Amros Corporation

Shale Play Development – A New Paradigm

Dr. Vladimir Ingerman, President

2017

© Copyright 2017 by Amros Corporation - All Rights Reserved

Shale Development Issues

- Traditional interpretation of well log is not applicable for formation evaluation in shale plays
- 95% of oil from shale plays is left in the ground
- Two thirds of hydraulic fracturing stages do not produce commercially

Amros Technology Solves These Problems

© Copyright 2017 by Amros Corporation - All Rights Reserved

Amros Proven Technology

Advanced formation evaluation that derives a Production Profile that shows productivity along entire wellbore in barrels per day.

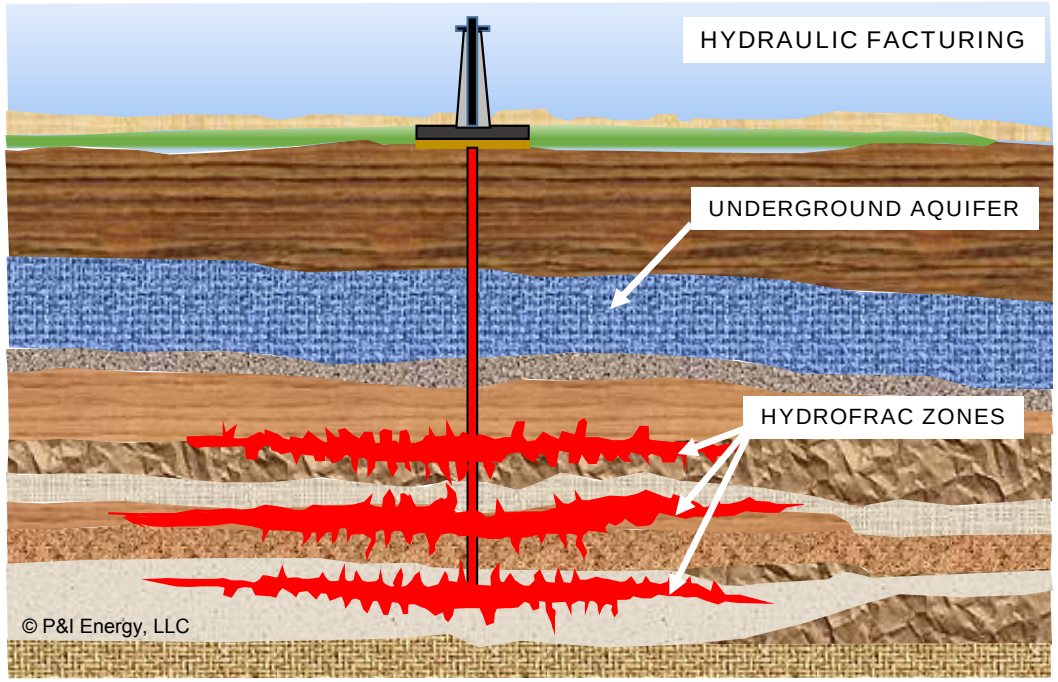
This allows operators:

1. Ideally position horizontal wells, and optimize locations of fracking stages in vertical and horizontal wells

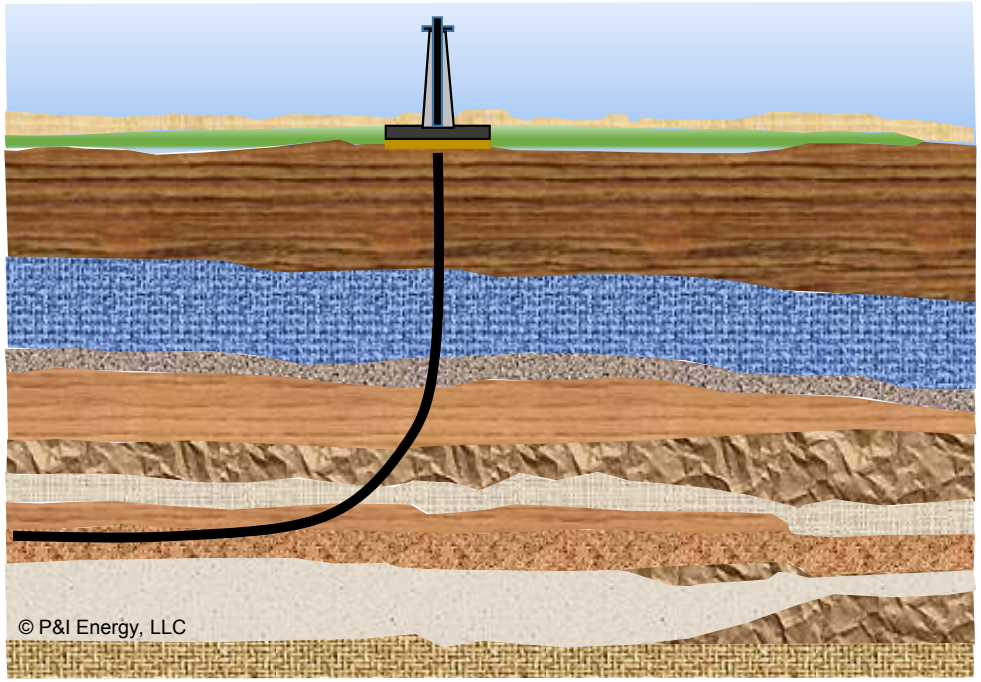
2. Identify missed oil and gas production intervals

