

ZERLUX, INC. - ADDRESS: 4006 FM 1900 WEST SUITE 400 - HOUSTON, TX 77069 - PHONE: 281-580-2218 - E-MAIL: INFO@ZERLUX.COM - WEB: WWW.ZERLUX.COM

ZerLux High Power Laser Applications

Innovative Way to Complete Wells

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History of Laser Development

- Prior to 2005, lasers had:
 - Insufficient pulse energy
 - Wavelength inaccuracies
 - Inadequate optical fiber efficiency
- Subsurface finally possible:
 - Exponential gains in service lifetime
 - Laser stability and reliability
 - Wavelength of semiconductor generated light
 - Optical fiber carrying capacity

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Lasers in Other Industries

- Lasers, a 7.57 billion USD industry:
 - Reliable, long lifetime, over 30,000 hours
 - Commercially available multi-ten kW lasers in small packages
 - High efficiency laser source (30%)
 - Precise movement of laser light
 - Laser light delivered through fiber at long distances with low loss



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The ZerLux Laser Technology Concept – General Description

- Get the laser under the ground – Use fiber optic cables
- Displace liquids by injecting Nitrogen
- Using Laser Light to heat up the environment:
 - Cut through casing
 - Move into formation


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The ZerLux Laser Technology – the Borehole Wall

Adjustable and Highly Permeable Obsidian Layer
 Improve porosity and permeability of the formation,
 Higher estimated ultimate recovery (EUR)




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Sandstone Coresample Drilled Through

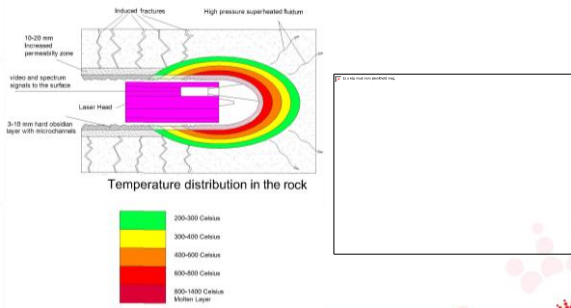


- 10 kW laser
- 35 mm diameter
- 100 mm long hole
- 96 ccm
- In 180 seconds
- SE 18 kJ/ccm

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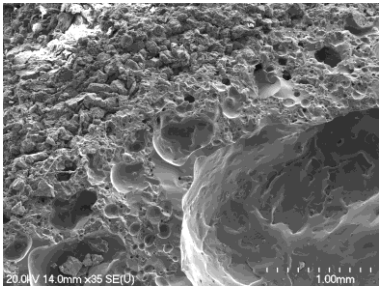
Secondary Effects of Laser Drilling Induced Fractures and Increase Permeability Zone



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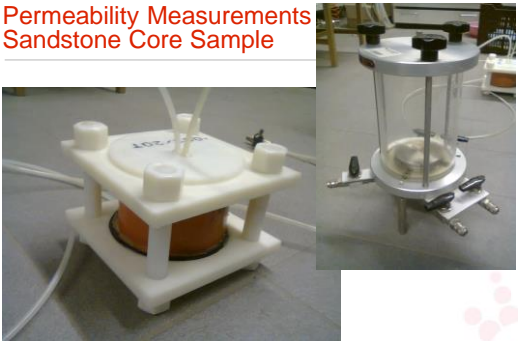
Microscope Image of the Laser Drilled Borehole Wall



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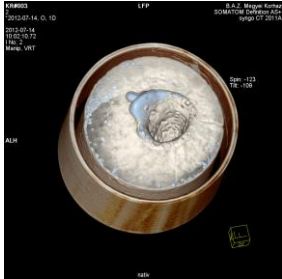
Permeability Measurements Sandstone Core Sample



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Computer Tomography Image Laser Drilled 120 mm Sandstone

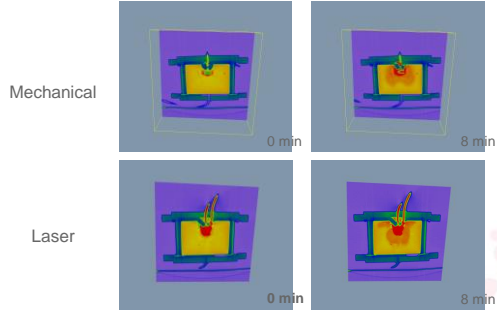


- 8 kW laser
- 30 seconds shot
- 35 mm diameter hole
- 40 mm deep

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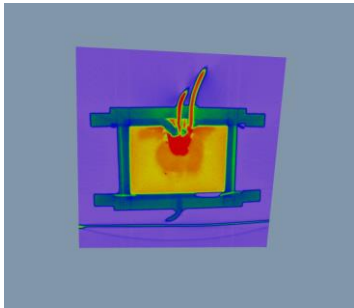
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Comparative Flow Pattern Analysis Laser v. Mechanically Drilled Hole



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- Sudden induced heat creates fractures
- Fractures show faster fluid flow

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ZerLux Laser Applications
- Well Completion with Short Laterals

Well Completion with Short Laterals

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ZerLux Laser Applications
- Well Completion with Short Laterals

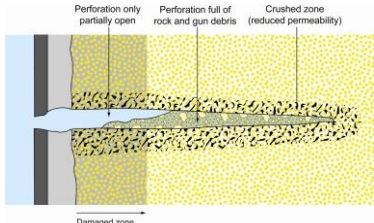


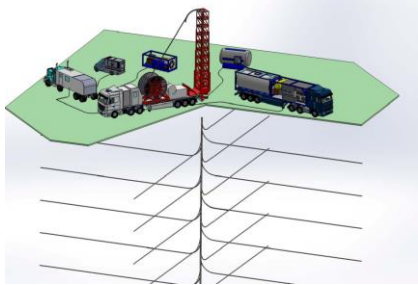
Figure 1 - Perforation Damage (Partial Clean up only Achieved) © J. Bellarby 2009

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ZerLux Laser Applications
- Well Completion with Short Laterals



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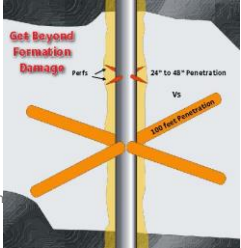
Laser Well Completion as More Efficient Alternative to Explosive Perforation

The Challenge:

- Increase production in newly drilled wells
- Reduce completion costs
- Overcome limitations of conventional technologies
- Make technology greener

The Solution:
ZerLux Laser Drilled Laterals (LDL)

- Increase drainage radius and oil production
- Reduce relative production costs
- More efficient alternative to perforation
- Environmentally smart technology protects water zones



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Removed Debris



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ZerLux Laser Applications

Thank You.