

# Synthetic fibre ropes: new applications



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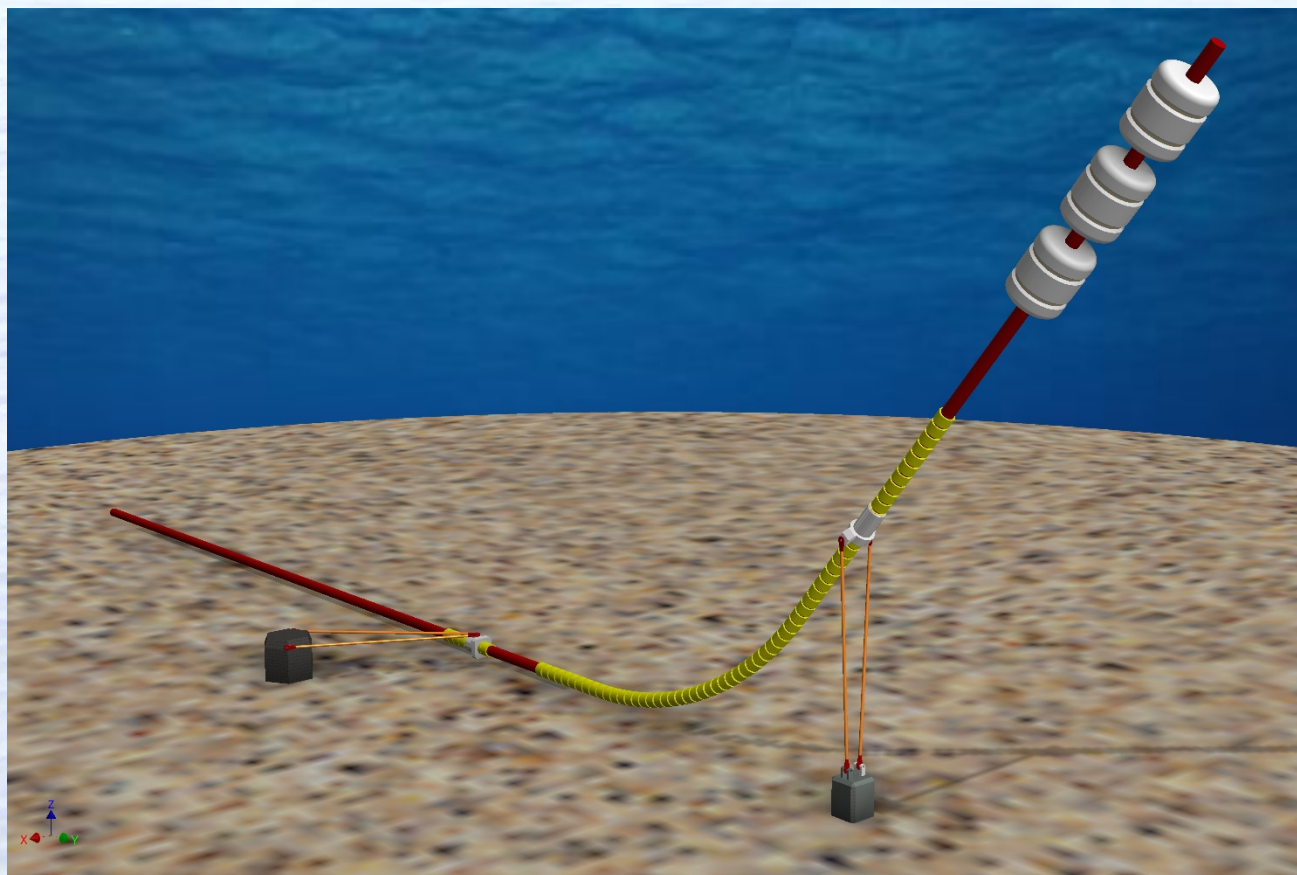
# Agenda