© Copyright 2017 by Amros Corporation - All Rights Reserved

Amros Technology Guiding Shale Development



Where to Frack Vertical Wells



Where to Drill Horizontal Wells

© Copyright 2017 by Amros Corporation - All Rights Reserved

Proven Technology

Proprietary equation to calculate permeability and well production from open hole log data

- Based on analysis of hundreds of hydrodynamic or pressure build-up well tests

- Successfully applied for conventional deposits in Russia, USA, Kazakhstan, Mexico, and Canada

- Proved by test results in more than 100 Permian Basin wells and Marcellus shale

Amros Technology Fully Developed, Available NOW

© Copyright 2017 by Amros Corporation - All Rights Reserved

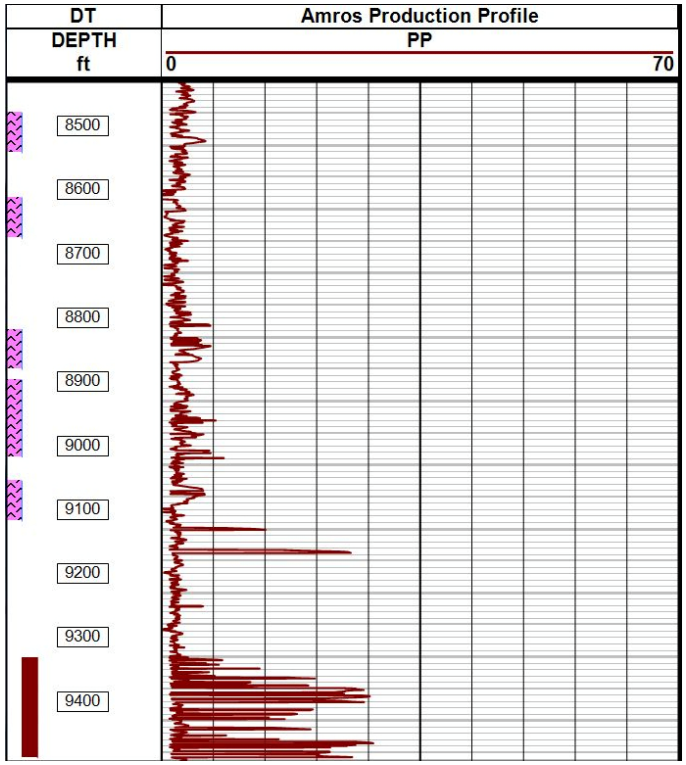
Amros Value Proposition

- Precise targeting of best intervals for vertical wells:
  - ❖ increase well production by at least 20%
  - ❖ decrease cost of fracturing up to 80%
- Optimize location for horizontal wells resulting in significant increase in production and ultimate recovery
- Lower environmental impact

