



## SUBSEA EQUIPMENTS

Developing solutions with excellence. Building a better future.

## SUBSEA EQUIPMENTS FABRICATED BY UNIÃO ENGENHARIA

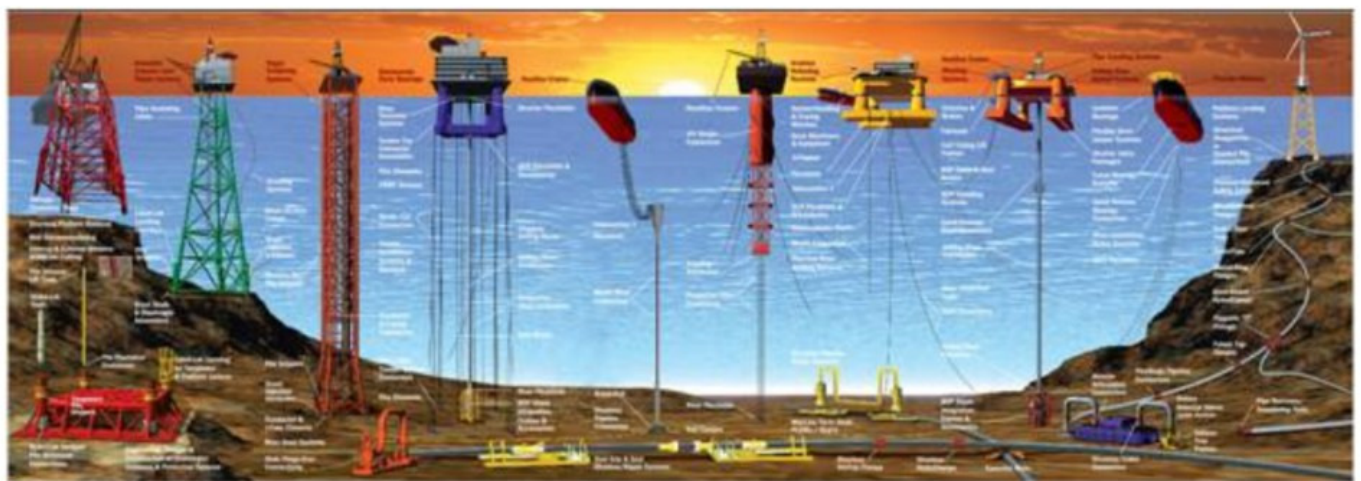
For the TUPÍ/Mexilhão production field, it was required a set of subsea pipelines with equipment to export gas from the FPSO (Floating Production Storage and Offloading) for operation, storage and disposal of oil and gas to the end line point in the Tupi field, through a PLEM (Pipe Line End Manifold), an IN LINE PLET (Pipe Line End Termination), an IN LINE WYE "Y" and a pipeline in the shallow waters PLEM PMXL-1 platform in the Mexilhão field..

The FPSO was directly connected to a 10" connector and two of 18" through another of 10" and PLEM hoses. The stiff jumper of 18" connects the Deep PLEM equipments to the PLET IN LINE. The connection system aimed at ensuring flexibility for the connection options, in addition to improving the development of future infrastructure pipeline.

To carry out this project the União Engenharia and Oil States Industries, provided equipment with underwater connectors, and other auxiliary equipment. This supply allowed the Petrobras to import gas from the FPSO to PMXL-1 platform, and other planned field with gas export lines.

The maximum installation depths were 2,200 meters. The system used regular connecting structures and subsea connectors off vertical type. All equipments supplied by Union Engineering / OSI are operated by ROV (Remotely Operated Vehicle).

The União Engenharia scope was fabrication, assembly, test and equipment delivery to provide a complete system for Petrobras. OSI was already responsible for the connectors components and installation tools.





## SUBSEA EQUIPMENTS FABRICATED BY UNIÃO ENGENHARIA

### SUBSEA EQUIPMENTS FOR DEEPWATER

Depth : 2.200 m

Pressure : 5.000 psi

Process fluid : Gas

Minimum temperature: 2° C

Lifetime: 30 years



#### a) Deep PLEM (Tupi FPSO):

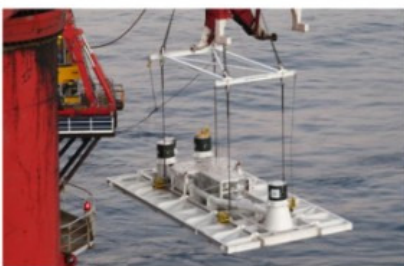
Located near by Tupi FPSO for the interconnection of two risers of 18" and one riser of 10" with a pipeline of 18".