1. Offshore Riser/Umbilical tethers
2. Offshore Deep Water Deployment
3. Offshore Deep Water Mooring

# Riser tethers/Umbilical tethers/MWA

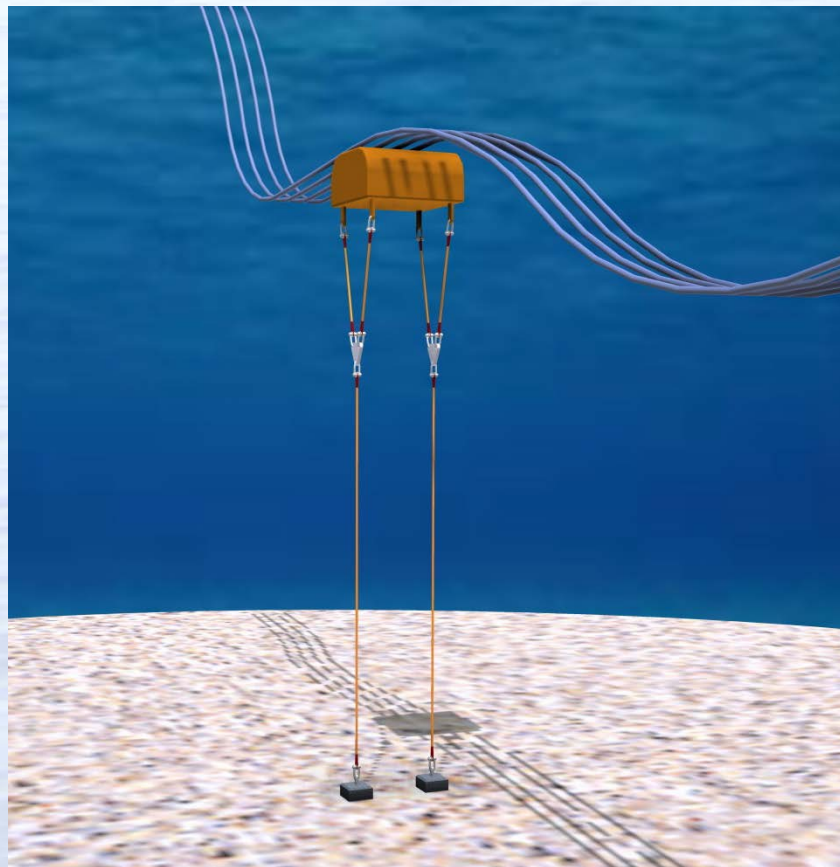
# Synthetic Tethers

## Umbilical & Riser tethers



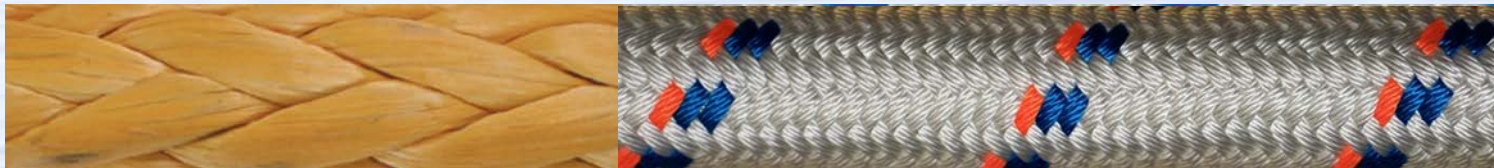
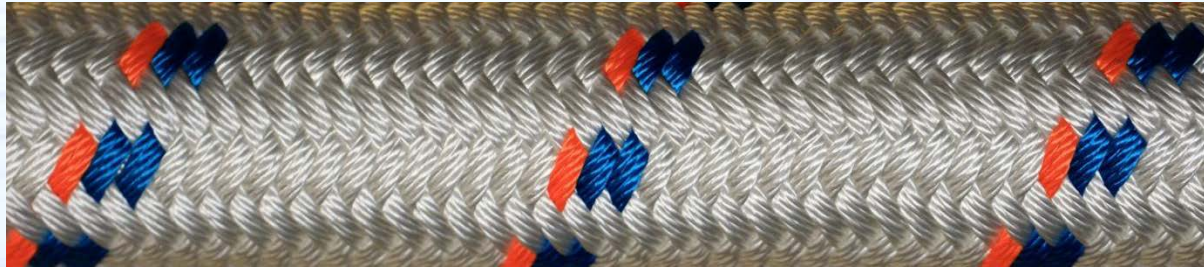
# Synthetic Tethers

## Middle Water Arches Buoy (MWA)



# Rope constructions

# LankoForce® 12 strand rope with jacket



- Core: strength member
- Jacket: protection only

# LankoForce® 12 strand rope with jacket



- Jacket: protection only
- Filter: restring ingress particles
- Core: strength member