FRACK LESS – PRODUCE MORE

© Copyright 2017 by Amros Corporation - All Rights Reserved

Frack Less – Produce More



Confirmed in blind test

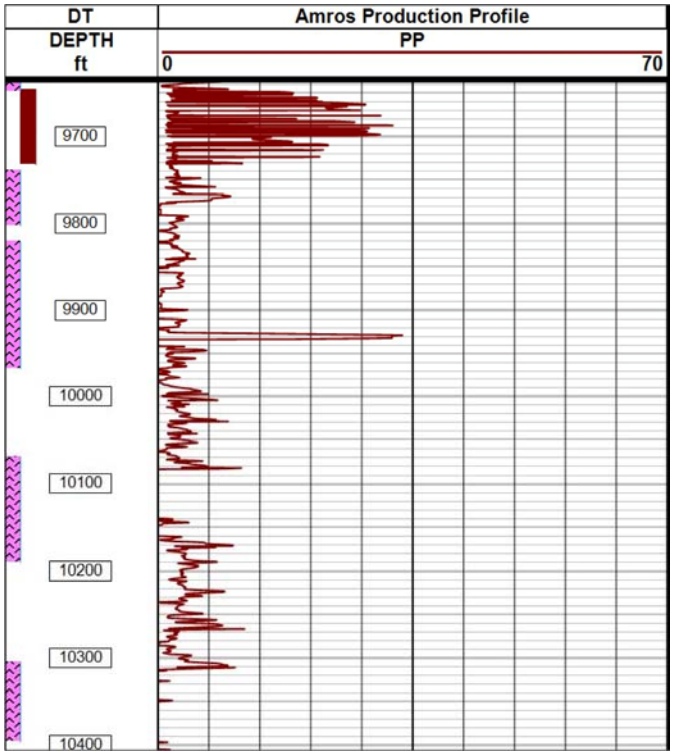
Operator, Pink stages 374 ft.; 8 bbl./day.
Horizontal well 7000 ft. – 150 bbl./day

Amros, Brown stage 157 ft.; 13 bbl./day.
Horizontal well 7000 ft. – 580 bbl./day
4 times more.

We can optimize the horizontal wells placement

© Copyright 2017 by Amros Corporation - All Rights Reserved

Frack Less – Produce More



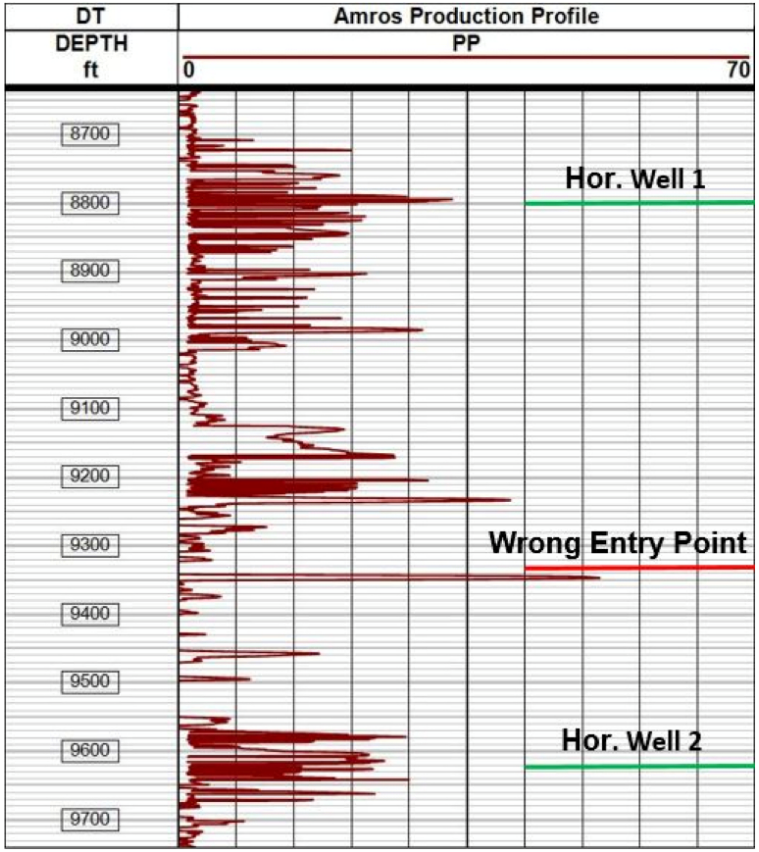
Operator, Pink stages 424 ft.; 9 bbl./day.
Horizontal well 7000 ft. – 150 bbl./day

Amros, Brown stage 87 ft.; 11 bbl./day.
Horizontal well 7000 ft. – 880 bbl./day
6 times more.

