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Innovative Solution Delivers First Ever Acoustically Initiated TCP Firing Head

IPS 16-14

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Project Delivery

Solution was creation

Challenge

- Mechanical firing head not suitable
- Pressure firing head pushed to the limit

Solution

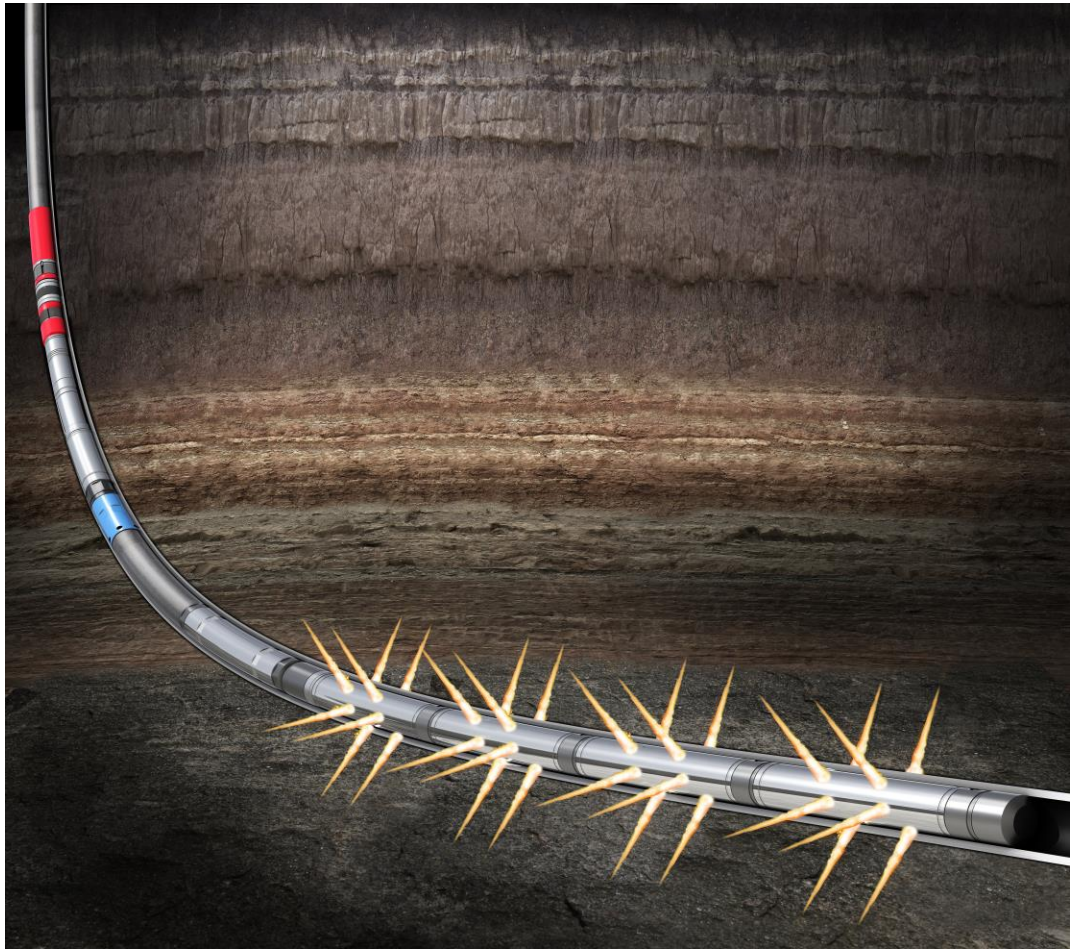
- First ever acoustic firing head
- Safe design