Length : 20,3 m

Width : 10,4 m

Height : 4,8 m

Weight : 124,8 t





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### b) IN LINE PLET (Tupi FPSO):

Installed on the export pipeline near the Tupi FPSO.

Length : 37,0 m

Width : 13,3 m

Height : 4,1 m

Weight : 85,5 t





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### c) IN LINE WYE "Y":

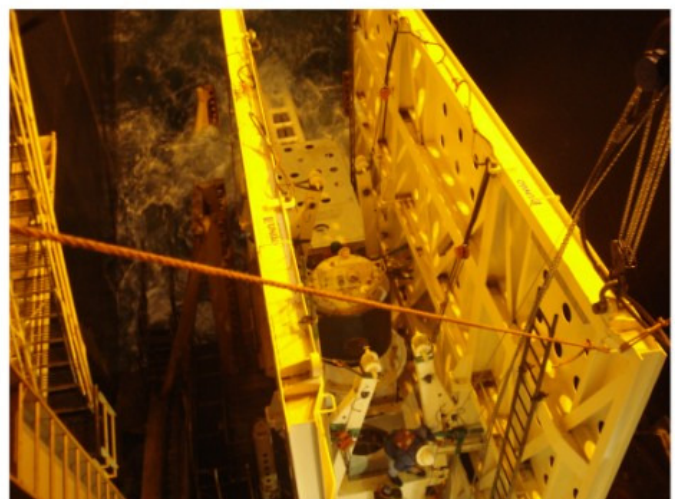
Installed on the export pipeline Tupi x Mexilhão.

Length : 55,2 m

Width : 15,7 m

Height : 4,1 m

Weight : 99,0 t





## SUBSEA EQUIPMENTS FABRICATED BY UNIÃO ENGENHARIA

### SUBSEA EQUIPMENT FOR SHALLOW WATER

Depth : 300m

Pressure: 5000 psi

Minimum Temperature: 4 °C

Process Fluid: Gas

Lifetime: 30 years



### SHALLOW PLEM:

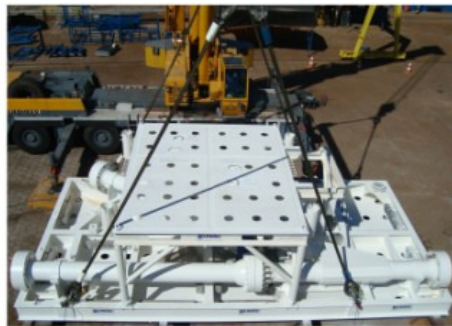
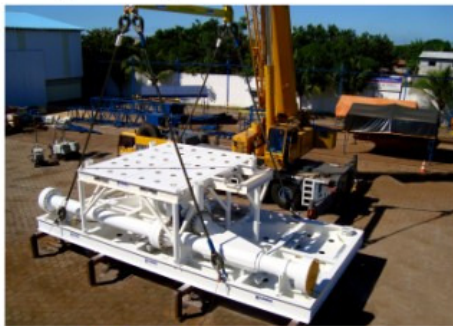
Connected to PMXL-1 through stiff flanged spool.

Length : 10,5 m

Width : 5,4 m

Height : 2,8 m

Weight : 57,6 t





## SUBSEA EQUIPMENTS FABRICATED BY UNIÃO ENGENHARIA

The Uote (Offshore Export and Transfer Unit) is an offshore terminal that consists of a FSO (Floating, Storage and Offloading) connected to two monobuoys, stiff pipelines and subsea equipments. This unit will be placed in the Campos basin approximately 80 km north of the Rio de Janeiro. It will temporarily store the oil received from the FSO and transfer it to other ships anchored at the monobuoys. It is also possible to transfer oil from a container to another through the monobuoys without using the FOE (Floating Offloading Equipment).

In this project the União Engenharia supplied nine (09) subsea equipment to be installed at 70 meters depth.