We can identify previously missed oil

© Copyright 2017 by Amros Corporation - All Rights Reserved

Optimize Location and Number of Horizontal Wells



Horizontal well 1, 7000 ft. – 550 bbl./day

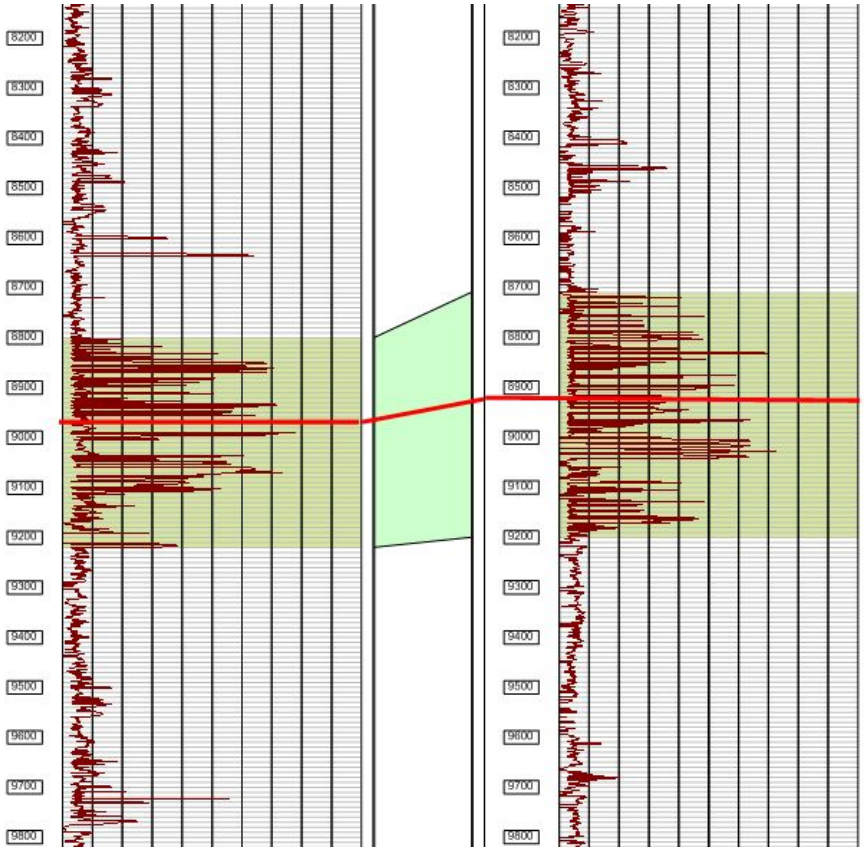
Horizontal well 2, 7000 ft. – 520 bbl./day

Wrong Entry Point, 7000 ft. – 160 bbl./day

1,070 bbl./day vs. 160 bbl./day
7 times more

© Copyright 2017 by Amros Corporation - All Rights Reserved

Horizontal Well Navigation



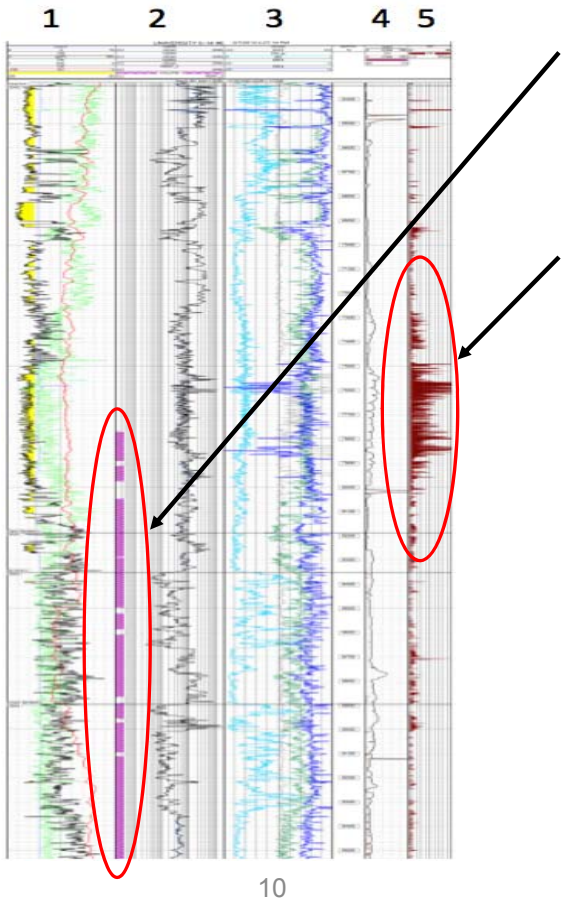
Navigate horizontal well through the best intervals based on Production Profile from vertical wells.

