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2016 INTERNATIONAL PERFORATING SYMPOSIUM GALVESTON

Wireless – Electronic Firing Head for Selective Reservoir Connection

IPS 16-16

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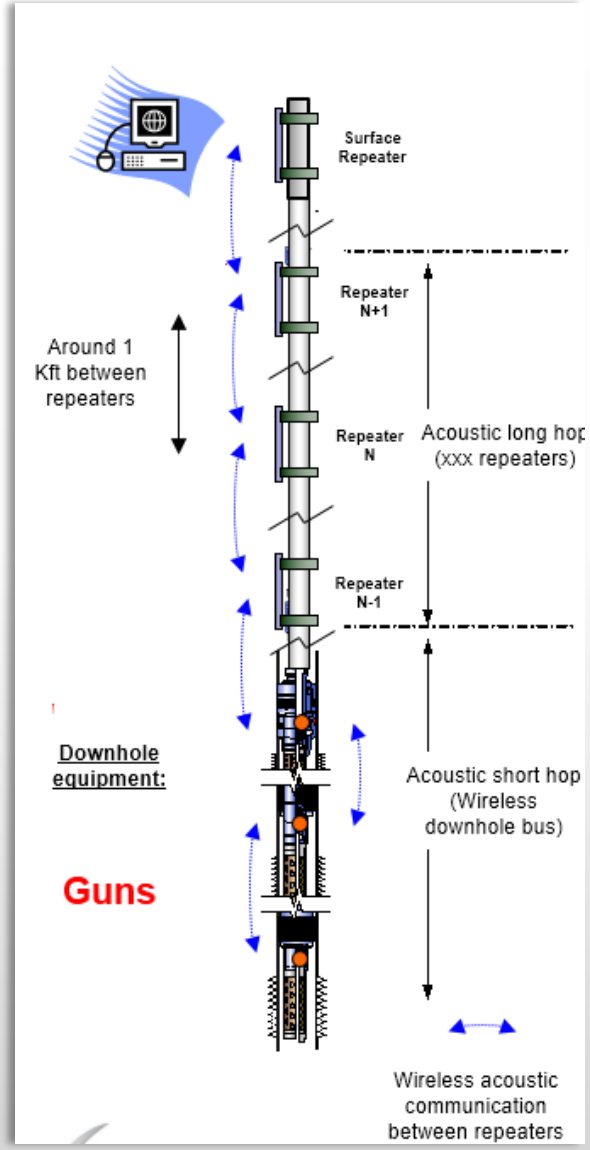
Objective:

- Provide a safe, efficient, and economical method to perforate
- Enable DSTs design for Multi-zone Testing
- Ability to survive Gun Shock
- Combines two proven highly reliable technologies:
    - Digital electronic firing head
    - Acoustic wireless communication system

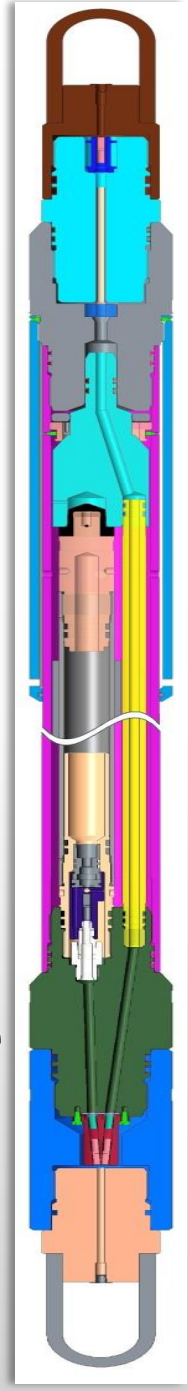
Introduction to the Technology:

- Intelligent Remote Instrumentation System
  - Combines sensors, battery power, microprocessors, and control switches
- Acoustic Technology – Wireless System
  - Provides bidirectional real-time digital communication
- As a result, provides:
  - Real time updates
  - Direct firing commands, any order
  - Confirmation of fire command receipt



Technology Flexibility & Value:

- Allows Multi-Zone Perforating either independently or combined
- Activate perforating guns without the need of any mechanical or pressure activation
- Explosive safety features that includes a safety dongle key
- Bidirectional Communication
- Initial SUB, SOB or balance control.
- Legacy acceptance of Mud Pressure Firing Command signals
- Fully compatible with redundant FH configurations & broad range of gun sizes



