

# Modeling the deformation of gravity cages using AquaFE

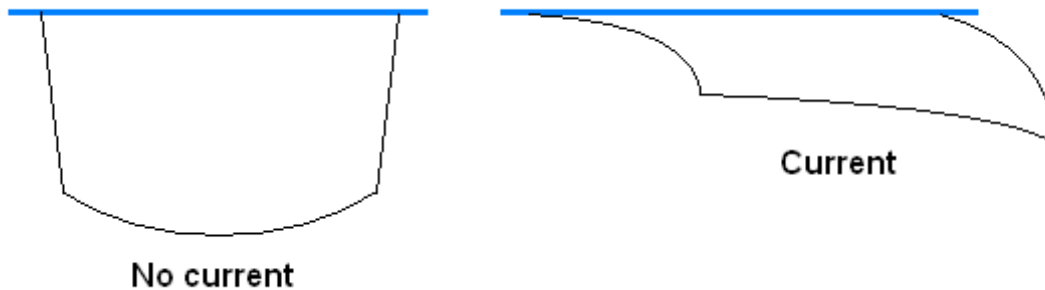
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Tórshavn, Faroe Islands 14 – 18 Aug 2005

# Gravity cages

Gravity cages:

- Cheap and easy to build
- Flexibility is an advantage in waves
- Largest drawback is the deformation of the netpen in current

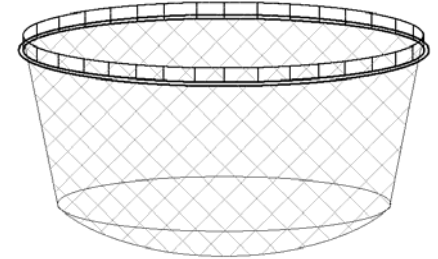


# Gravity cages in the Faroes

## Weight integrated in net

3 kg/m

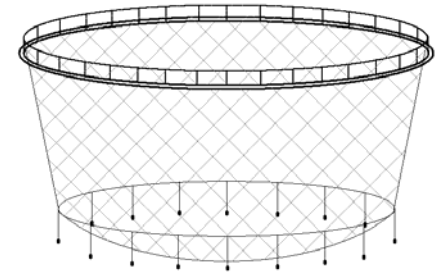
(380 kg for a 128 m cage)



## Weights around net bottom

32x15kg for 128 m cage

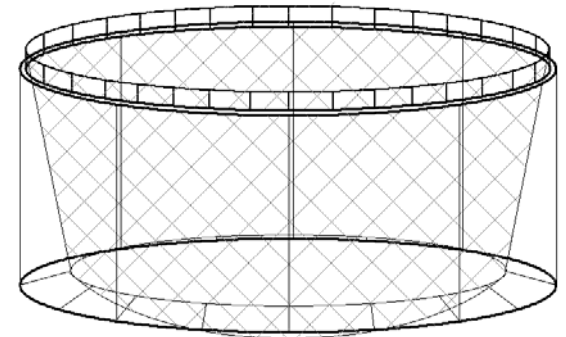
(480 kg)



## Weight ring

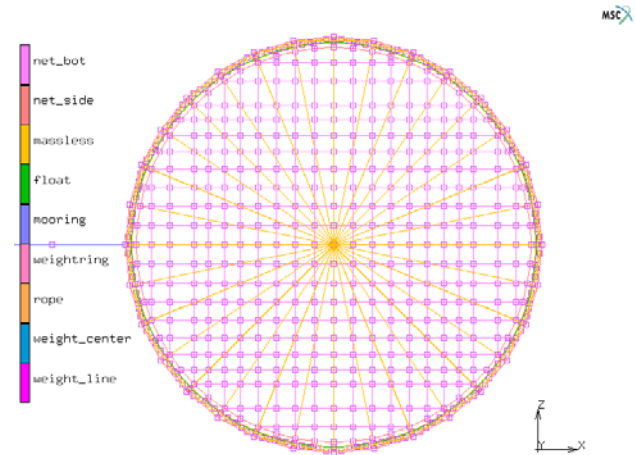
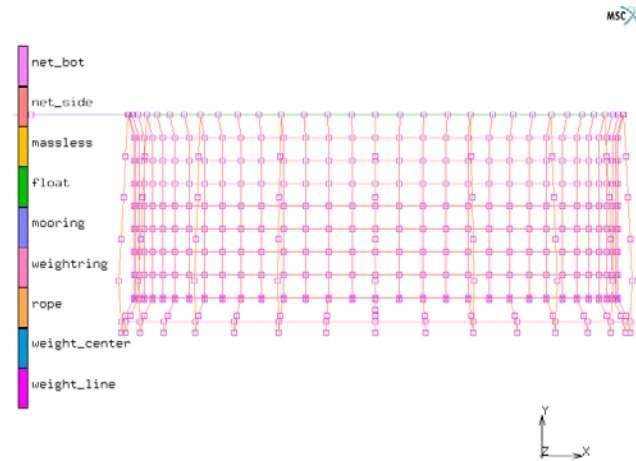
15 – 25 kg/m