# 2014: Umbilical tethers – GIRRI II project

Rope: LankoForce® Dyneema® with Tipto® jacket

Ø: 28 mm

Shape: “V”

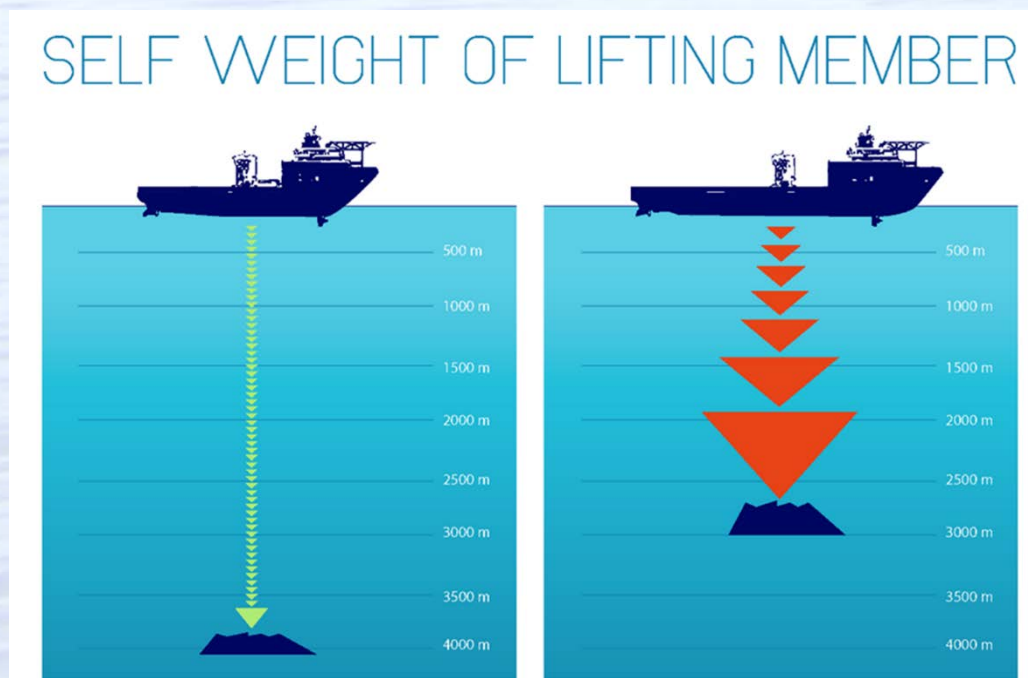
Length: 18,5 m



# Deep Water Deployment

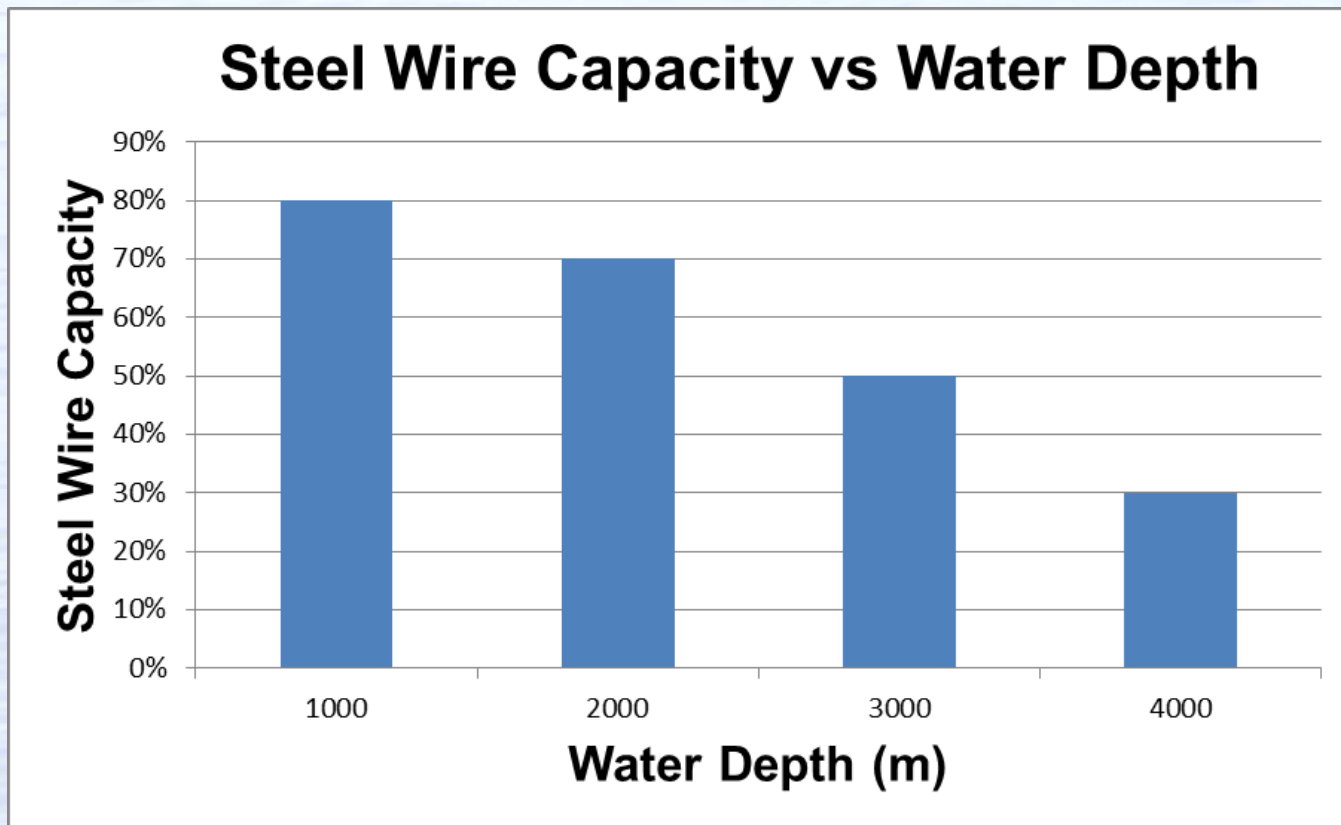
# Lifting/lowering technology

Self weight steel wire ropes makes wire rope lifting/lowering systems inefficient & impractical water depths > 3,000 meters.



# Capacity steel wire vs water depth

Steel wire capacity will decrease with the water depth



# LankoDeep<sup>®</sup> rope - Dyneema<sup>®</sup> 12x3 construction



1. Yarn & coating
2. Rope construction
3. Rope coating

# Thinking beyond steel...

Subsea Crane

## Steel:

3000m x Ø 60mm

Weight Air: 57 ton

Weight Water: 49 ton

## LankoDeep<sup>®</sup> AHC:

3000m x Ø 76mm

Weight Air: 11.5 Te

Weight Water: 0 Te

# Advantages LankoDeep<sup>®</sup> AHC

	Steel	Fiber
<b>Weight</b>	Heavier (5-7x)	Light
<b>Corrosion</b>	Yes	No corrosion
<b>Bending</b>	Good	Good
<b>Abrasion</b>	Excellent	Good
<b>Cutting resistance</b>	Excellent	Moderate
<b>Temperature resistance</b>	High	Limited
<b>Inspection inside</b>	Difficult	Easy
<b>Splice (strand)</b>	No	Yes
<b>Grease</b>	Bad for environment	No grease

