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Applicability of Flexible Pipe Riser Technology to Ultra Deepwater  
Mining: Case Study

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**Abstract**

Currently, flexible pipe risers are a field proven technology operating in Brazil in 6,500ft water depths since the late 1990's. Free hanging pipe weight in water depths greater than 6,500ft create a challenge for any riser system. The flexible riser configuration presented herein is a continuance of the concept(s) presented at the Offshore Technology Conference 2006, OTC No. 17768.

Discussed herein are the challenges and benefits of a 10-inch internal diameter x 5000m water depth flexible riser pipe as applicable to the offshore mining industry. The key technical challenges include:

- top tension load
- collapse load
- upward flow (pumping)
- active mobility

The purpose of this paper is to demonstrate technical feasibility of unbonded flexible pipe for ultra deepwater seabed mining via a unique riser configuration and staged pumping.

In addition to the operability of the risers, unbonded flexible pipe offers numerous benefits including:

- 25 year service life
- Re-usability
- Pipe is fully tested before delivery – Factory Acceptance Testing
- Wet Storage
- Flexibility of installation methods:
  - Carousel or reel
  - Towing from shore

Future work to confirm the flexible pipe riser system to allow field operation includes:

- Optimize riser solution for intended operating conditions.
- Optimize buoyancy requirement.
- Detail method of attaching/integrating buoyancy in the riser system.
- Detail method of integrating staged pumps.