Modeling and Characterization of Novel Deepwater Composite Risers

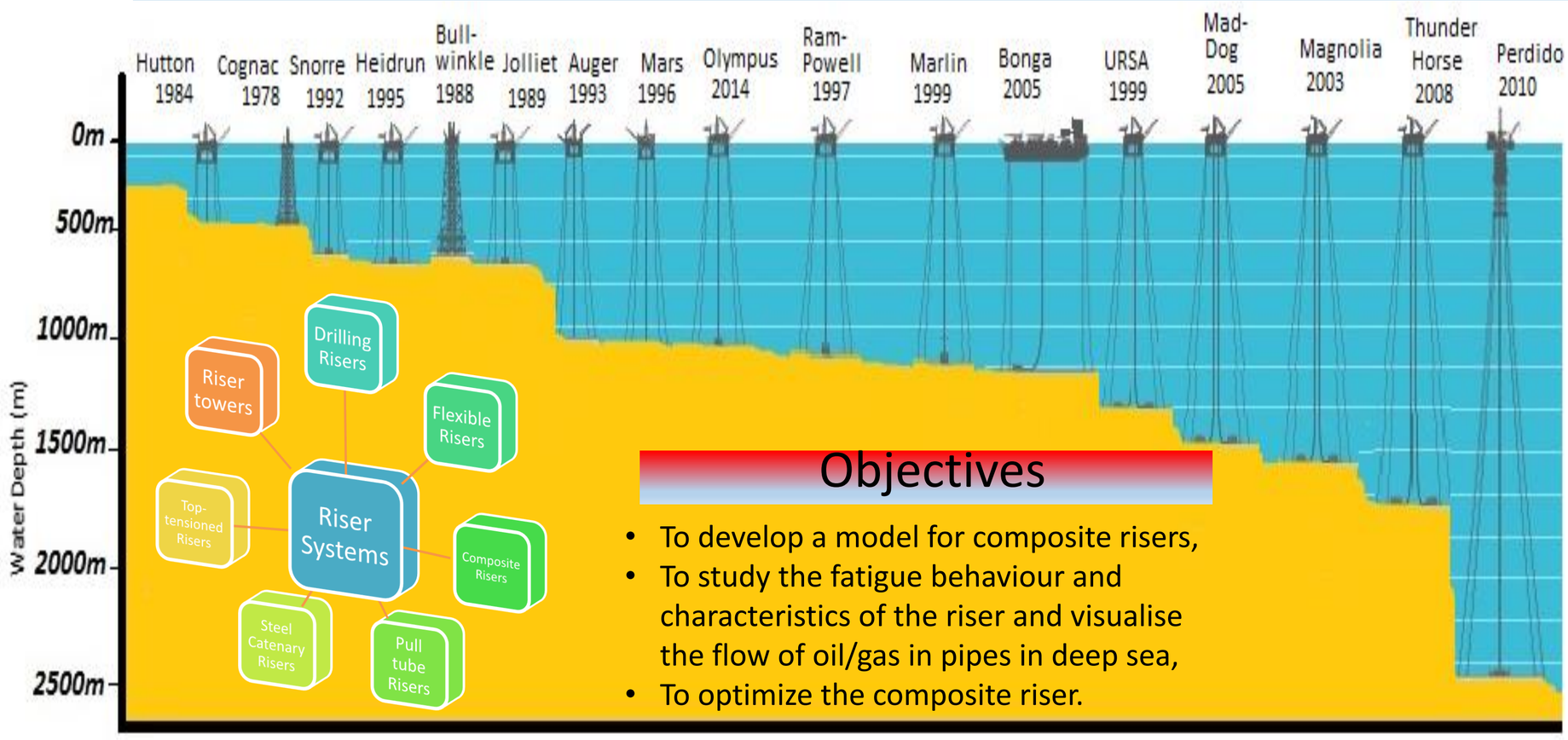
Amaechi Chiemela Victor[1]
1st Year PhD Student – Engineering Department
Supervisor: Prof. Jianqiao Ye
[1]Email: *c.amaechi@Lancaster.ac.uk*

Motivation

- Different types and sizes of pipes are used, like the drill pipes, risers and the horizontal pipes. The dimensions could be 30” (76cm) or more as they are large capacity pipelines.
- The earliest known oil wells were drilled in China in 347 AD or earlier. They had depths of up to about 800 feet (240 m) and were drilled using bits attached to bamboo poles.
- The history of oil exploration dates to 1891 when the first oil well was drilled at Grand Lake St Mary’s, Ohio.
- In 2003 in Gulf of Mexico, only 35% of production was from wells at depths of >300m. By 2015, that figure was 95%.