Results

- No pressure application necessary
- Positive industry response

Achieving the Goal

Understanding

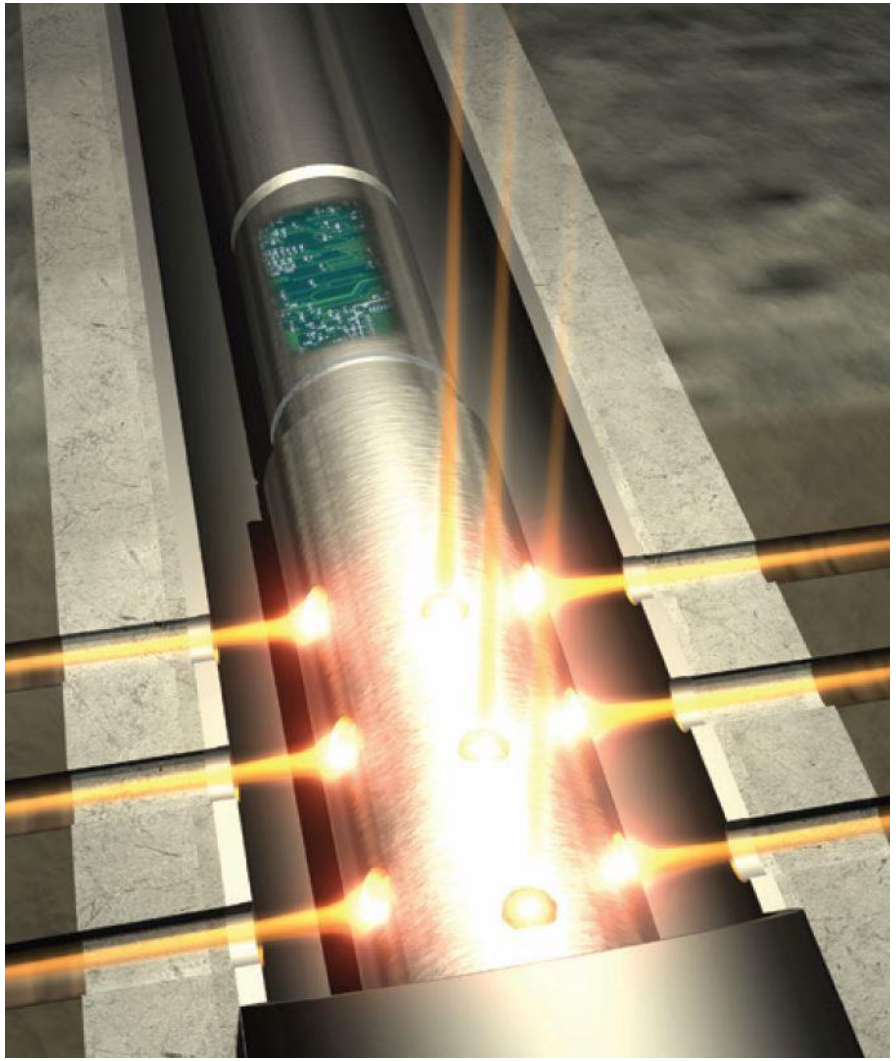


- Acoustic firing head
- Secondary pressure firing head
- Delay elements
- Safety device
- Gun release
- 4 5/8-in. 5-spf TCP guns