Future production of horizontal wells can be accurately predicted.

For Permian Basin two high producing horizontal wells can be drilled in the same location.

© Copyright 2017 by Amros Corporation - All Rights Reserved

Cost-Value Analysis of Amros Technology



- Actual: 2,652 ft. hydraulic fracking produced 36 bbl./day production
- Amros recommendation: fracking 484 ft. would have produced 50 bbl./day
- For oil price $50 / Barrel

Increased cum oil production	**$1,050,000**
Fracking cost savings	**$550,000**
Total opportunity cost	**$1,600,000**

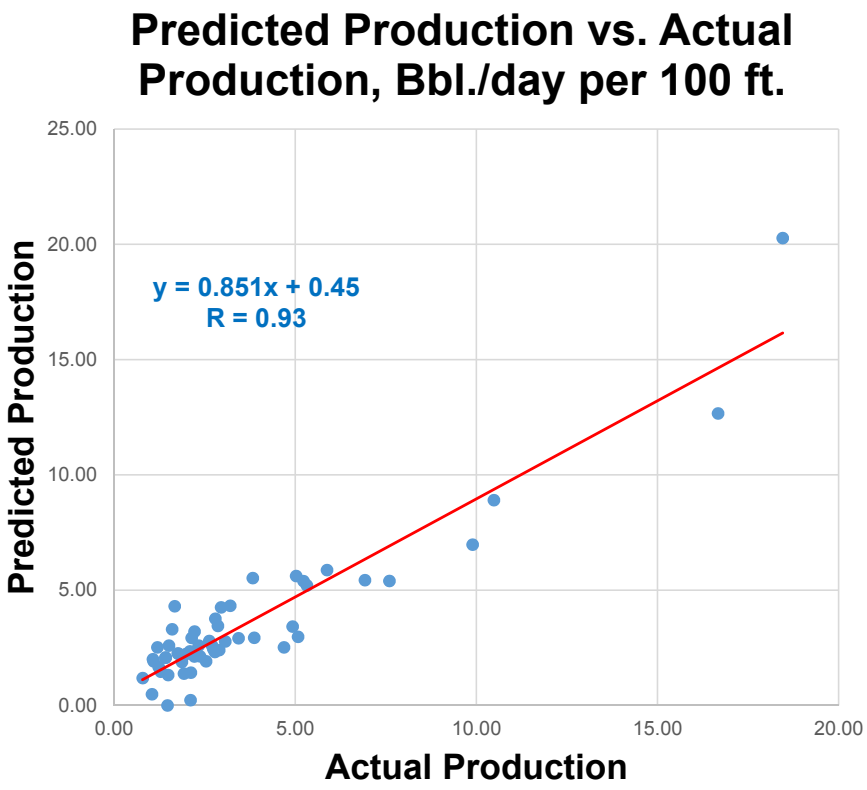
© Copyright 2017 by Amros Corporation - All Rights Reserved

Lower Environmental Impact

- Existing Frack Length: 2,652 feet with 36 bbl./day production
- Amros Frack Length: 484 feet (or 18% of existing frack length) with 50 bbl./day production
- The Amros technology saves a 82% in water and proppant consumption

© Copyright 2017 by Amros Corporation - All Rights Reserved

Actual vs. Predicted Production



Predicted production was based on Amros Production Profile derived from open-hole logs.

The chart for 51 wells shows great correlation between Amros predicted production and actual production.

