



## ADVANCED ENGINEERING FOR UMBILICAL RISERS

- **Independence**
  - Independent and impartial engineering, without hardware or installation preference
- **Advanced Subsea Engineering**
  - Unique combination of engineering experience, including design, testing, analytical skills and proprietary software solutions
- **Experienced Personnel**
  - Personnel with worldwide experience, all locations, all water depths
  - 25 years in offshore industry
- **Resources**
  - Staff of 150 based in Houston, Galway, Aberdeen, Rio, Perth and Paris
- **Worldwide client base and experience**

### SERVICE

- Overall concept design and configuration selection
- Cross-section design and evaluation
- Steel tube sizing and verification to codes
- Selection/specification of material requirements
- Extreme and Fatigue analysis (time and frequency domain methods)
- VIV analysis (design of VIV suppression devices)
- Installation analysis and procedures
- Interference and Layout Design
- Design of vessel interface (bend stiffener or bellmouth design)
- Analysis of non-linear performance characteristics
- Development of umbilical specifications
- Design of umbilicals in various flexible riser configurations (e.g. lazy wave, steep-S, etc.)

### CAPABILITY

- Unique combination of expertise in steel tube umbilical (STU) technology through combination of global design and analysis of steel risers with the local design and analysis of flexible pipe systems.
- MCS Design Service Experience: Red Hawk, Matterhorn, Gunnison Habanero Mad Dog, Holstein, Boomvang, Nansen, Agbami, Akpo, Kizomba, Bonga, Baobab, Greater Plutonio, Moho-Bilondo, Girassol and Rosa
- Enhanced non-linear time domain approach to umbilical fatigue design accounting for stick-slip effects and tubular friction stress has led to an enabling solution for deepwater high tensioned STUs
- Evaluations of low cycle fatigue utilizations during fabrication ensure fitness for purpose during 25 year in-place condition
- Accurate determination of progressive in-place umbilical seabed walking condition to determine optimised initial design layout
- In depth knowledge of design limitation of each manufacturer based on variations on design capacities and philosophies following extensive facility visits and interviews