

High Power RF for Down-hole Drilling



Customer Challenge

A customer asked Winchester to collaborate on its experimental system to reduce the viscosity of “heavy” oil inside an oil well so it could be pumped more efficiently. To accomplish this, a flexible coax cable would need to transmit RF signal from a generator on the surface to the load installed at the bottom of the well. The cables would be subjected to a range of harsh environments and needed to reliably perform over a long life. The customer was uncertain how long the systems would be exposed to the outdoors and could not completely identify what kinds of solvents or corrosive materials the cables would be subjected to.

Challenge Review

Winchester reviewed the application with the customer as this down-hole cable installation environment is not standard. The customer did not have a lot of experience with RF but wanted to investigate RF as a solution and needed Winchester to help define the specifications.

The cable would be fed down an oil drilling well where the environment would be particularly harsh. The system would be exposed to corrosive liquids and gases including a vertical drilling path of 630 meters, horizontal depth of 300 meters, and 30 meters of curved path. In addition, the cable solution would have to withstand 150 lbs. to 200 lbs. of direct crush force without affecting electrical characteristics, and be clamped to a pipe running alongside other signal, temperature, and video monitoring cables. The cables needed to have an average power handling requirement of 45 kW at 100°C in a high pressure environment of 50 bar. A radial pressure distributed along the external cable surface would also be present, which would increase with depth.

Winchester Solution

Winchester provided a Tru-Win™ flexible, robust coax cable with PTFE dielectric to run down the 1,000 meter drilling hole path. The solution included an environmentally sealed, Tru-Win ruggedized EIA interface to meet the customer's high power specifications. Winchester also used a customizable, flexible coated steel conduit armor to meet the flexibility requirements of the curved travel path, extreme crush forces, and corrosive environment below the surface. Further, the connector/cable assembly was sealed against pressure and fluids in accordance with Ingress Protection (“IP”) 67 standards to further ruggedize the solution. The solution offered the customer additional convenience through its unique coaxial interface that could easily attach to interchangeable cable lengths, and therefore adjust to different well depths.

Ultimately, the design allowed for sufficient flexibility and ruggedization to route the cable into the oil deposit and withstand the harsh environment. In addition, the solution satisfied the RF performance specifications to effectively reduce oil viscosity.



Tru  **Win**

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Customer Improvement

Winchester Interconnect provided an entirely new solution to the customer for its experimental system that offered:

- A ruggedized, flexible RF coaxial cable assembly (TRUflex™ PWR cable series) using flexible coated steel conduit armor
- Low loss and high power handling RF coaxial connectors (EIA connector series)
- Improved throughput of oil pumping due to the less viscous oil



Contact our Winchester Interconnect Experts for your custom solution!

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