# Rope

**LankoDeep<sup>®</sup> AHC**

**Ø: 76 mm**

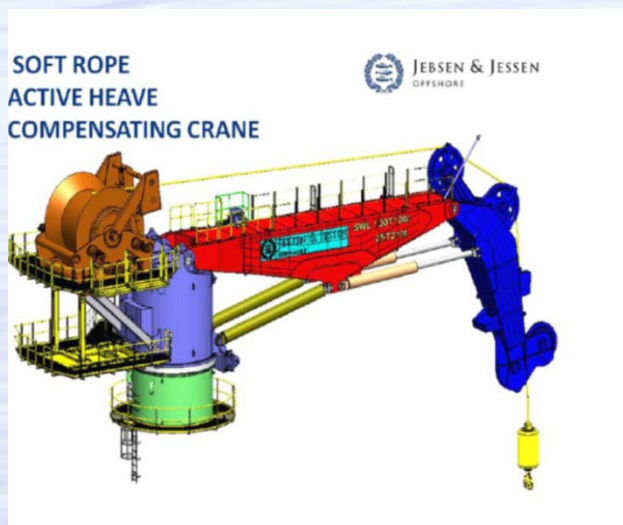
**Length: 3.000m**

**WLL: 110t@3000m**





# First synthetic fibre rope AHC knuckle boom crane in the world



# Vessels



# Drum winch

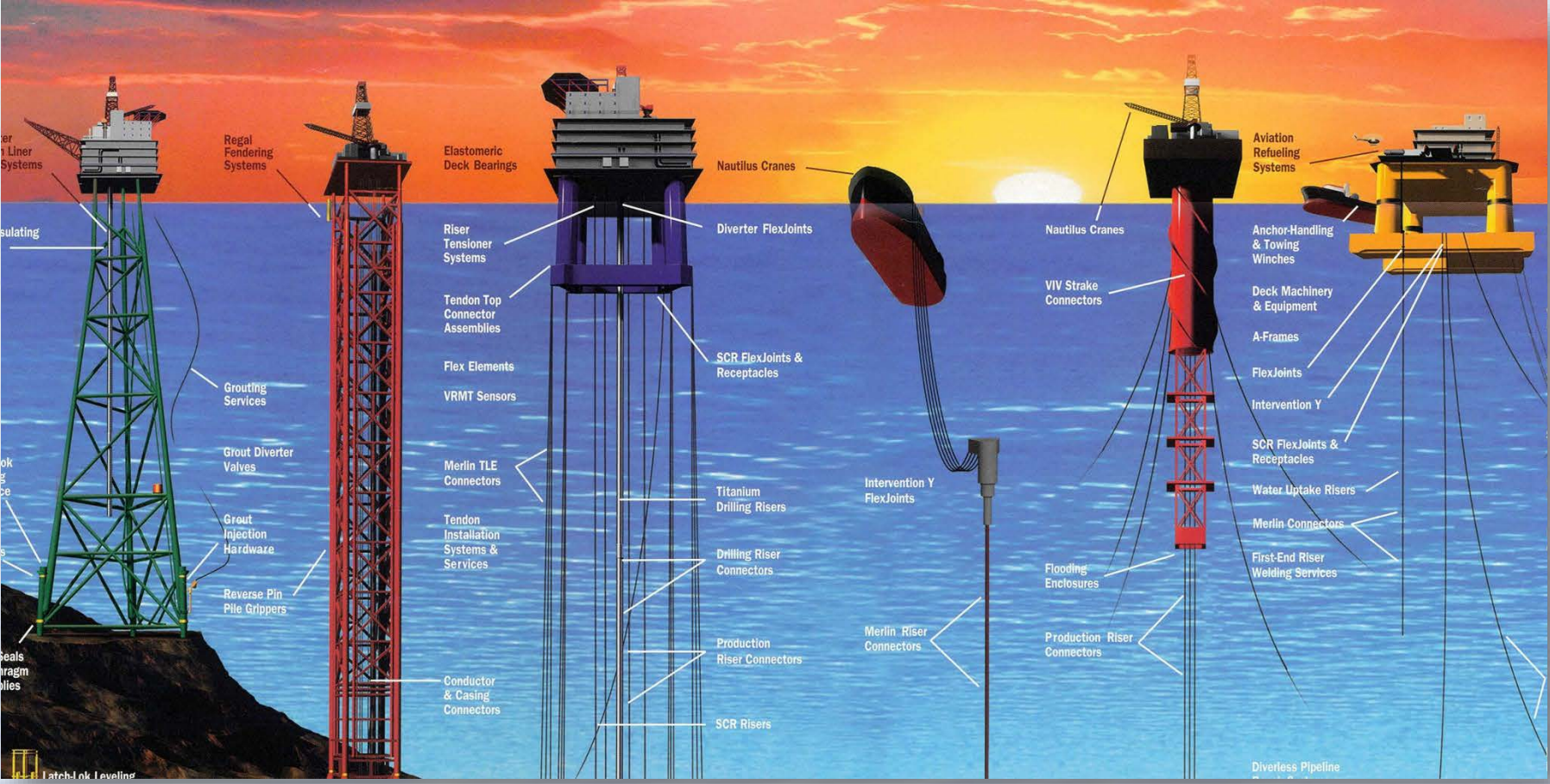
## Innovative drum profile



# Crane

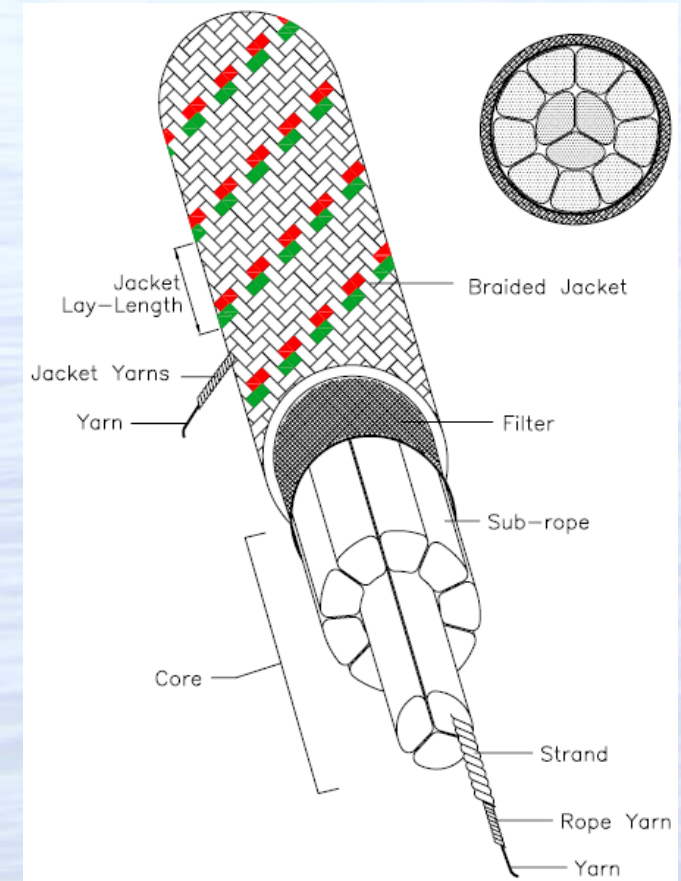


# Deep Water Mooring



## Gama98<sup>®</sup> Polyester rope construction

- Construction: Gama 98<sup>®</sup>
- Core: 12 Braided sub-ropes (laid parallel)- Polyester
- Jacket: Braided - Polyester
- Filter: between core/jacket - restricted ingress of particles



# Why rope is called Gama98<sup>®</sup> ?

- Rope patented in 1998
- In recognition 500<sup>th</sup> anniversary of the Portuguese explorer Vasco da Gama – 1<sup>st</sup> arriving to India by sea.
- External marking red and green = Portuguese national flag





# 1998 P-36 – First Deep Water Mooring project

Project: P-36



Customer: Petrobras

Rope: Gama98<sup>®</sup> Polyester 1000t

MBL x 12,600 m



# 1998 P-36 – First Deep Water Mooring project

After installation, the platform sunk



# 2005 – First Deep Water Mooring project in GOM - USA

Project: Tahiti

Customer: Technip/USA

Final Customer:

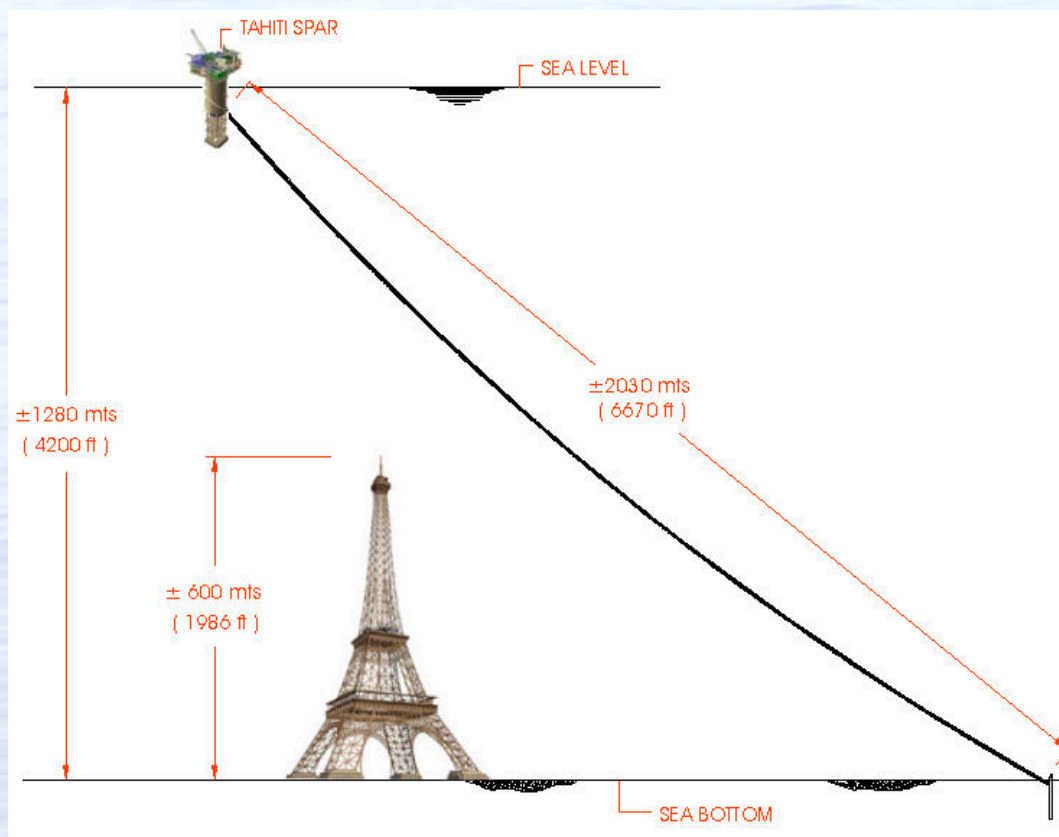
Chevron/USA

Rope: Gama 98<sup>®</sup> Polyester

1907t MBL x 26,000m



# 2005 – First Deep Water Mooring project in GOM - USA



# Trial fit H/link & rope



# 2011 - Goliat

Projet: Goliat

Customer: Sevan Marine

Final customer: ENI/Norge

Rope: Gama98<sup>®</sup> Polyester

2550t MBL x 12,000m



# 2011 - Goliat

1. Biggest rope in world:  
Ø 290 mm; 55 kg/m;  
2550t MBL
2. First permanent mooring in  
Norway
3. First rope with a Jacket Cut  
Resistant



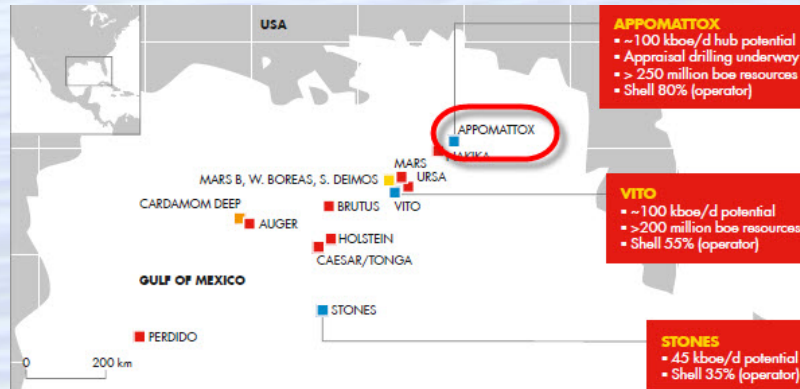
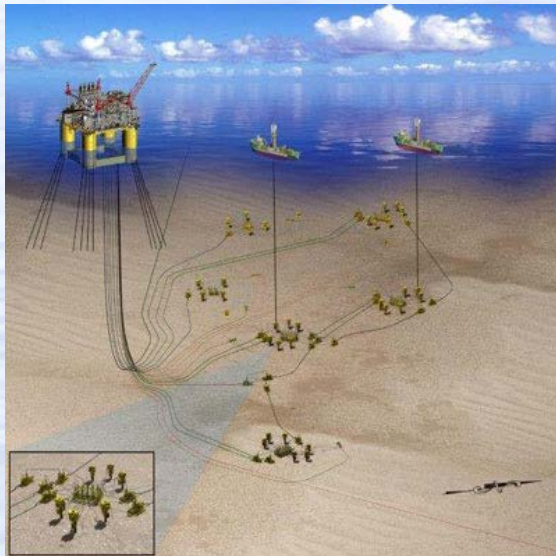
# 2015 - Appomattox

Projet: Appomattox

Customer: Shell/USA

Rope Gama98<sup>®</sup> Polyester 2154t MBL x 65.000m

Biggest polyester order





**Obrigado  
Thank you**