TechnipFMC

Next Generation Thermoplastic Hose

AOG 2017 – Perth, Australia

February 2017

Overview

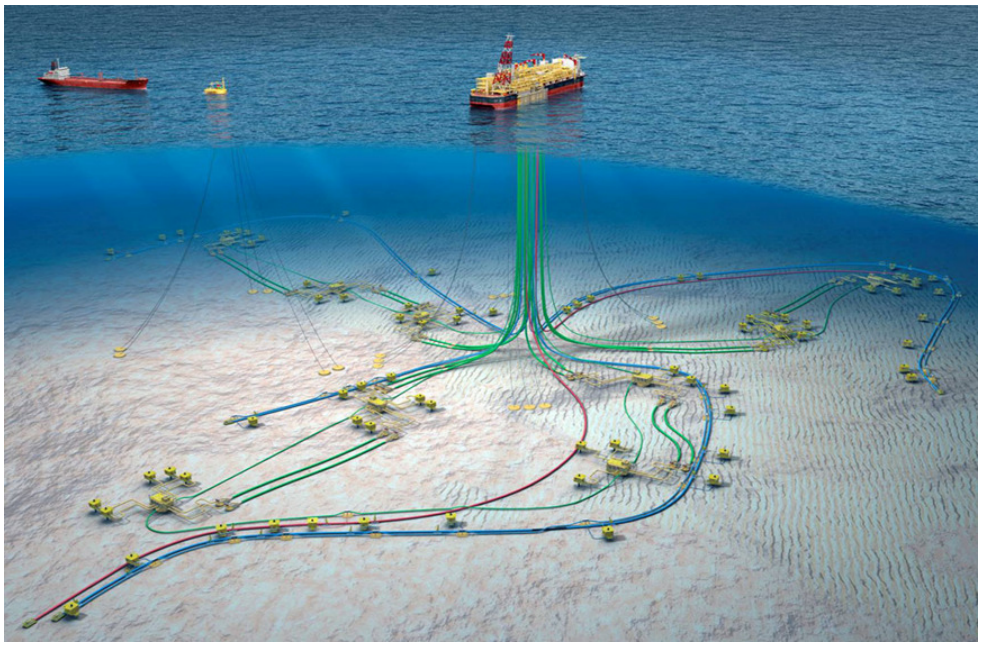
Function of Subsea Umbilical

Critical supply and control link

- Power – Hydraulic & Electrical
- Chemicals - MeOH
- Control – Electrical & Optical

Umbilical Types

- Thermoplastic hose - TPU
  - High fatigue resistance
  - ~20% more cost effective
  - Robust, 4:1 burst ratio
- Steel tube - STU
  - Deeper water
  - Higher working pressure
  - Expensive temperature coatings

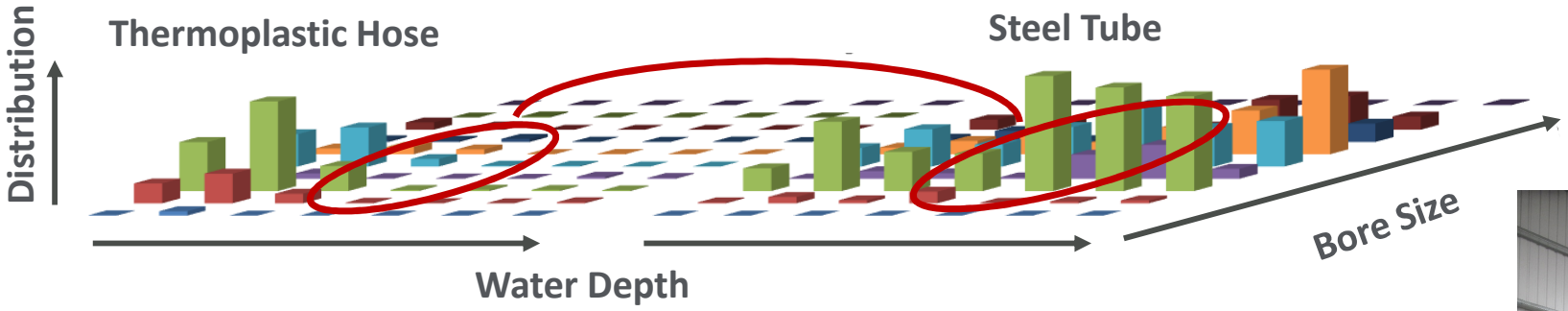


Future prospects in deeper water, higher pressures.

