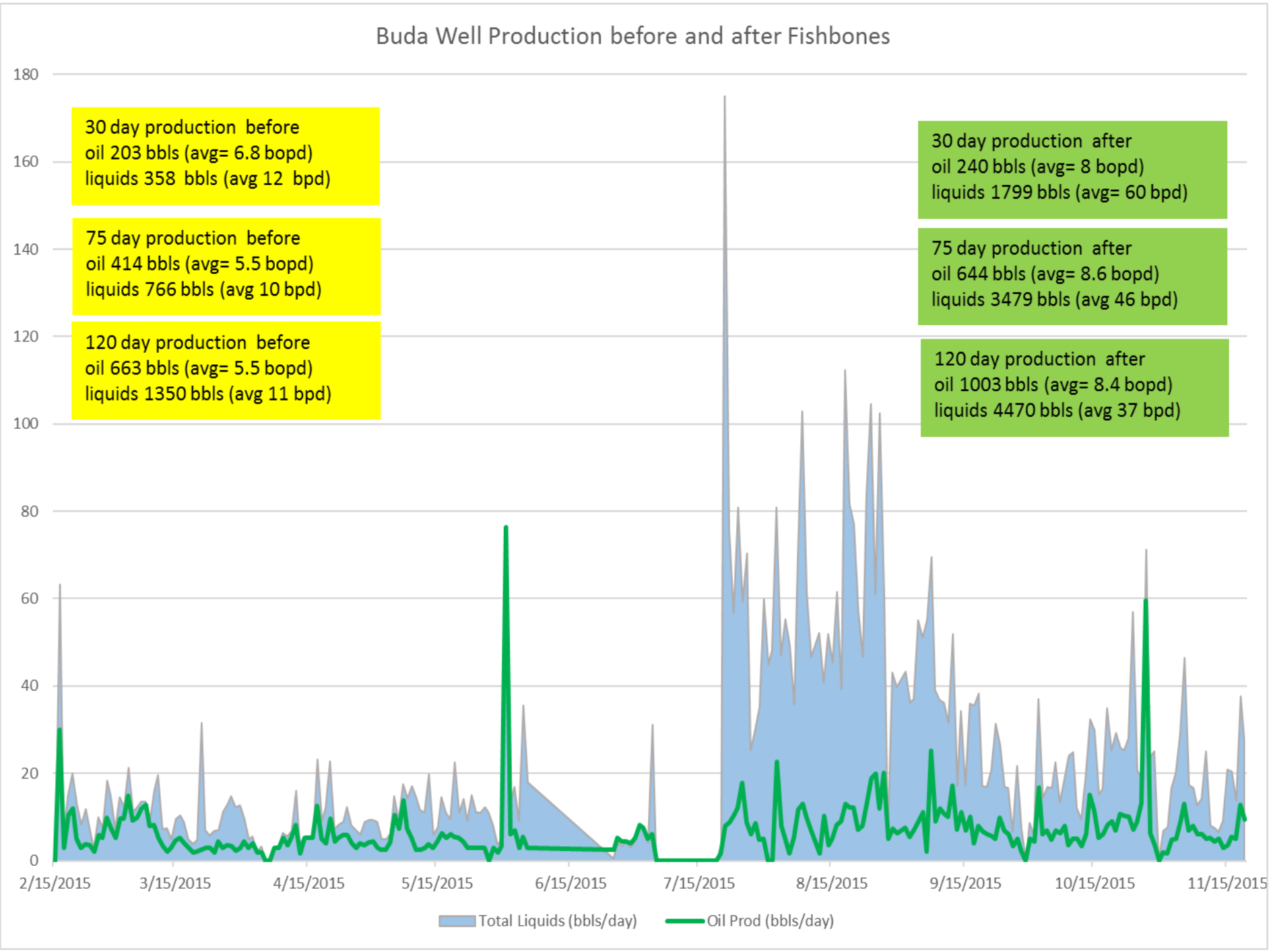


# Fishbones MST installation #2 in USA

- JCR installation #2, June 2015
- Buda formation, Texas
- Tight, fractured limestone
- Horizontal well, 6 1/8" open hole
- 15 ea. Fishbones subs, 3 ea. Backbones
- Successful installation
  - 60 laterals, 4 hrs total pumping time
  - Similar pump chart profile as first well




