

# EDRIVE - MEC

## Magnetic Gear Update

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# Why Magnetic Gears?

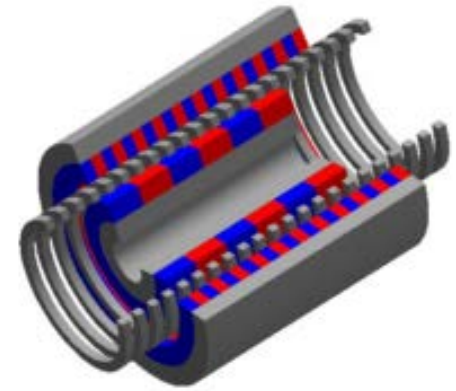
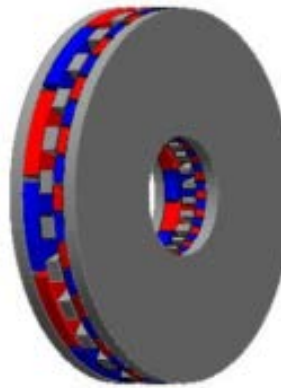
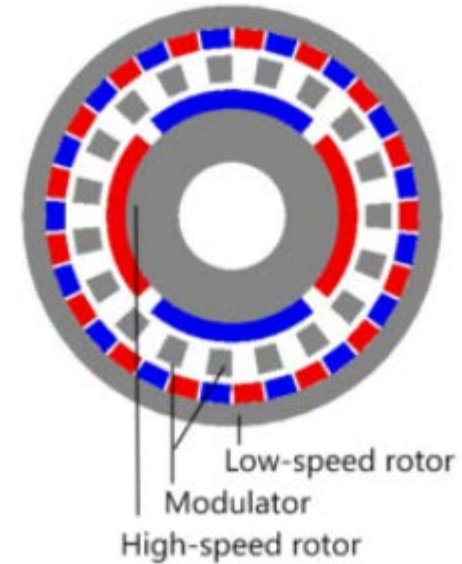
Issues with wave and tidal energy:

- **High operation and maintenance costs**
- Highly variable forces
- Low frequency

# The Magnetic Gear Solution

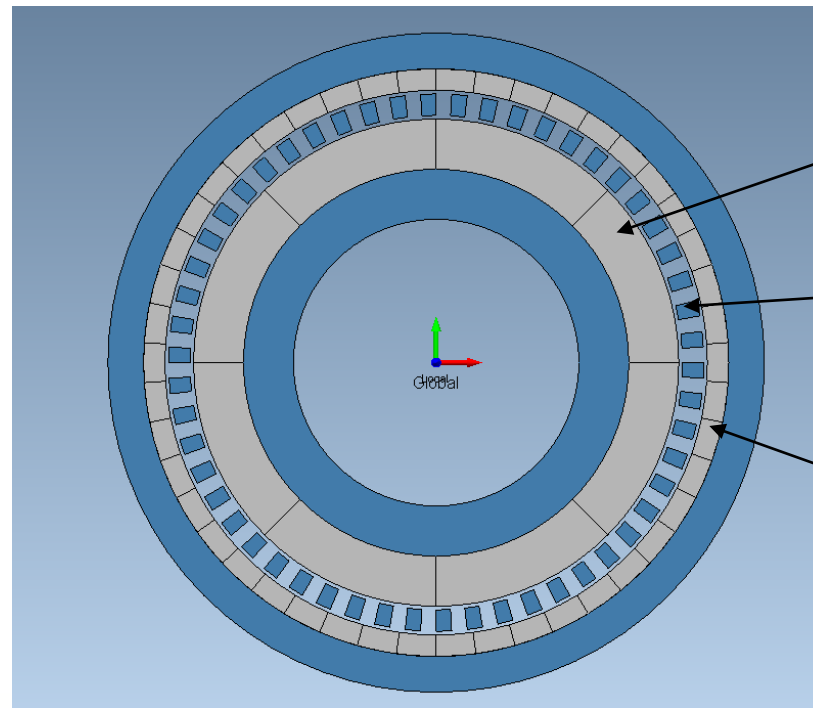
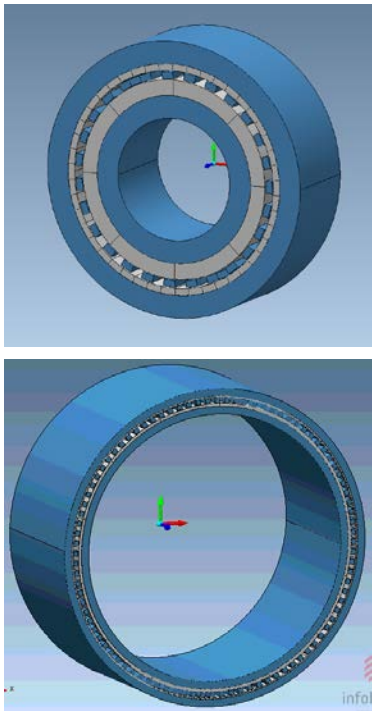
Magnetic gear advantages:

- Contactless torque transfer
- Machine sizing
- Overload protection
- Adaptability



# MG Modelling Tools Developed

- 2D tool in xfemm
- Full 3D tool in MagNet



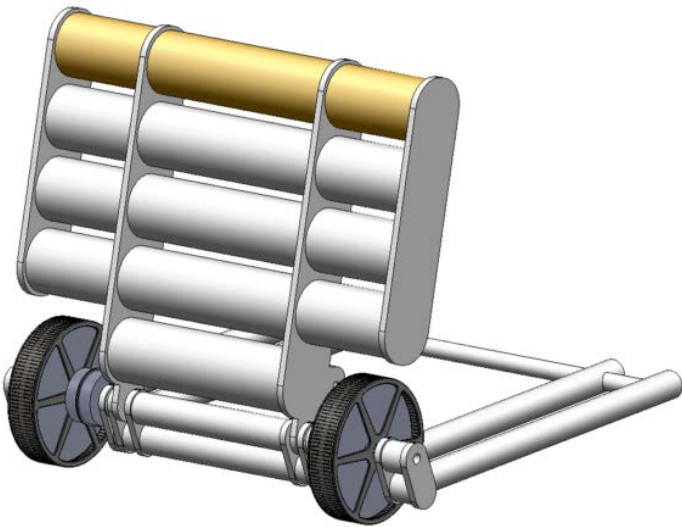
High speed rotor

Ferromagnetic pole rotor

Low speed rotor

# EWTEC Paper

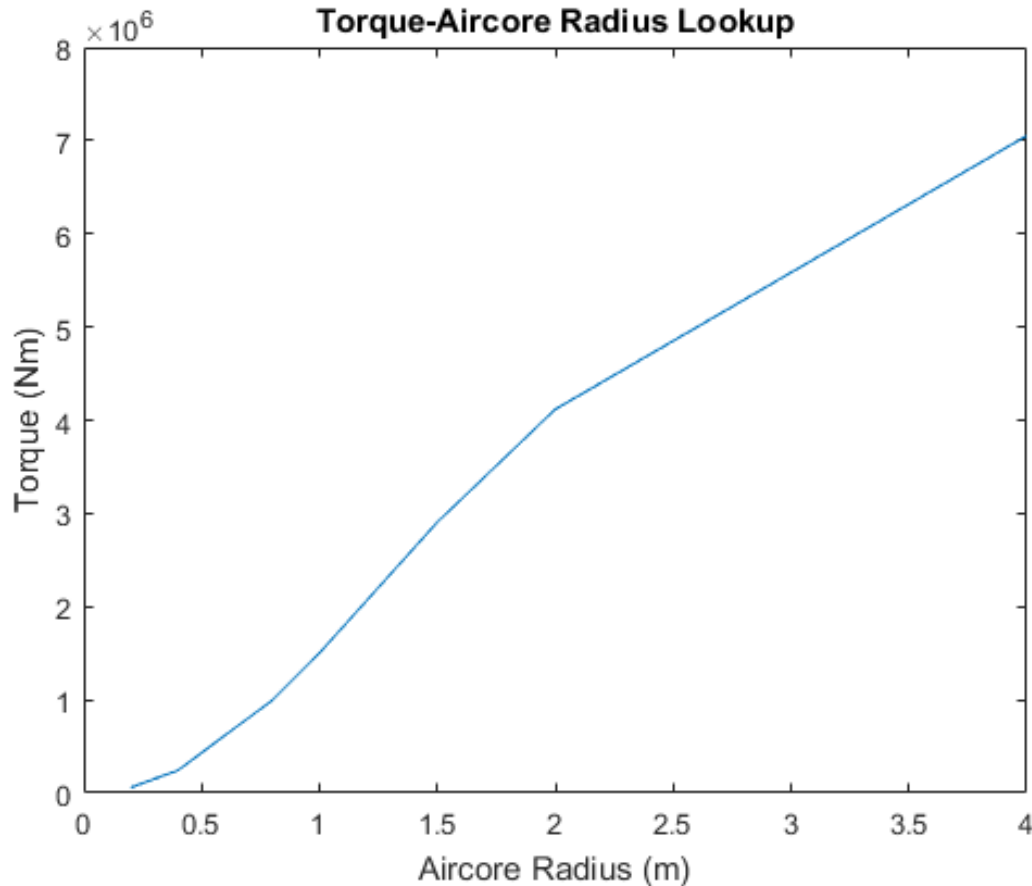
Designing a magnetic gear for the Aquamarine Oyster device to get an appreciation for size and cost



