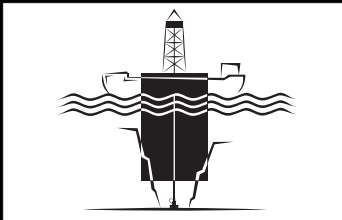


Subsea Technology:

Electrical and Hydraulic Flying Leads



Modern subsea oil and gas production requires hydraulic power and electrical signals to operate and control its various components. Before reliable wet-mateable conductive connectors became available, the industry had only limited means to establish electrical connections between subsea components. The origin of the flying lead can probably be traced back to Shell's deepwater drilling program off the USA east Coast 1983. They made provisions for the ROV to deploy and mate flexible hydraulic tubing on the lower marine riser package. Following that experience, and with the availability of reliable wet-mateable connectors and the maturation of the ROV as a capable subsea robot, the technology was advanced to deploy and connect electrical and multicore hydraulic "flying leads" between subsea components as far away as 200 feet.

This technology allows: subsea architecture with multiple smaller modules placed on the seabed, installed and retrieved with modest and widely available surface equipment; flexible subsea architecture allowing the addition of equipment at a later date when needed (e.g. subsea pump modules when reservoir pressure is in decline); relatively simple and inexpensive interconnections between modules made by ROV using flexible umbilicals (flying leads).

Recognizing the pioneering efforts of the following individuals and organizations that contributed to this technology:

Dick Frisbie, Howard Shatto, Mike Williams and Tom Williams

FMC (now TechnipFMC), Oceaneering and Shell