Existing Technologies

Comparison

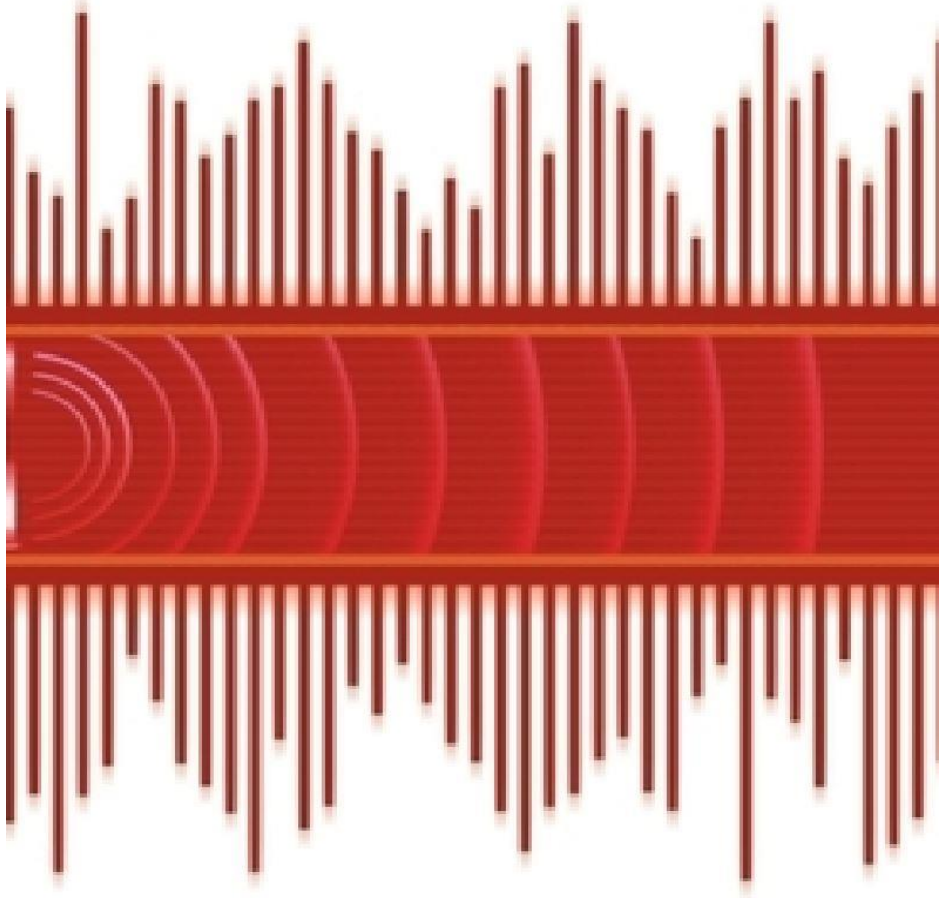
- Mechanical actuated firing heads
- Pressure actuated firing heads
- Electronic initiated firing heads



What is Acoustic Technology?

