Wireless – Electronic Firing Head for Selective Reservoir Connection

IPS 16-16

AUTHORS: Jose Escudero, Sheryl Raezer, Chris Spring, Alfredo Fayard, Julien Janicot, Andrew Prisbell, Li Hai Yu, Ji Tao, Ryan Parasram (SRC-RPS), Palma Giordano, Orland Guedes, Thibault Vexiau, Dominique Sabina (SRPC) & Field Crew.
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
Technology Flexibility & Value:

Enhance **SAFETY**
- No primary explosives
- No applied pressure

Improve **RELIABILITY**
- No moving parts
- Survival in gun shock
- Redundant firing head

Increase **EFFICIENCY**
- Acoustic signal with direct firing commands
- Real time updates
- Confirmation of fire commands

Promote **FLEXIBLE** Operation
- Selective perforating
- Multizone perforating
- Partial cushion or with little margin for applied pressure

Well Integrity

Rig Time Saving
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