

SAIPEM MULTIPIPE

SUBSEA GRAVITY
GAS-LIQUID SEPARATOR



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MULTIPIPE: SUBSEA GRAVITY GAS-LIQUID SEPARATOR

A PROCESS SOLUTION FOR DEEP AND ULTRA-DEEP WATERS AND/OR HIGH PRESSURE APPLICATIONS

Subsea gas separation and liquid boosting is a solution to maximize recovery of deep and ultra-deep water reservoirs. Saipem has developed and qualified an innovative separator based on small diameter separator pipes.

MULTIPIPE SUBSEA STATION DESCRIPTION

- Several vertical pipes working in parallel for gravity separation.
- Can incorporate mudline pumps or ESP's.

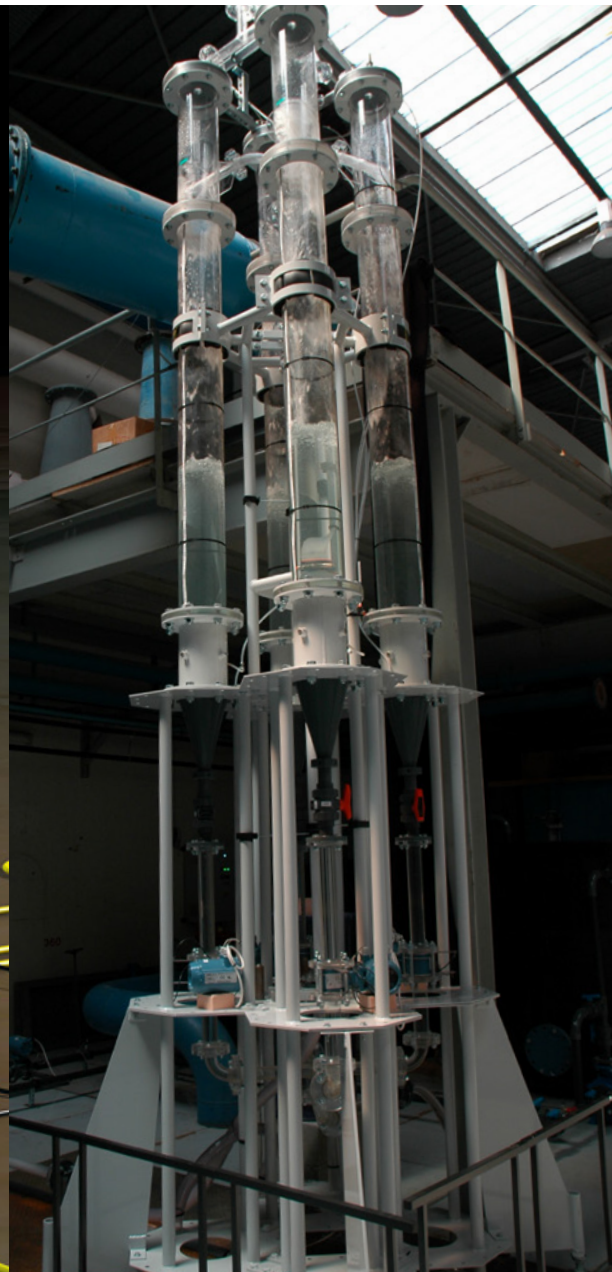
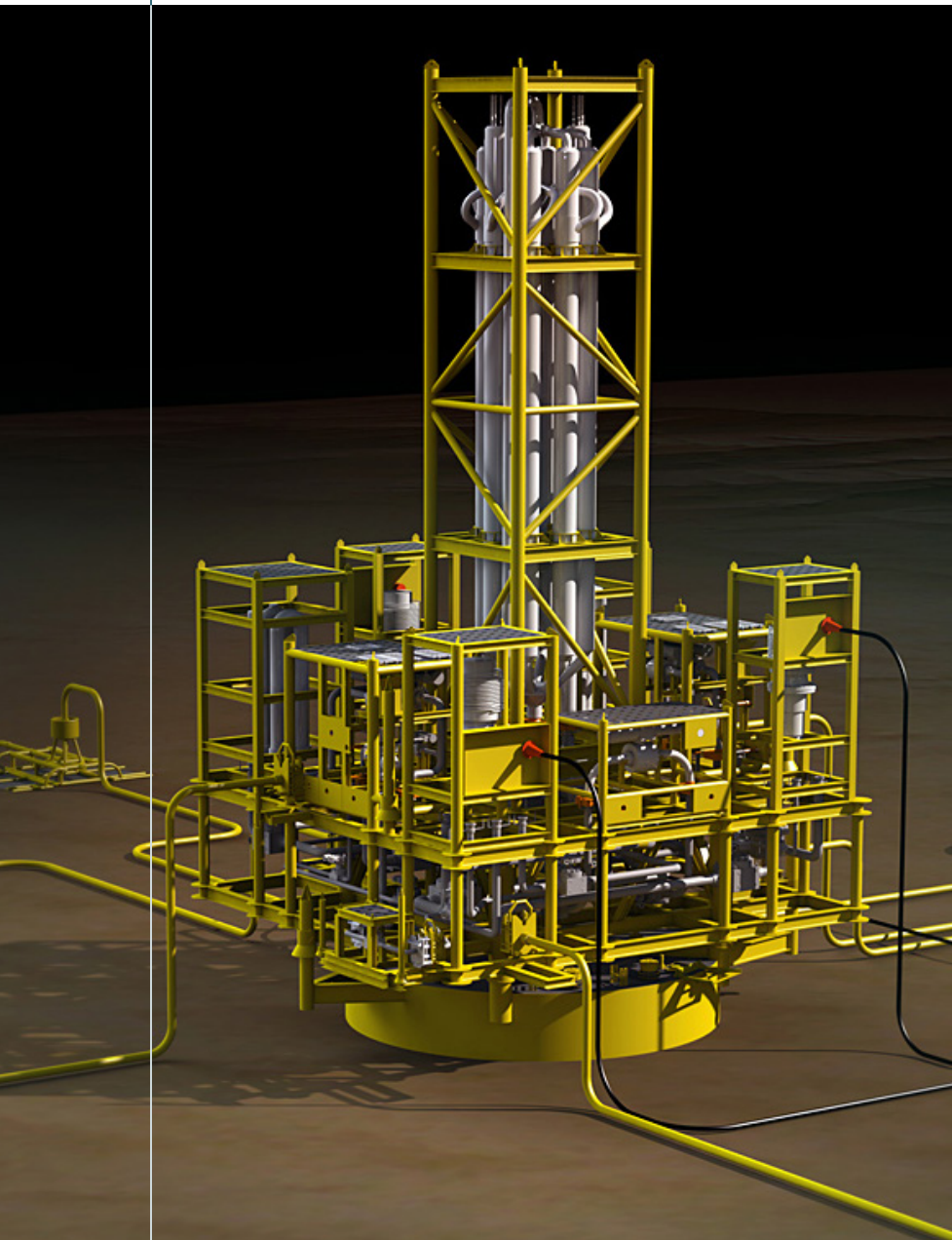
BENEFITS OF THE TECHNOLOGY