STU TPU

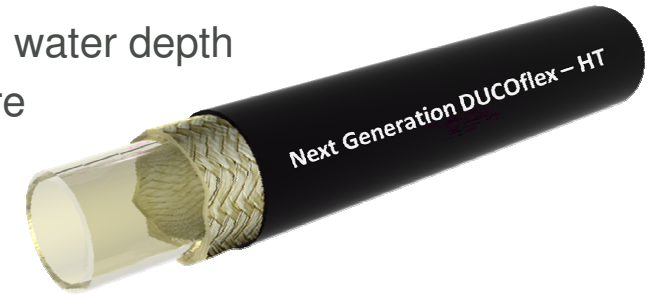
Opportunity for Thermoplastic Hose

Distribution of hose and steel tube bore against water depth



Expanding hose capabilities to meet market needs

- Hose can complete more with steel tube to 1500m water depth
- Limited by Pressure, Water Depth and Temperature
- Perceived tieback length limitation



Hose development R&D Program

- New liner materials – DUCOflex HT
- Braid design optimization – over 250 prototypes built and tested

Next Generation Thermoplastic Hose – A new range

Enhanced hose performance for cost effective alternative to steel tube

- New materials and design optimisation, full ISO qualification

Higher Pressure capability across the range

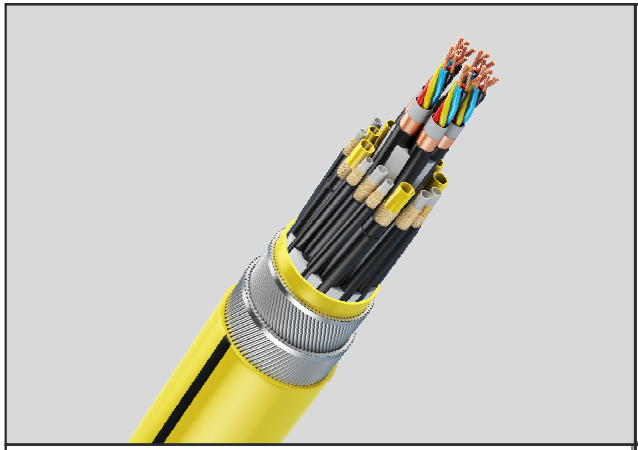
- Designs to compete with Steel Tube

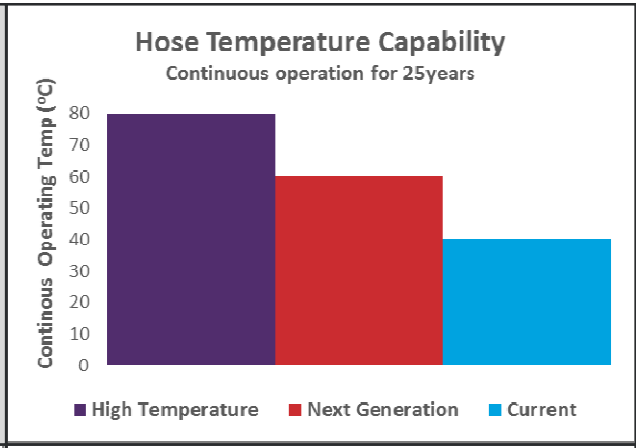
Increased continuous high temperature operation up to 80°C for 25 years

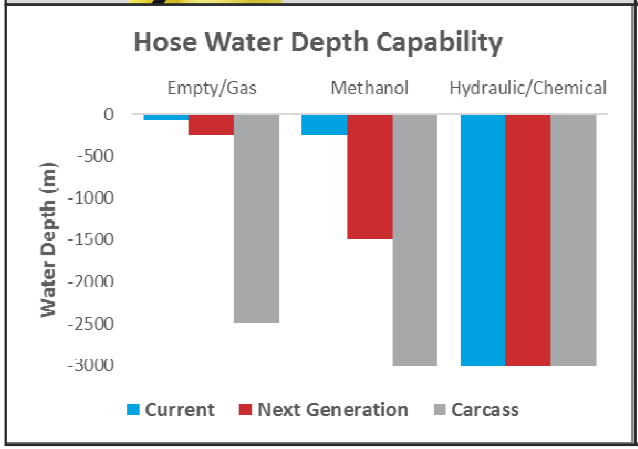
- Out performs uncoated Steel Tube capability