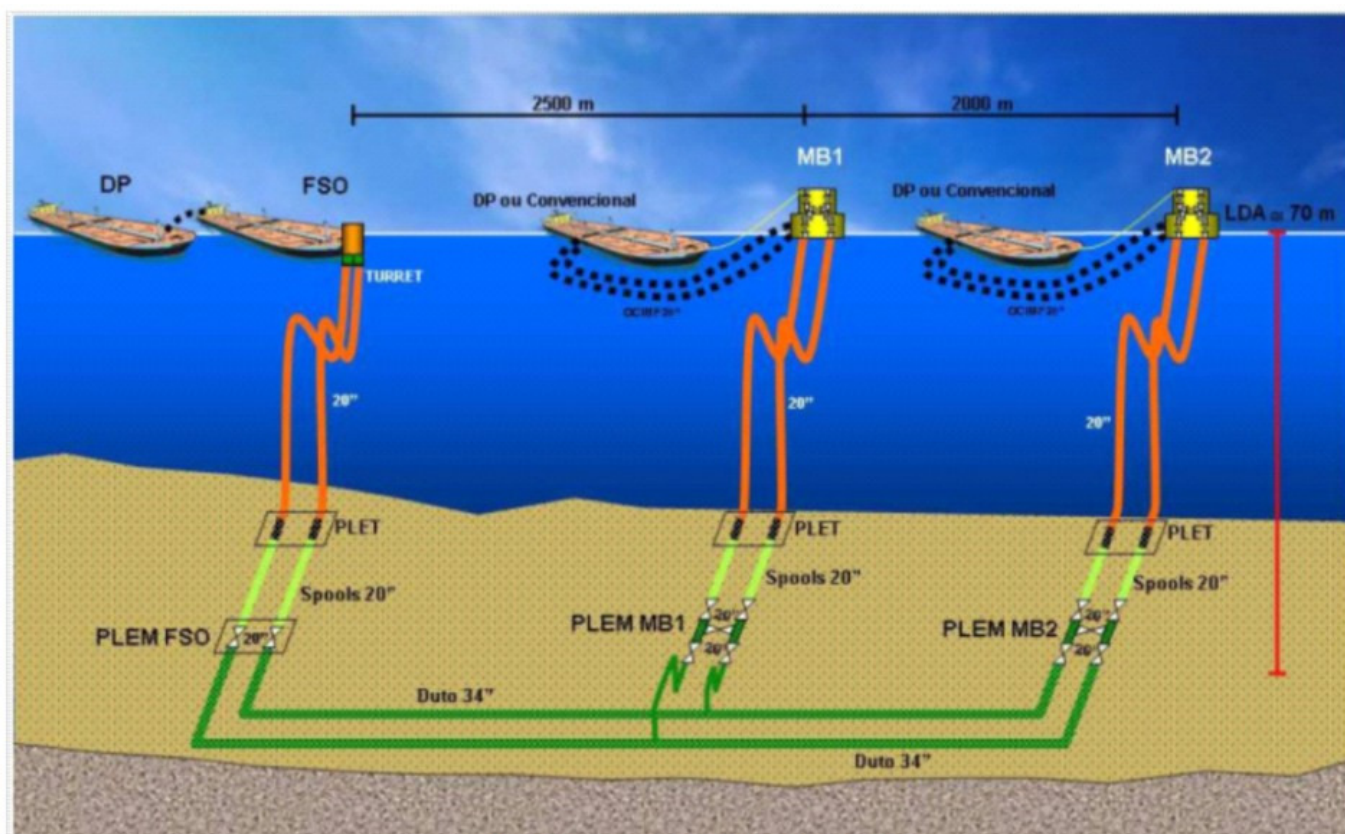


Figura 1 – Esquemático da UOTE

## SUBSEA EQUIPMENTS FABRICATED BY UNIÃO ENGENHARIA

### SUBSEA EQUIPMENTS FOR SHALLOW WATER

Installation depth : 70 m

Pressure : 593,113psi

Process fluid: Oil

Minimum temperature: 15° C

Lifetime: 25 years



### PLET SPI-A:

Length : 18,78 m

Width : 4,24 m

Height : 2,6 m

Weight : 36,64 t





## SUBSEA EQUIPMENTS FABRICATED BY UNIÃO ENGENHARIA

### PLET SPI-B:

Length : 18,5 m

Width : 4,24 m

Height : 2,6 m

Weight : 36,2 t





## SUBSEA EQUIPMENTS FABRICATED BY UNIÃO ENGENHARIA

### PLET SPI-C:

Length : 18,1 m