(2 – 3 ton for 128 m cage)

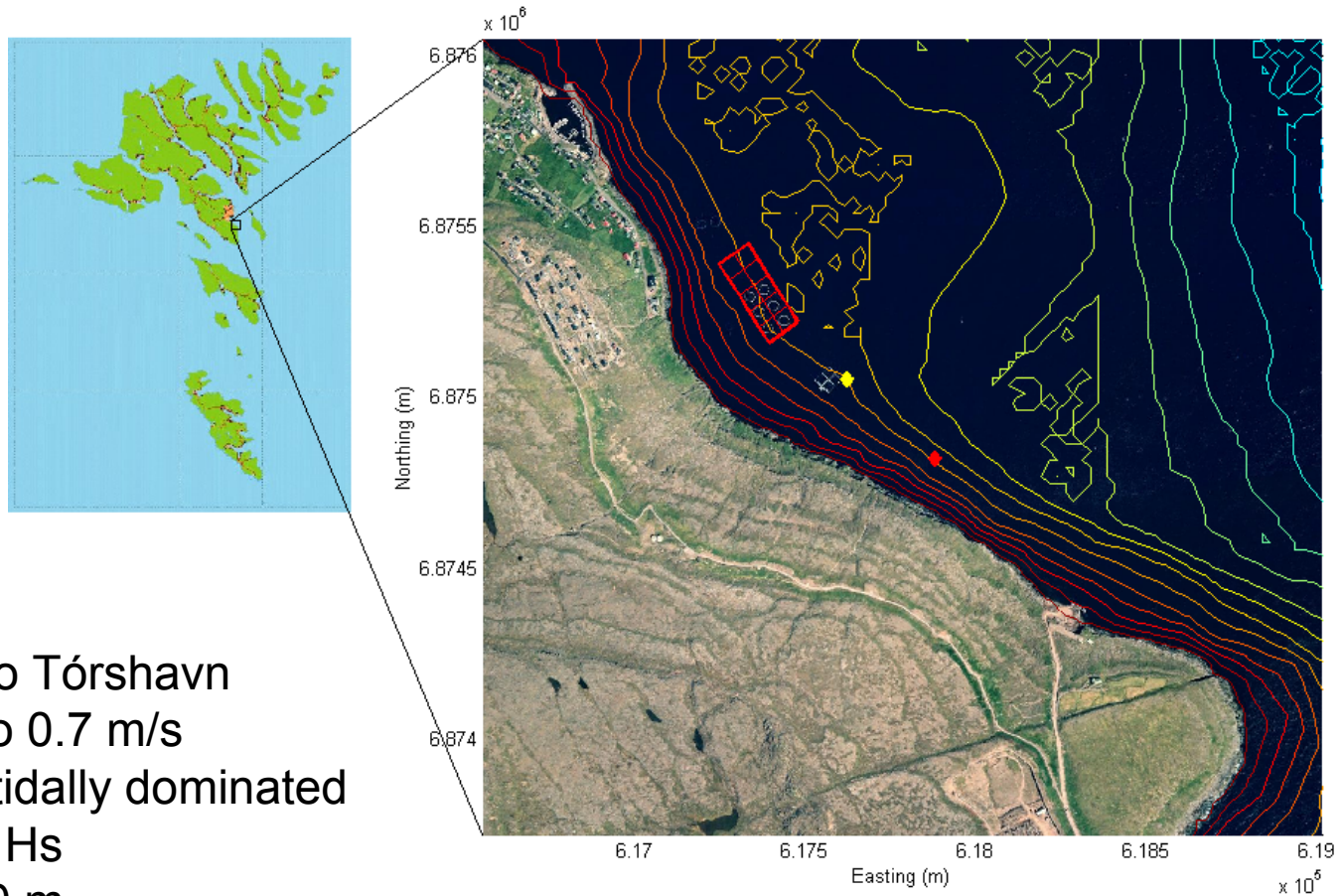


# Numerical model

- Model is built using truss elements
- Two forcing scenarios: 0.25 m/s and 0.45 m/s
- Solved using the Finite Elements software AquaFE



