

# Reliability in harsh environment: Application in transportation and industrial environment



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## Example of harsh industrial environment: Hydrocarbon exploration

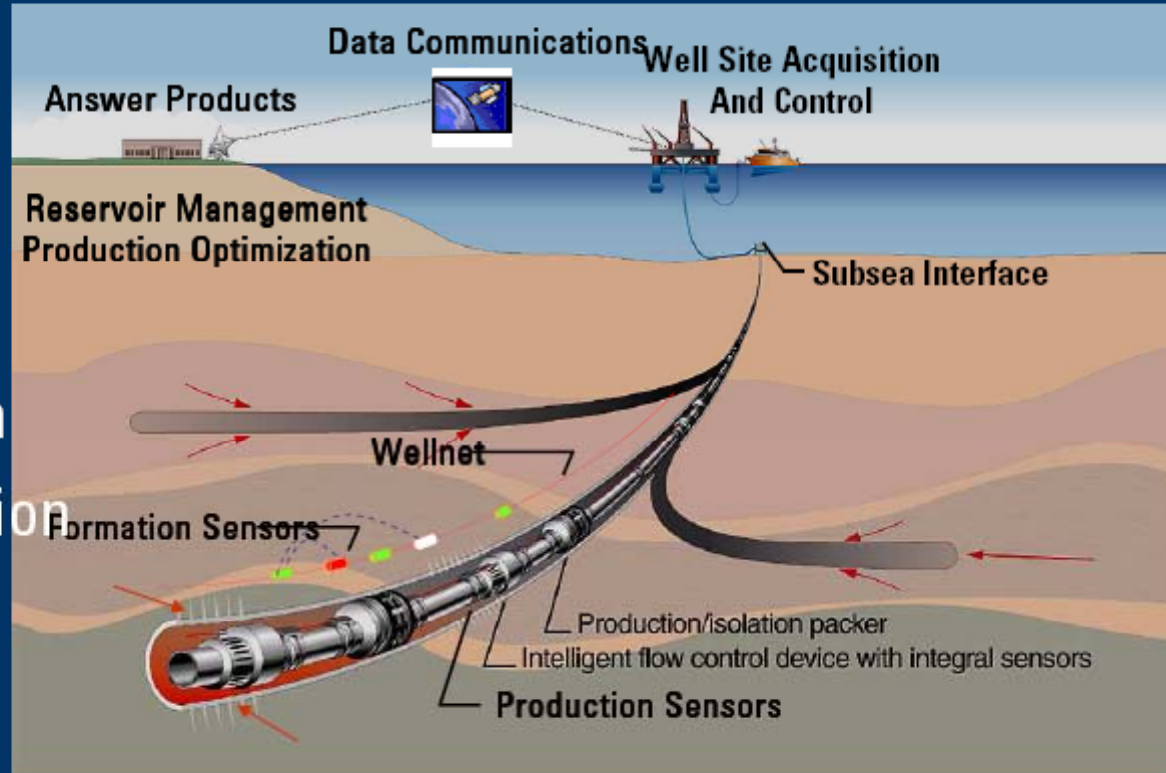
- Drilling is ever deeper:
  - Offshore exploration and production (E&P) is geared towards developments in depths greater than 1500 meters
  - Underground deeper than 10 km
- Harsher environments:
  - High temperatures: over 200°C, up to 300°C
  - High pressures: up to 2500 Bars
- Measurement while drilling (MWD) tools must survive high-pressure/high-temperature with real-time continuous inclination, vibration detection, annular pressure, and gamma ray detection