© Copyright 2017 by Amros Corporation - All Rights Reserved

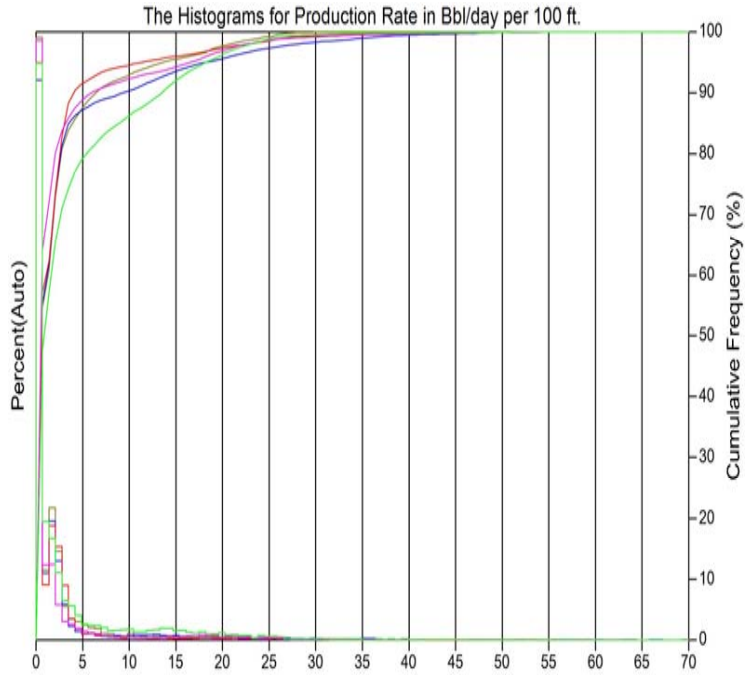
Amros Technology

The technology allows operators to identify the best location and **trajectory of horizontal wells,** avoid missing good productive zones, and optimize location of fracking stages for vertical and horizontal wells.

Provides **Production Profile** and **Brittleness,** based on open-hole logs, that allow operators to calculate accurately the cost of fracking and initial production of each zone. Accordingly, economically justified initial production for different oil price can be calculated.

© Copyright 2017 by Amros Corporation - All Rights Reserved

Targeting the Best Formations



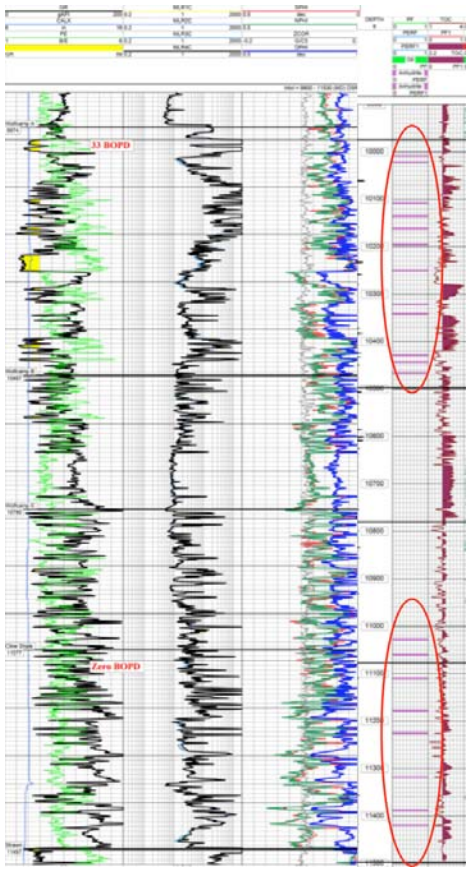
80% of the thickness have average initial production 1.5 bbl./day per 100 ft., but for the rest 20% it is 18.0 bbl./day per 100 ft.

Horizontal well 7000 ft. for 80% formations will produce **105 bbl./day** There are 20% formations that will produce **1260 bbl./day**, 12 times more