Width : 4,24 m

Height : 2,6 m

Weight : 37,8 t





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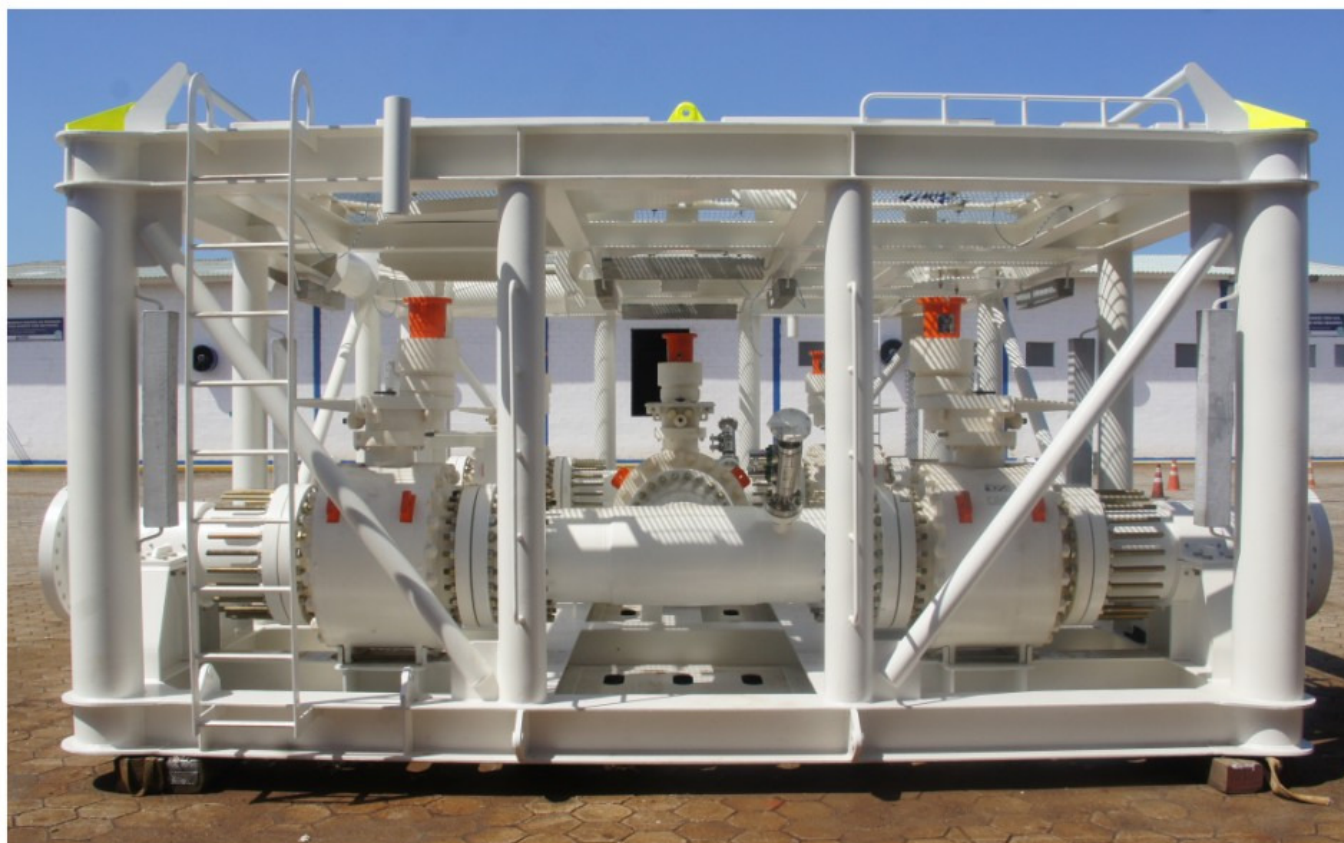
### PLEM MB1:

Length : 7 m

Width : 6,85 m

Height : 2,89 m

Weight : 44 t





## SUBSEA EQUIPMENTS FABRICATED BY UNIÃO ENGENHARIA

### PLEM MB2:

Length : 7 m

Width : 6,85 m

Height : 2,89 m

Weight : 44 t





## SUBSEA EQUIPMENTS FABRICATED BY UNIÃO ENGENHARIA

### PLEM FSO:

Length : 7,24 m

Width : 3,14 m

Height : 2,89 m

Weight : 22,75 t





Blessed is the nation whose God is the Lord. Psalms 33:12

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