# WCP-Reservoir Monitoring & Control

Manage Production, Optimize reserve recovery, Increase asset value

- Sensors
- Valves
- Telemetry
- Acquisition
- Interpretation



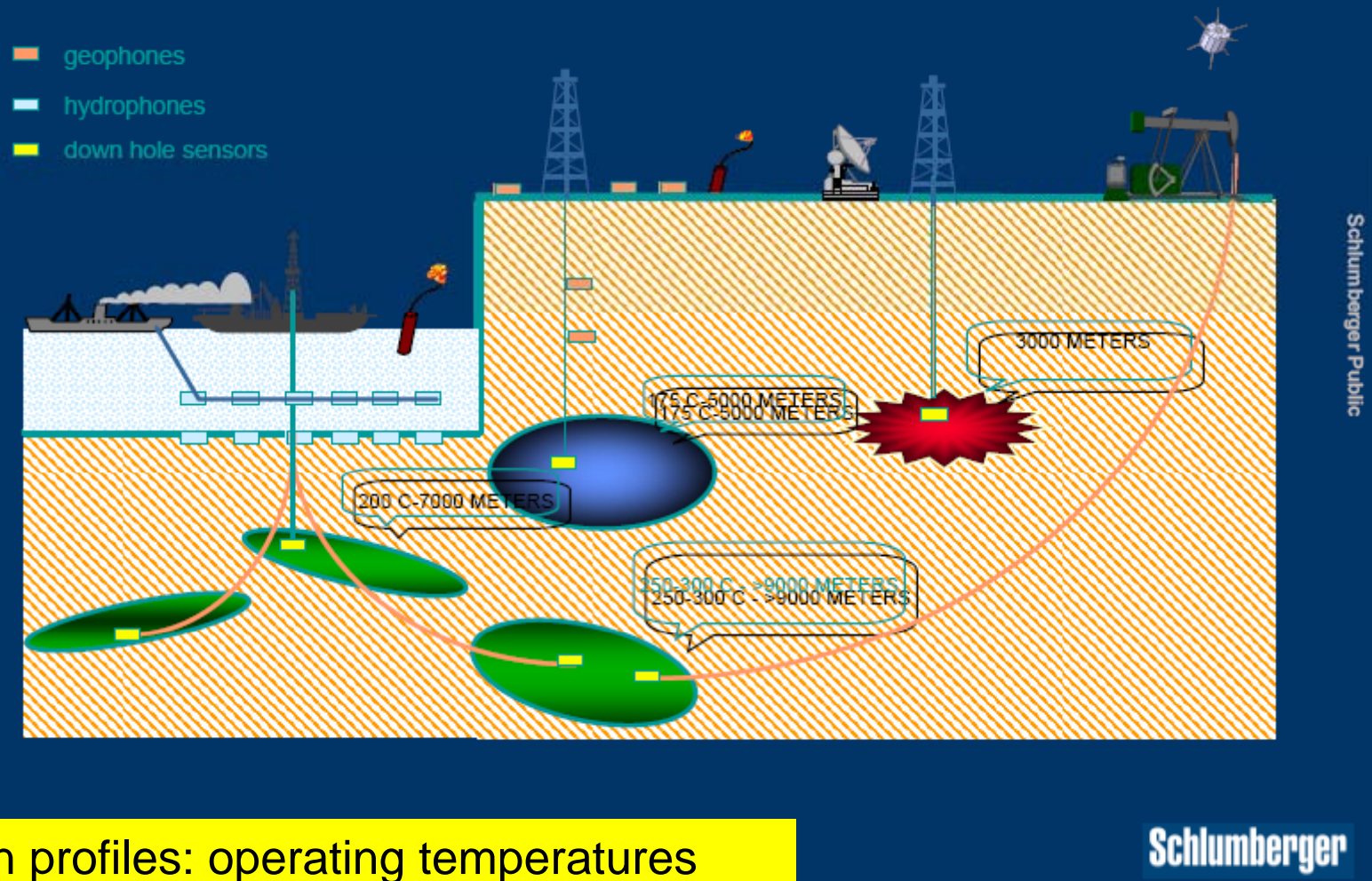
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# Seismic Analysis



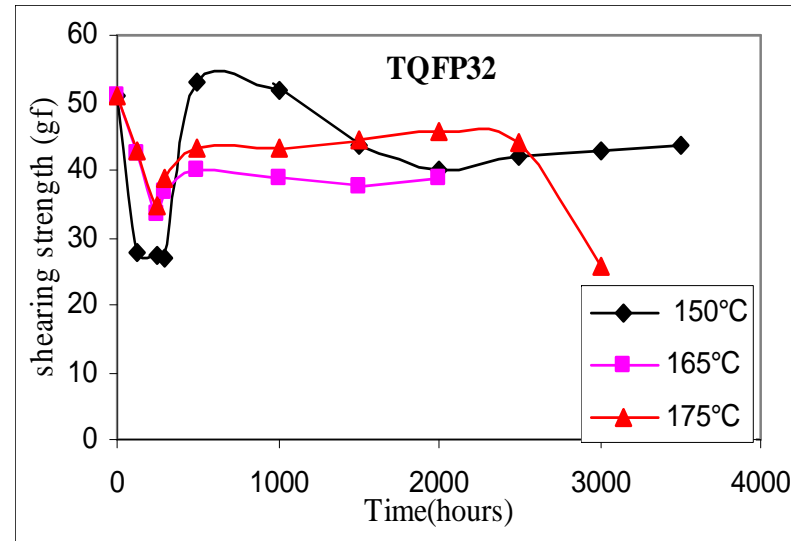
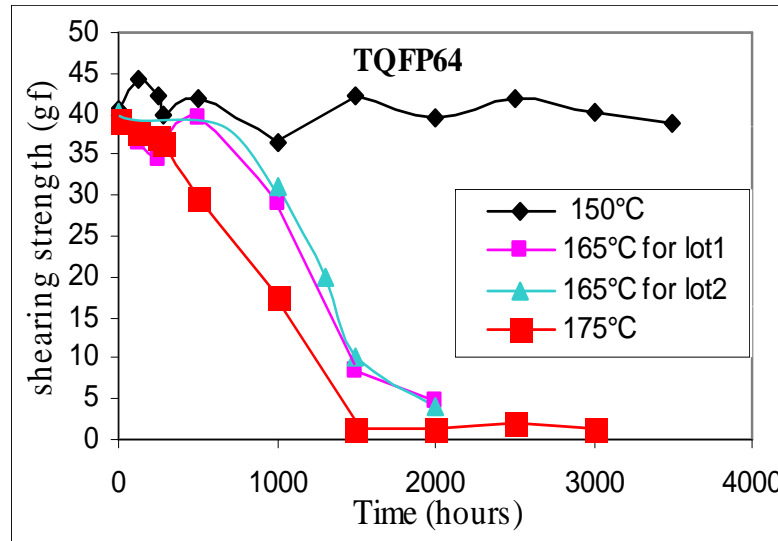
- Mission profiles: operating temperatures

- - 5000m : 175 °C
- - 7000m : 200°C
- - 9000 m : 300°C

# Consequences on wire bonds

- Technological choice : Materials
  - Au on Al ?
  - Al on Au ?
  - Doped Al? Doped Au?
- Technological choice : Pad thickness ?
- Technological choice : Case size ?

# Wire bonds in the automotive environment (M. Bahi)



Thermal storage aging conditions

Different temperatures: 150°C, 165°C and 175°C

Long durations: up to 3500h