Applications

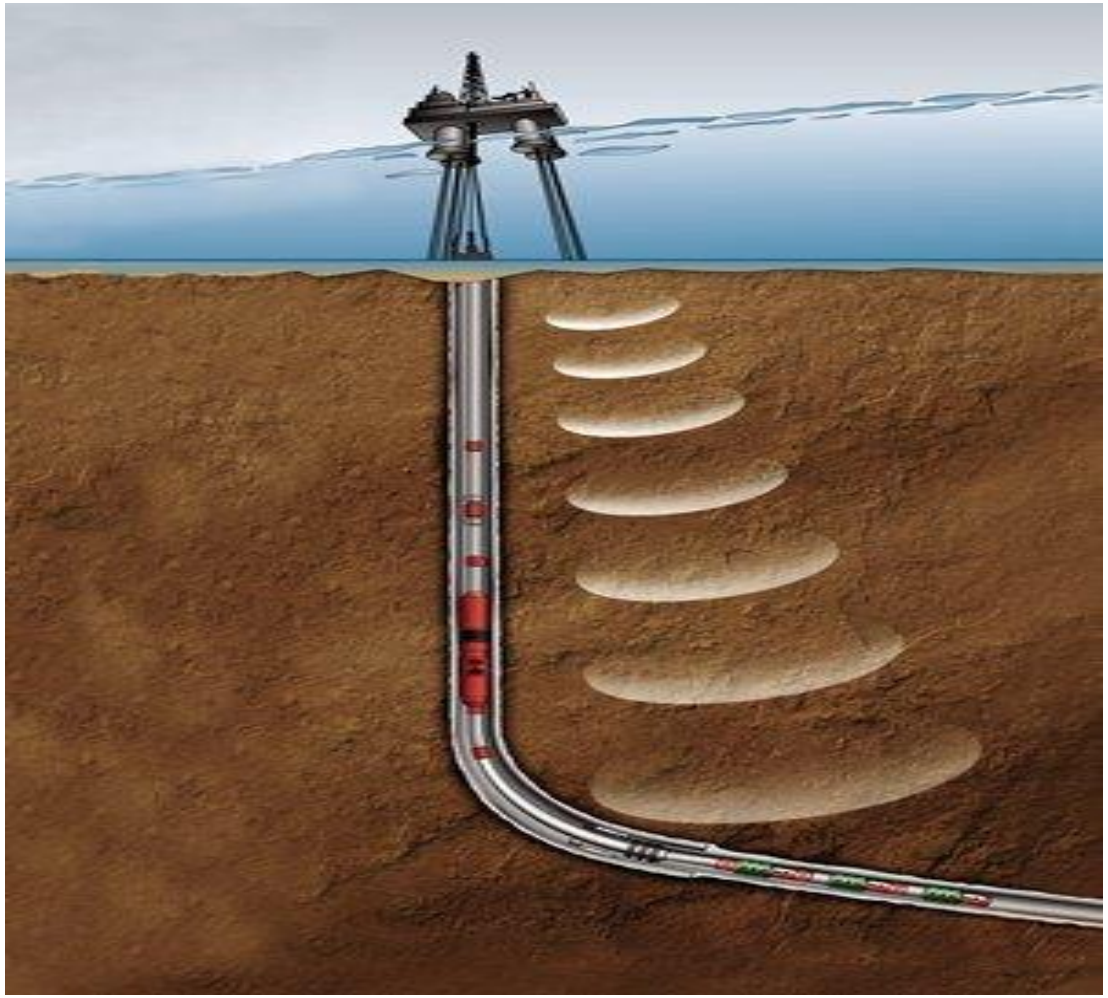
- Fire guns
- Surface readout of BHP/BHT throughout the DST
- Trigger BH samplers
- Activate valves for zonal flow control and multi-zone testing