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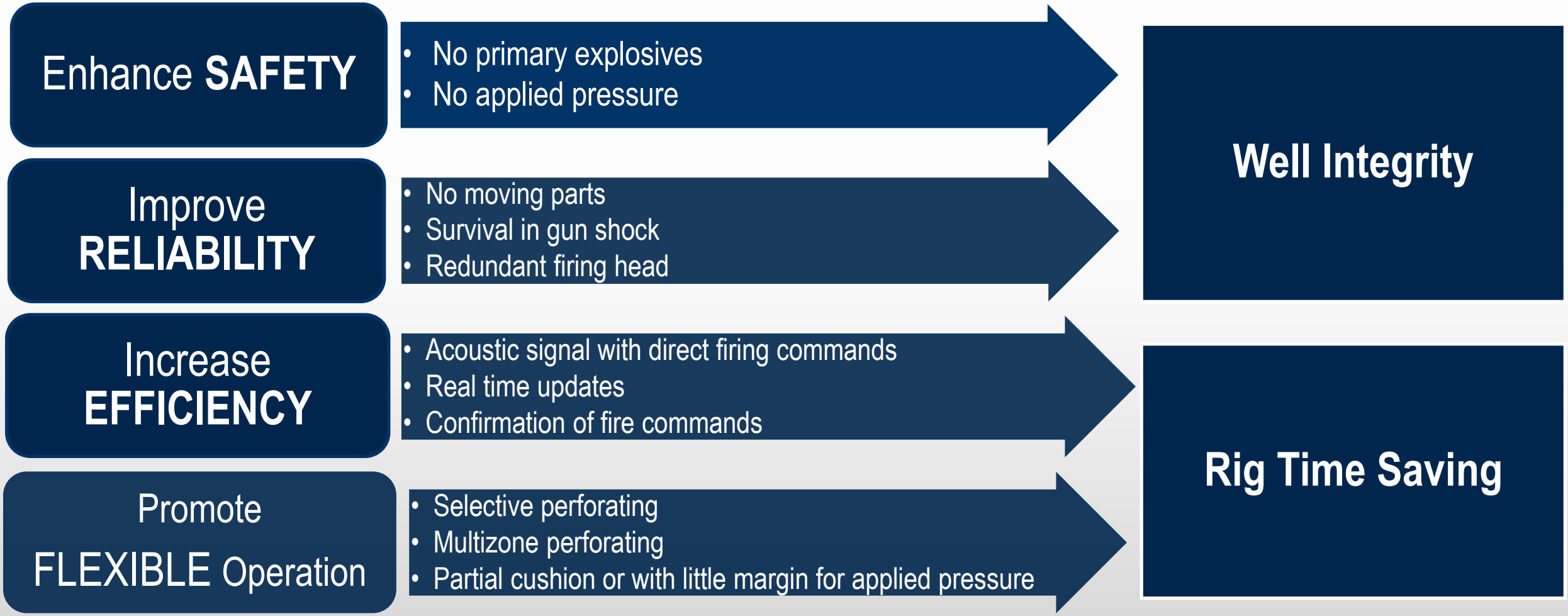
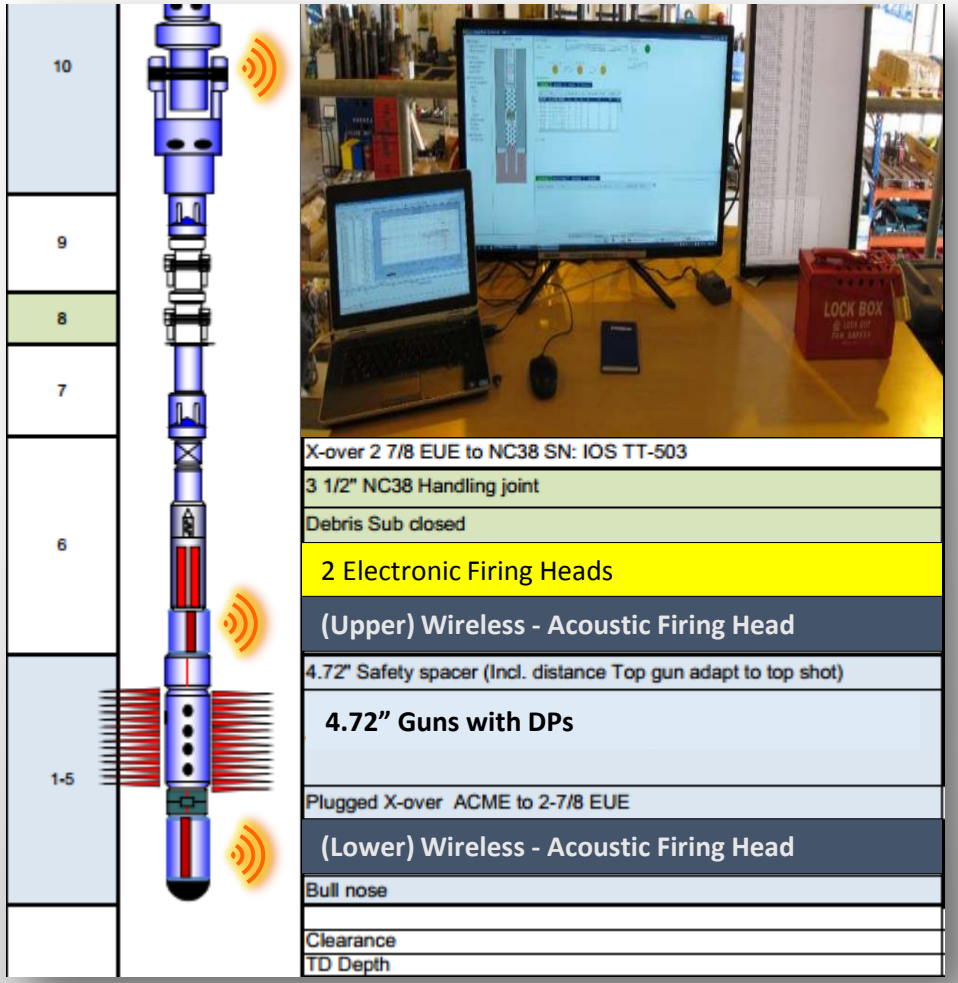