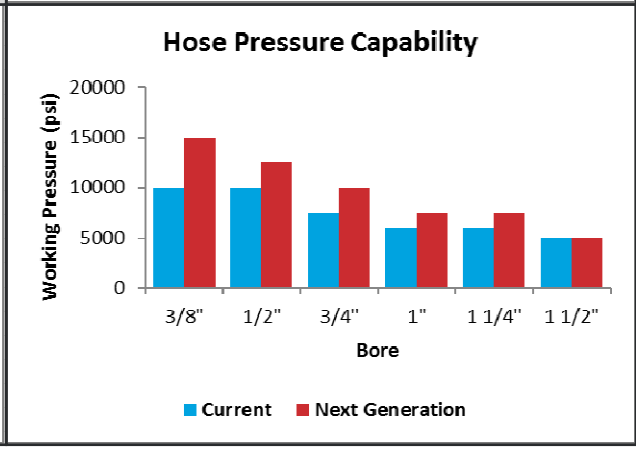
Deep water non-carcass MeOH service to 1500m

New patented coupling design









Qualification Status

High Temperature ‘H’ Range

- Materials proven
- First application award 2016

Bore (inch)	Pressure (psi)	MEOH Water Depth (m)	Proven Concept	ISO / API Qualification
½”	5000	Medium	✓	Complete
½”	7500	Medium	✓	Complete

High Pressure Hose - ‘E’ range

- Industrialised hose samples
- Priority on historical most popular sizes
- Qualification duration 3months (typ)

Bore (inch)	Pressure (psi)	MEOH Water Depth (m)	Proven Concept	ISO / API Qualification
3/8”	High	*	✓	Ongoing
½”	High	*	✓	Ongoing
¾”	High	Medium	✓	Ongoing
1”	Medium	Deep	✓	Ongoing

Long term Chemical Compatibility

- Prove DUCOflex HT is better than field proven DUCOflex

Fluid	Transaqua HT2	Brayco Micronic SV3	Brayco Micronic SVB	Oceanic HW443	Oceanic HW740R
Status	No degradation after 6 months	No degradation expected	No degradation expected	No degradation expected	No degradation expected

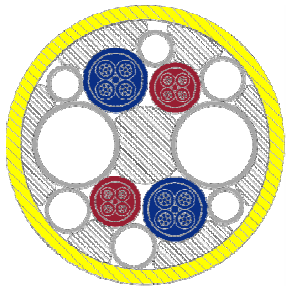
Application and Benefits

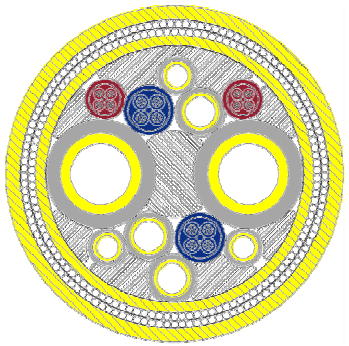
Control Umbilical

North Sea – Deep water & High Pressure

STU			TPU
91.4	OD (mm)	↑	138
12.0	Mass air (kg/m)*	↑	28.7
54	Weight water (N/m)	↑	136
16.6	Diameter/Weight Ratio	↓	10.0
245	Max Load (kN)	=	250
1.4	MBR (m)	=	1.4
6	Bending Stiffness (kN.m²)	=	7
9	**Delivery** (months)	↓	6
	Hardware Cost Supply & fit	↓	-50%
	Project Price	↓	-20%

*mass in air can be optimised if required





Multi-Phase Pumping Umbilical

Electrical power cables elevate operating temperature

- Cost saving over FBE coated tubes
- No fatigue or corrosion derating required
- No electromagnetic induced voltage or corrosion
- Excellent continuous high temperature operation

Expanding the working pressure, operating temperature and water depth capabilities of hose to align with market needs, enables more subsea projects to access the benefits of Thermoplastic Umbilicals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