Geometric drilling and completions vs. Advanced formation-evaluation approach

© Copyright 2017 by Amros Corporation - All Rights Reserved

Case Study: Value of Selective Fracking



Cline (bottom circle) - 00 bbl./day

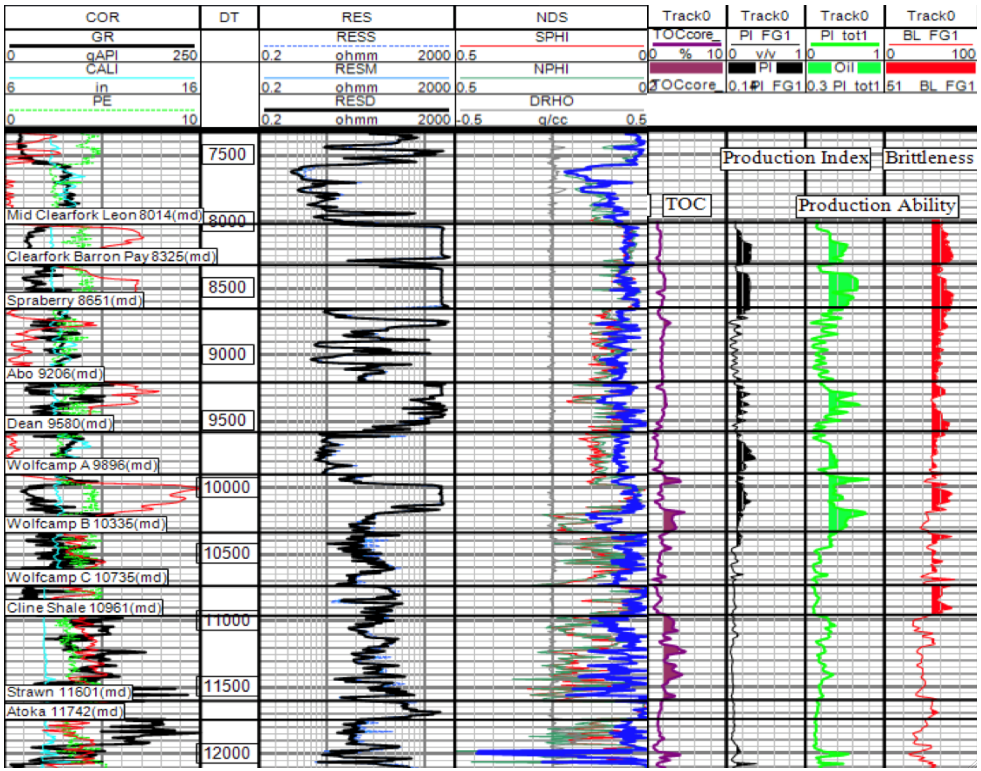
Wolfcamp A (upper circle) - 33 bbl./day.

Production Profile (the right column) matches well with the results of selective testing.

Production Profile saves 4 months and $0.5 million

© Copyright 2017 by Amros Corporation - All Rights Reserved

Case Study: Production Profile vs. Cutting Analysis



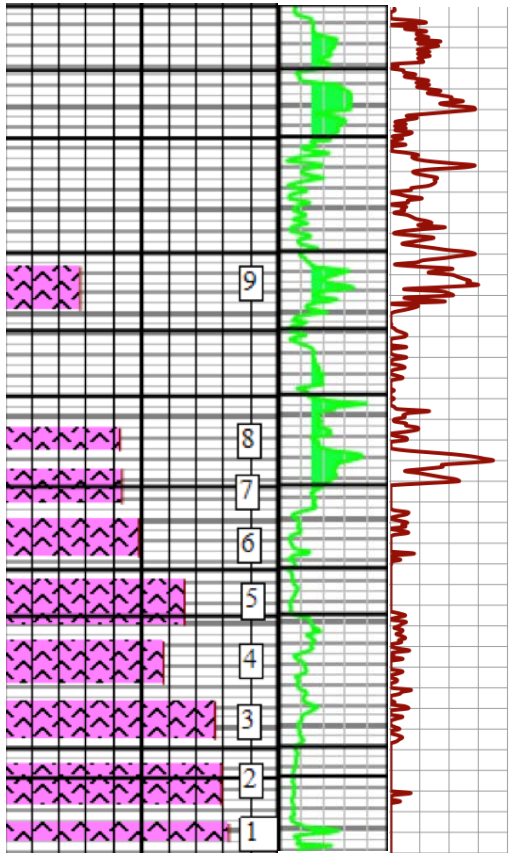
The results of cuttings pyrolysis analysis (right 4 columns) are direct measurements in the lab that show movable part of hydrocarbons (**green curve**).

This is valuable information for separating low and high producing zones along the well.

Only problem with this data, that it takes a few months to obtain the information.