# Field measurements - Site



Site is close to Tórshavn

Currents up to 0.7 m/s

Currents are tidally dominated

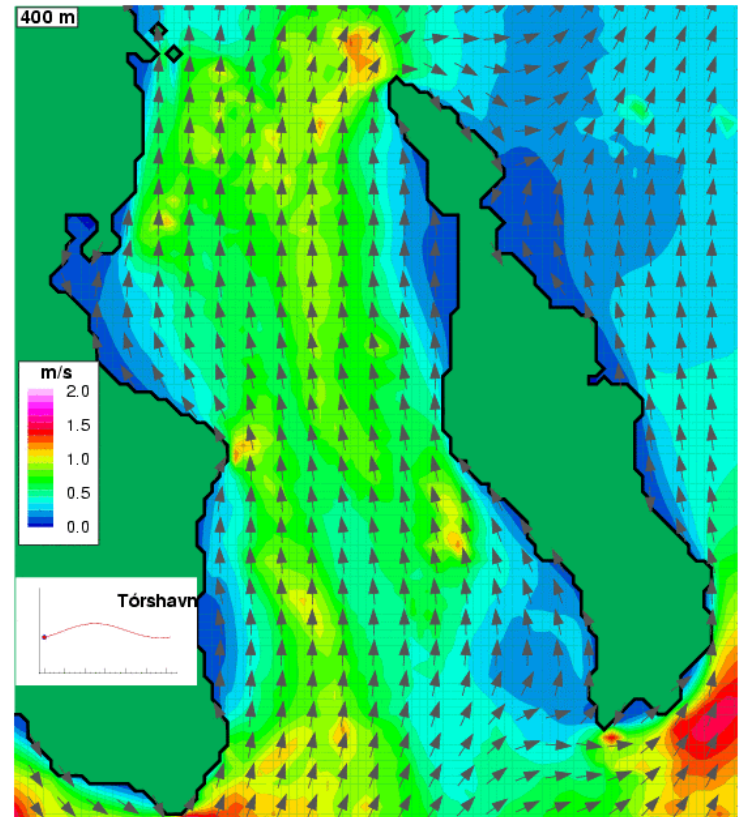
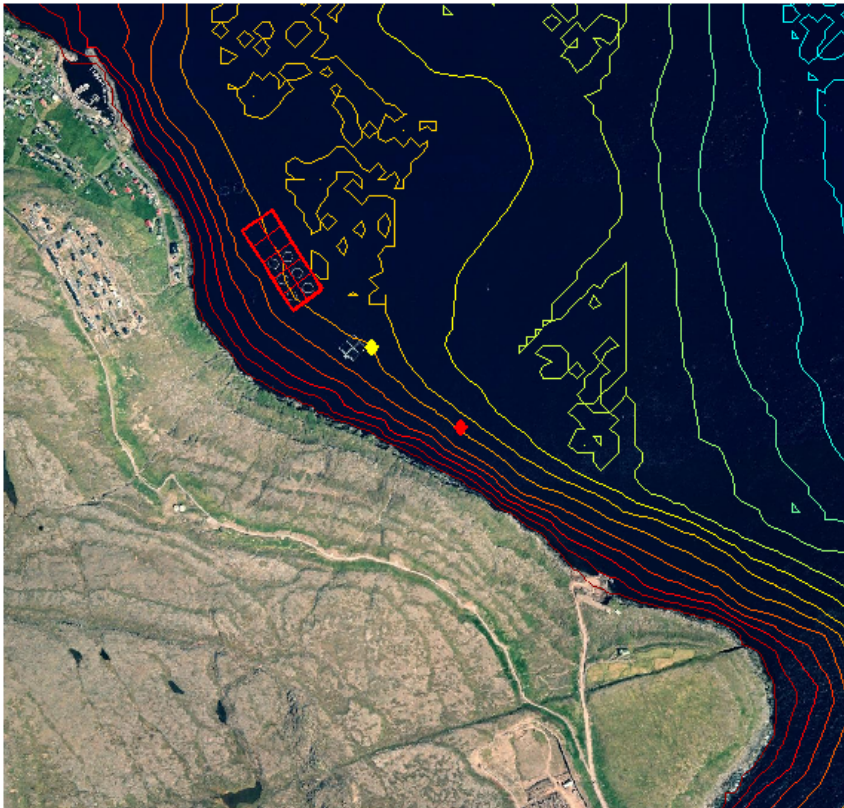
Waves < 3 m H<sub>s</sub>