7” 26# @ 7,522ft
Eagle Ford Formation
Buda Formation
6 1/8”
OH
7,400ft TVD
7,588ft MD
9,217ft MD
3-6% matrix porosity, naturally fractured, 0.01-0.4 mD permeability,
Tres 185°F, Pres 750psi, no previous stim, drilled in 2013




fishbones

336% increase in liquids production after Fishbones MST installation

# First Dreamliner MST installation

- Offshore Norway, July 2015
- New well in tight sandstone formation
- 2012m / 6600ft horizontal section
- 8.5” open hole with 5.5” liner
  - 48 ea. Dreamliner subs – 144 laterals
  - 7 ea. Backbone open hole anchors
- Successful installation
  - Liner run to TD without issues
  - 6 hours mud circulation time for laterals drilling
  - Pressure responses indicate extension of needles

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- Offshore Norway, July 2015 -New well in tight sandstone formation
- 2012m / 6600ft horizontal section
- 8.5" open hole with 5.5" liner
- 48 Dreamliner subs drilled144 laterals + 7 Backbone open hole anchors
- Successful installation- liner run to TD with no issues
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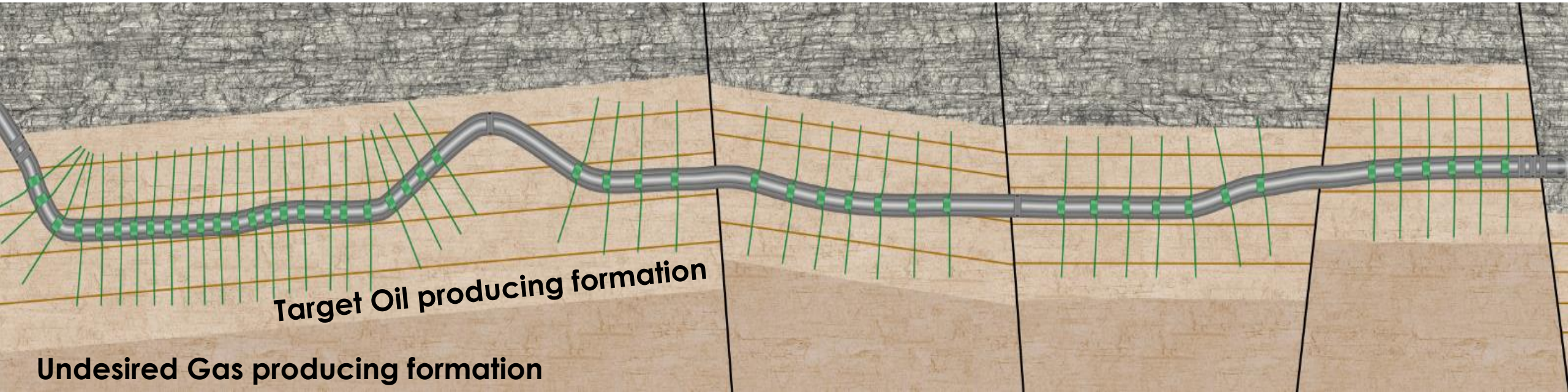

# SimFish

- SINTEF MRST - Fenix Consulting Delft
- Fishbones vs. Open hole
- Simplified grid
- Estimates oil rates, PI increase and incremental oil
- Producers and injectors
- 1-6 min execution
- Generates Eclipse compatible wellbore geometry

# Expanding global presence


- Fishbones office
- Agent / Alliance partner

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# Thank you

Connect your reservoir with simplicity, accuracy and efficiency