The Acoustic Firing Head

Workings

- Two main components:
  - Acoustic actuator
  - Pressure assisted mechanical firing head
- Firing head operation:
  - Prime and fire commands
  - Rotating lead screw
  - Impacting rod
  - Pressure assisted mechanical firing head



Firing Head Safety

Acoustic controls

- Software security
- Electronically commutated motor
- Temperature range
- Prime and fire
- Hydrostatic firing head
- Thermal switch
- Time delayed hydraulic lock-out

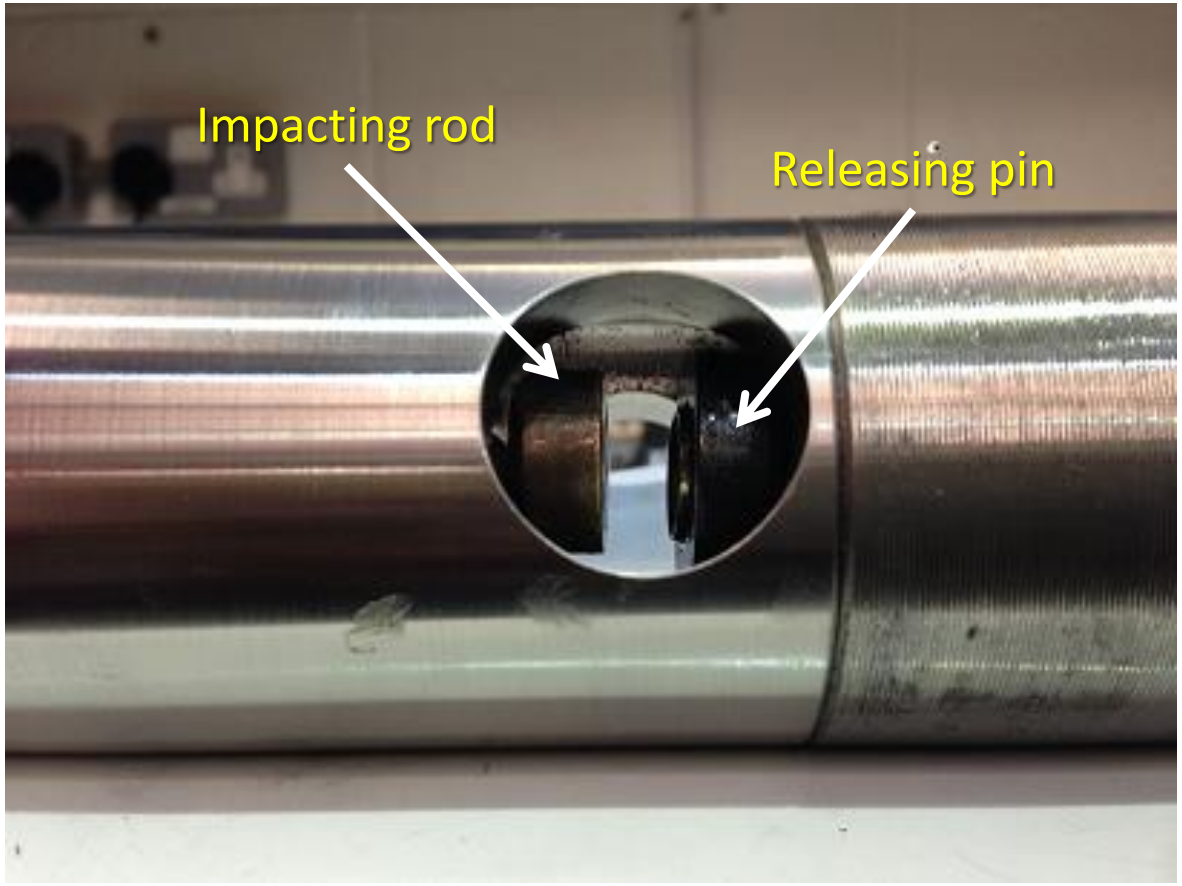
Testing the Firing Head

SUBTITLE

- Design collaboration
- Intensive test program

Testing the Firing Head

Results



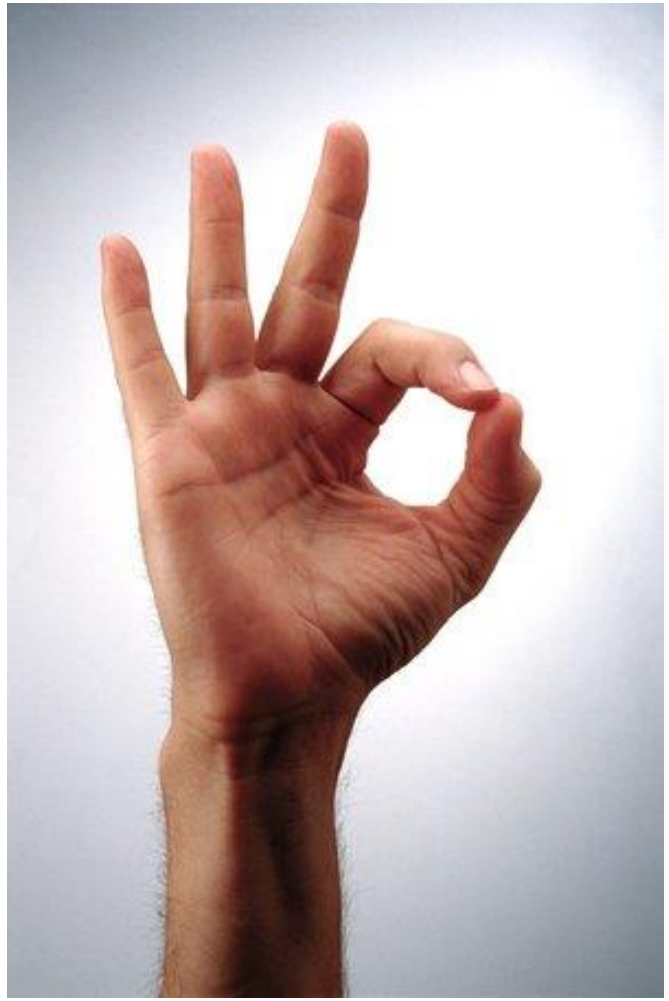
Testing the Firing Head

Results

System Integrity Test (SIT)