Why Choose Composite Risers?

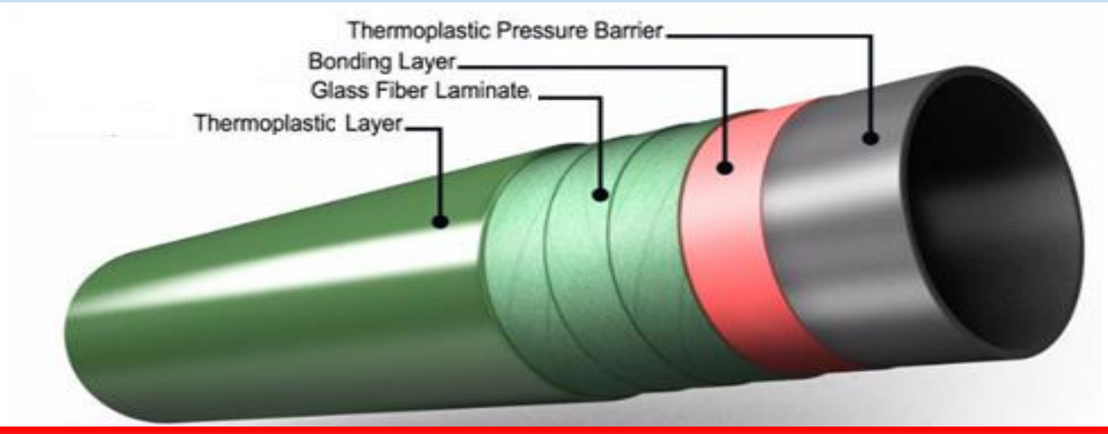
History on Offshore Deepwaters



Objectives

- To develop a model for composite risers,
- To study the fatigue behaviour and characteristics of the riser and visualise the flow of oil/gas in pipes in deep sea,
- To optimize the composite riser.