Depth 25 – 30 m

Current measurement close to the site

Currents are predicted using 36 tidal constituents

# Field measurements - site



# Field measurements - Setup

Cage circumference: 96 m

Net depth: 10 – 15 m

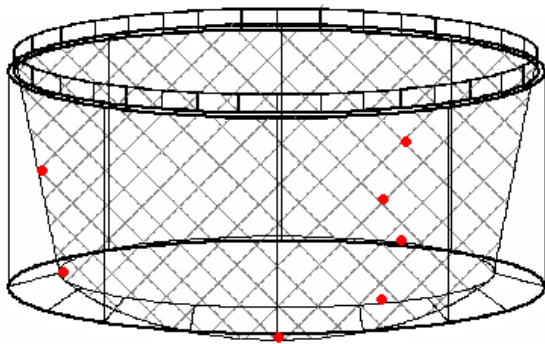
Weight ring: 18 kg/m

Weight in net: 3 kg/m

Twine thickness: 3 mm

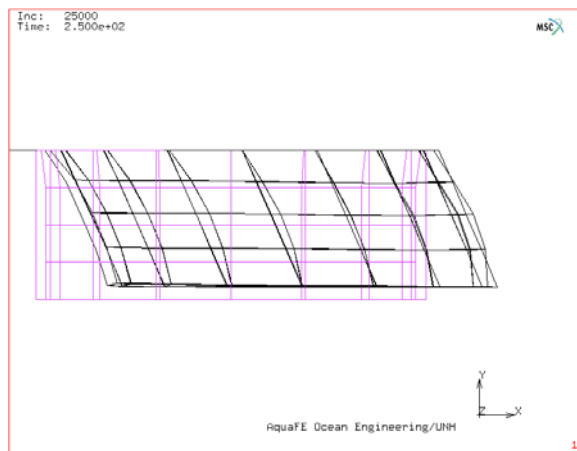
Mesh size: 25 mm

Pressure sensors attached to net

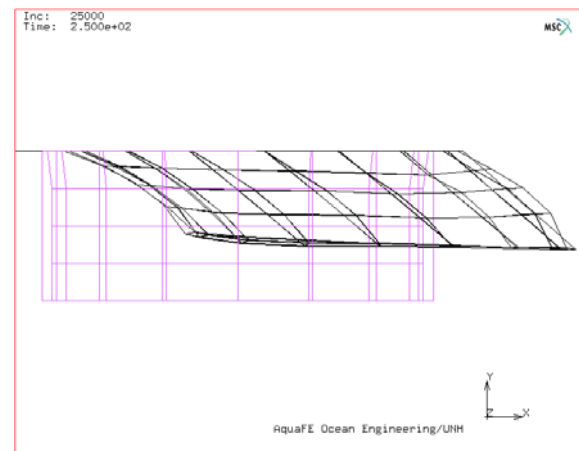


# Results

Current velocity	Field measurement	Numerical model
0.25m/s	80 – 85%	90%
0.45 m/s	60 – 70%	59%



0.25 m/s



0.45 m/s

# Conclusion

- The model results are close to the measured deformations
- The current prediction might not be accurate for the position of the cage
- Similar measurements are now going on for a similar cage but this time current measurements are done at the same time
- A new more detailed numerical model will be buildt and a better validation study performed

## The next step

- Biofouled net panels