SUBTITLE

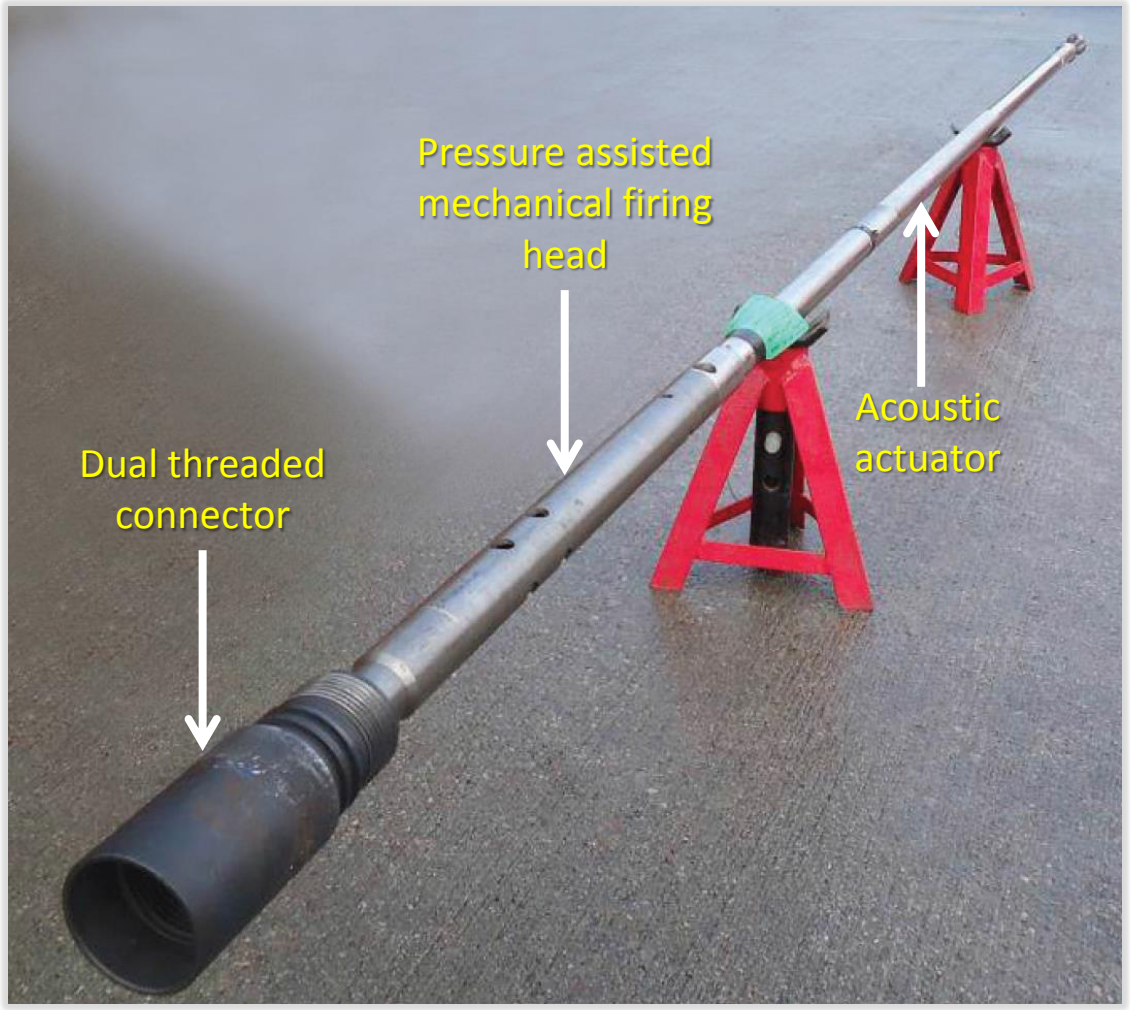
- Highlighted potential teething problems
- Operator witnessed
- Acknowledged individual responsibilities



Acoustic Firing Head

Fully assembled

- Software security
- Electronically commutated motor
- Temperature range
- Prime and fire
- Hydrostatic firing head
- Thermal switch
- Time delayed hydraulic lock-out



The Future
For Perforating

- DSTs
- Multi-zone perforating
- Permanent completion
- Shoot and pull
- Redundant systems

The Value
For Perforating

- The new acoustically initiated firing head requires neither pressure nor mechanical intervention to operate, although minimum hydrostatic pressure is necessary to work successfully.

- By using acoustic telemetry instead of pressure to initiate, operations are safer and can potentially save time in the future if entire firing systems employ this technique.

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QUESTIONS? THANK YOU!