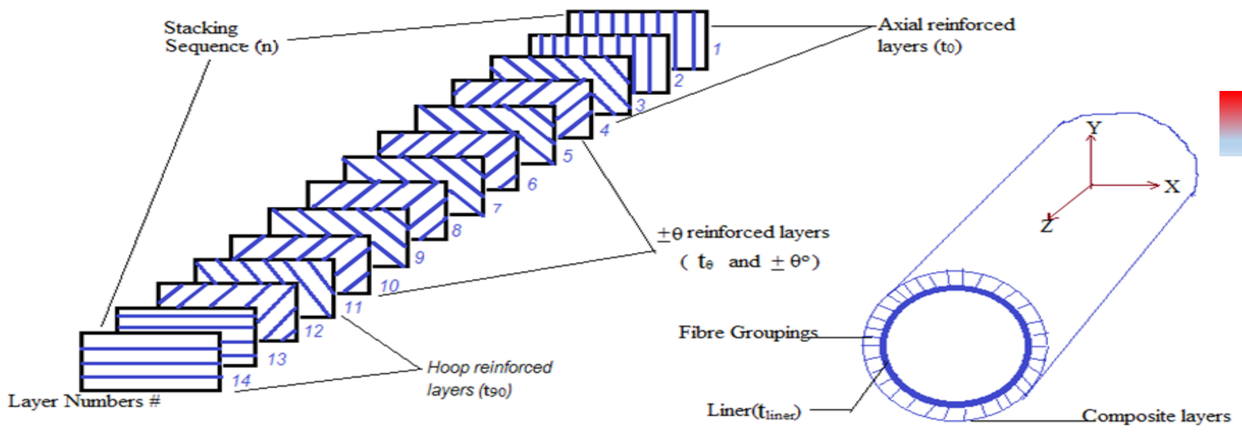
Composite Tubes



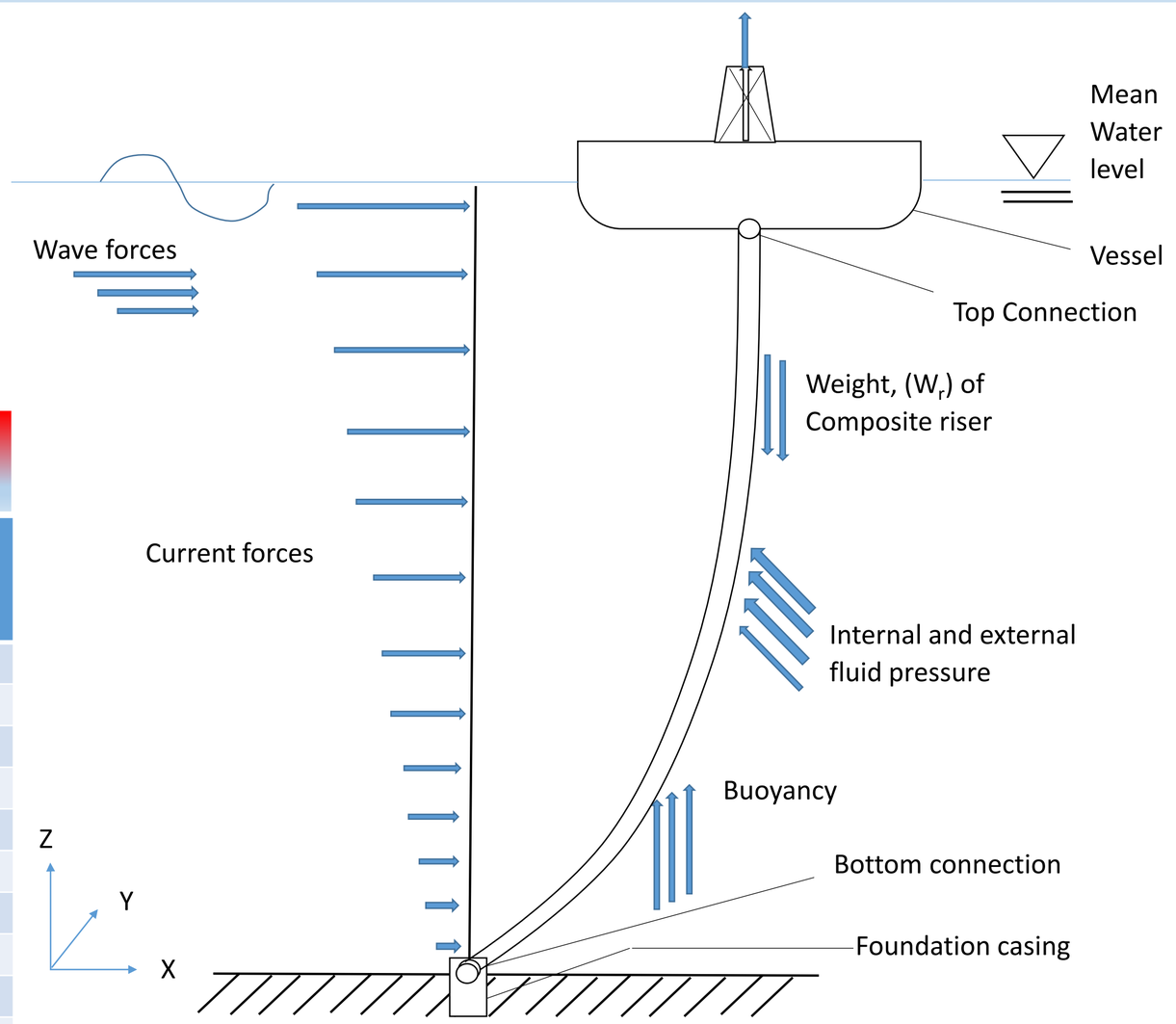
Material Properties

PROPERTY	Specific Gravity	Density (kg/m³)	Thermal conductivity (w/m-°C)	Heat capacity (J/kg/°C)	Poisson ratio V_{12}	Young’s modulus (GPa)
Sea Water	1.0	1,030	0.6	4,200	0.5	2.15
Steel	7.8	7,850	50	480	0.30	200
Titanium	4.43	4430	19	540	0.342	113.8
Aluminium	2.78	2780	204.26	910	0.33	68.9
AS4-Epoxy	1.53	1530	----	----	0.32	----
AS4-PEEK	1.56	1561	----	----	0.28	66
P75/Epoxy	1.78	1776	----	----	0.29	----
P75/PEEK	1.77	1773	----	----	0.30	33
PEEK	1.32	1300	----	----	0.40	5.15
Composite Riser	1.68	1680	0.5	1,200	0.28	----

Parametric of a Composite Riser Tube



Loads on Composite Risers



Conclusion

Composite riser behave differently from Steel Risers, they were first deployed in deepwaters in 2002, and there are some challenges, e.g. lack of standards on Composite Risers. Composite materials offer a range of benefits that could improve riser technology.

References

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