Key design objectives:

- 3.1 MNm Torque (99.95% operating conditions)
- Gear ratio: 10-15:1

# Design Initial Results



## Initial design results:

Airgap Diameter: 4.2m

Axial Length: 2m

Total magnetic material: 1.347m<sup>3</sup>

Total active ferromagnetic material:  
4.47m<sup>3</sup>

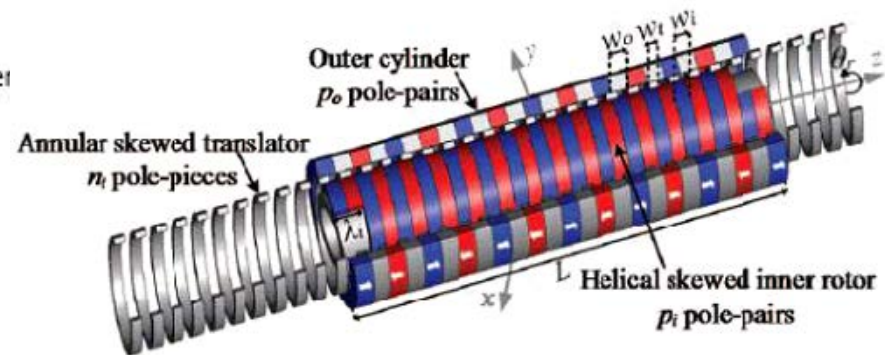
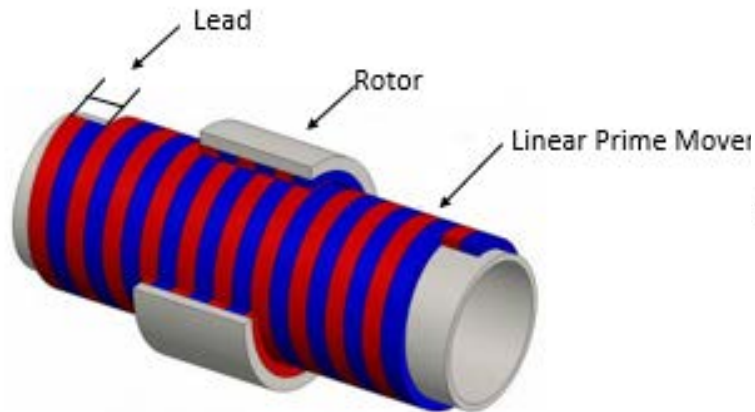
Average ratio achieved: 12.2:1 (or  
13.2:1)

Inner rotor poles: 14

Outer rotor poles: 170

# Future Work

- Further case studies
- Develop tool for trans-rotary magnetic gear design and apply in a heaving buoy type WEC
- Build prototype



# Thank You

## Any Questions?

Review paper presented at RPG 2016 (with extended version submitted for journal publication in IET RPG 2016 Special Issue): **Review of Magnetic Gear Technologies and their Applications in Marine Energy**