© Copyright 2017 by Amros Corporation - All Rights Reserved

Case Study: Production Profile vs. Cutting Analysis

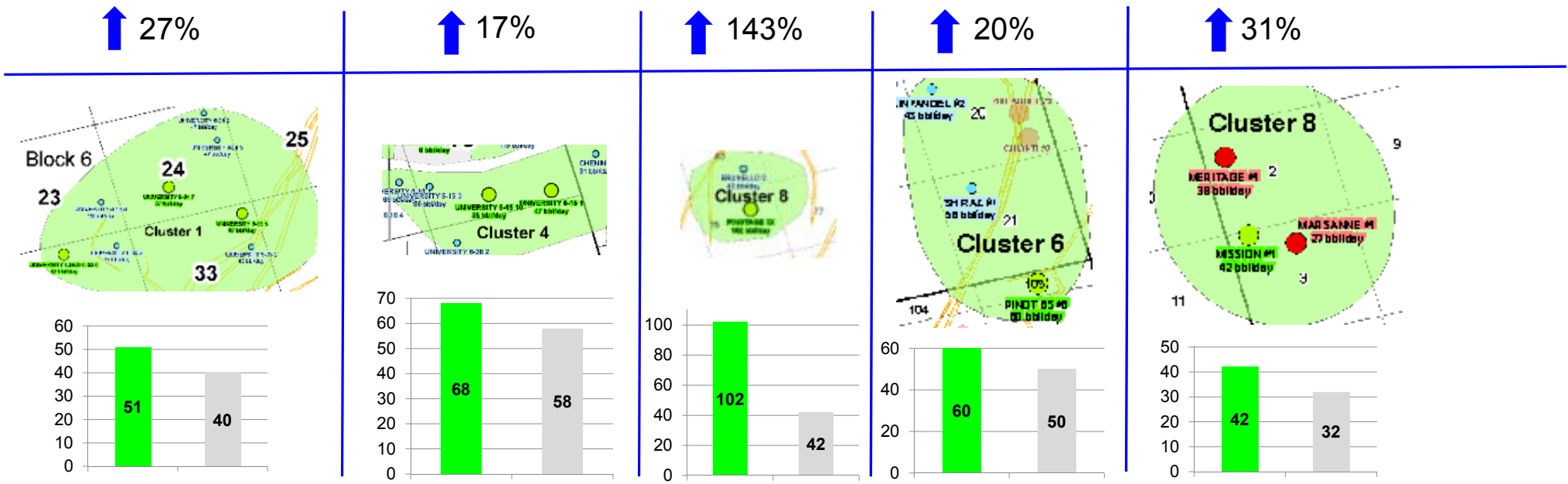


Fracking stages (left column in pink), production prediction from cutting analysis (central column) and Amros production profile (right column in green).

A Production Profile, that can be calculated from open-hole logs within 24 hours, matches well with the direct measurement from a lab that requires a few months time.

© Copyright 2017 by Amros Corporation - All Rights Reserved

Case Study: Well Production Comparison



Increased Production in the wells that used Amros Production Profile (green)

Average Production increase for five groups with 22 wells is 48%

© Copyright 2017 by Amros Corporation - All Rights Reserved

Competitive Technology Landscape

Amros is the only company that provides Production Profile to the customers

Company	Input	Output
Amros	Standard open-hole log data	Production Profile, bbl./day per 100 ft.
Weatherford	Core/cuttings, standard open-hole and azimuthal sonic log data	Data for stage optimization
Schlumberger	Core/cuttings, standard open-hole, NMR and dielectric log data	Reservoir Producibility Index

© Copyright 2017 by Amros Corporation - All Rights Reserved

Amros Deliverables

Production profile with recommended fracking stages and brittleness for all wells

Production maps for the best formations

Recommended trajectories for horizontal wells with initial production estimation

FRACK LESS ….. PRODUCE MORE

© Copyright 2017 by Amros Corporation - All Rights Reserved

Gain More Value from Your Acreage Position

Amros technology will radically change the Shale development paradigm by increasing Operator's success rate

Increasing production and reducing development cost

Accessing reserves missed by conventional development

Increasing recovery efficiency

Reducing environmental impact

© Copyright 2017 by Amros Corporation - All Rights Reserved

Founder / President

Dr. Vladimir Grigory Ingerman

Dr. Ingerman received a Doctor of Technical Science, as well as a Ph.D. in oil field development, and a Master of Science in geophysical methods. He has 48 professional publications including a book.

He founded Amros Corporation in 1994. Amros Technology was a **finalist for the World Oil Awards 2016** in the category New Horizon Idea involving formation evaluation in shale. Amros Corporation was recognized as Most Promising Company at RICE Alliance in 2015 twice.

He has over 30 years of experience in the energy sector across the US, Russia, India, Mexico, Venezuela, Ecuador, and Denmark. His experience encompasses exploration, integrated field studies, data management, database optimization, software development and optimization of production of mature fields.

© Copyright 2017 by Amros Corporation - All Rights Reserved

Contact Information

Dr. Vladimir Ingerman

President, Amros Corporation

Website: www.amros.us

Email: ingerman@amros.us

Amros Corporation

© Copyright 2017 by Amros Corporation - All Rights Reserved

Amros Corporation

© Copyright 2017 by Amros Corporation - All Rights Reserved