- Robust and reliable process design based on field proven gravity separation
- Large volumes available in order to handle slugs
- Pipes with reduced wall thickness compared to single vessel design
- A flexible design to cope with a wide range of applications and requirements (high pressure, high flowrate, slugs, etc.)
- Fully modular system with retrievable components
- Allows maximization of local fabrication and assembly



MULTIPIPE DESIGN

TYPICAL DESIGN	DESIGN DATA	TYPICAL PERFORMANCES
Number of pipes: 4 to 8	Liquid: 30,000 to 115,000 bpd	Outlet GVF <- 10% vol.
Diameter of pipes: 42 in	Gas flowrate: 10 MMSCF	Outlet LCO <- 0.1% vol.
Height of pipes: 20 m	Slug volume: 5 to 70 m ³	
	Water depth: 3,000 m	
	Design pressure: 5,000 to 10,000 psi	



QUALIFICATION ACTIVITIES PERFORMED

SUBSEA TEST UNIT PROCESS SCHEME

Hydrodynamic behavior

- Tests performed at CERG Grenoble to qualify distribution symmetry and liquid level stability.
- Model scale: $\frac{1}{4}$, Plexiglas, 4 pipes (ID=8 in, H=3 m) with air and water at atmospheric pressure.

Separation performance

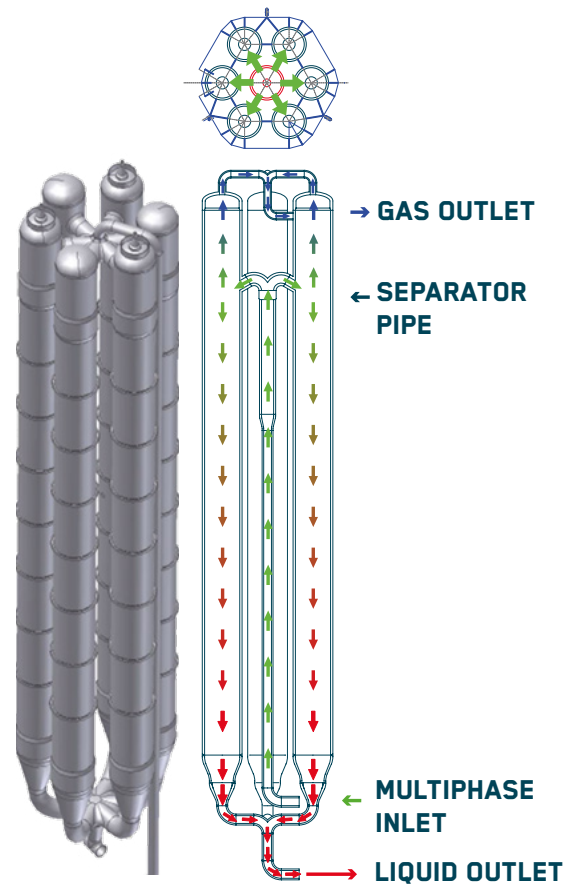
First JIP completed with Total and BP to validate the separator performances.

- Tests performed at IFP Solaize with real crude: measure of GVF at liquid outlet and LCO at gas outlet.
- Model scale: $\frac{1}{4}$, carbon steel, 4 pipes with crude oil, salted water and natural gas under pressure (30 bars, 65°C).

System qualification

Second JIP completed with Total, Petrobras and Eni for the definition and qualification of the whole subsea station.

- Additional performance tests with the plexiglas model performed with several separator internals.
- Manufacturing and mechanical testing of a full scale distributor piece with internal cladding.





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