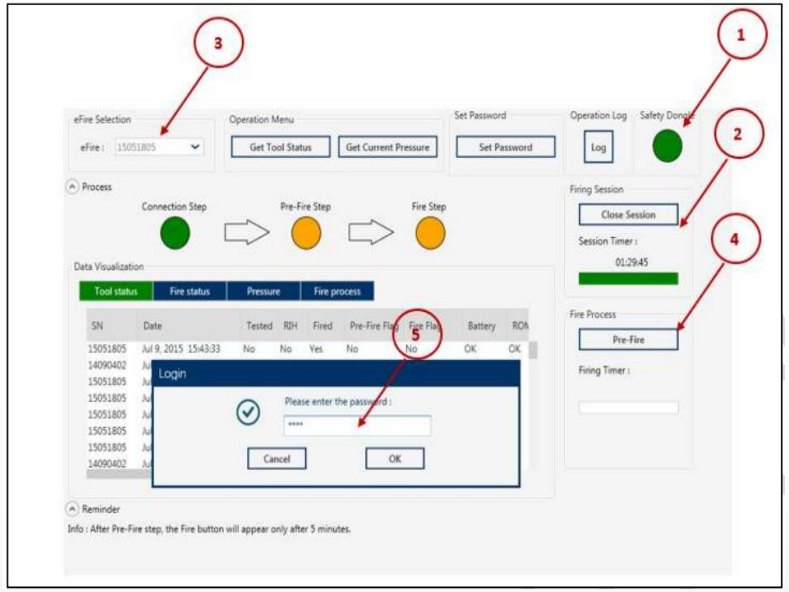
Technology successfully Demonstrated!

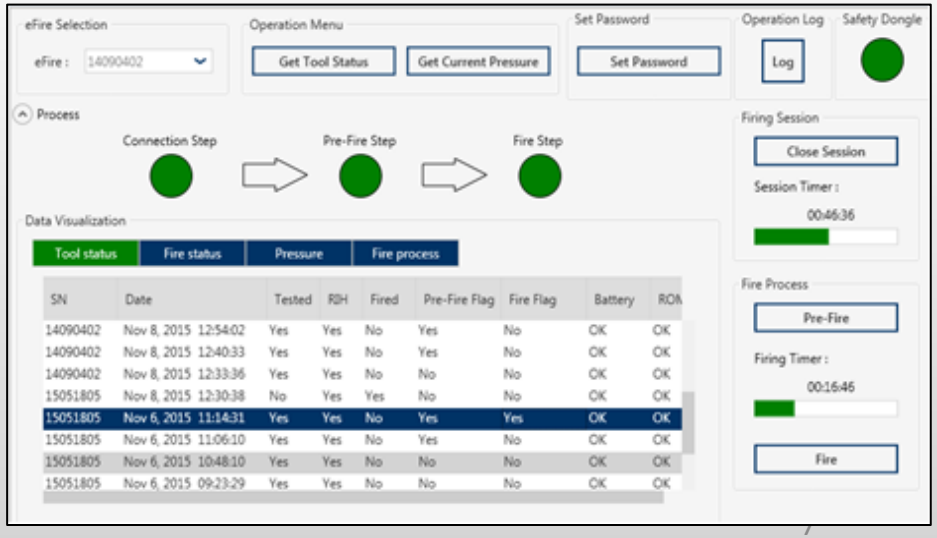
- North Sea - Offshore
- Water Depth 1,300ft; TD 12,000ft
- BHP 9,400psi & BHT 280degF
- TCP String:
  - 2 Sets of Acoustic Firing Heads (Upper/Lower)
  - Upper Acoustic Firing Head ran in redundancy with 2 more electronic FHs
  - 4.72” gun with DPs shaped charges.



Technology Success!

- 10/29/15 RIH
- Stablish Network Discovery (Tool status)
- Set Packer
- Displace Cushion
- Request Pressure Tool reading
- 11/06/15 Firing Sequence for the Upper Wireless - Acoustic Firing Head
- Test the Well
- End of Build Up
- 11/08/15 Firing Sequence for the Lower Wireless – Acoustic Firing Head
- POOH - End the job





Questions?

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