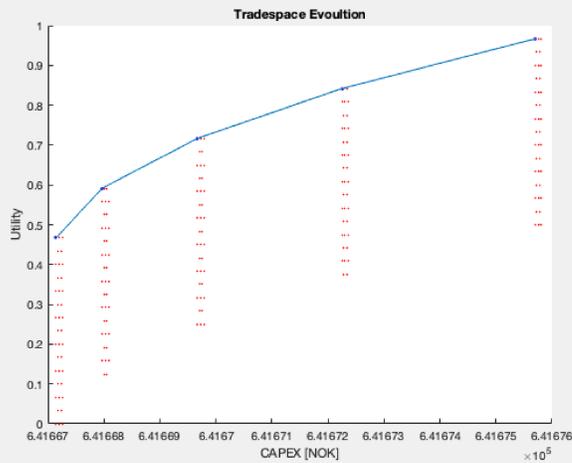


Evaluation of new design concept of submerged fish farm

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Results

The results from the hydrodynamic aspect sets most of the restrictions and together with the expenditure for the air-dome an tradespace evolution will be performed to find the best design which gives highest utility.



Problem

The problem with the air-dome is to try to understand the behaviour when this geometry is in a submerged state. This concept has never been tested before and the little information available is classified information. However, the aim of this thesis is to do simplified hydrodynamic calculations and investigate the system of the air-dome with all its equipment to get a better understanding of how they affect each other.

Economical Investigation

By using the new concept of a submerged fish farm with an air-dome the sea lice problem are assumed to be solved. To get an idea of how much the industry will save if the sea lice problem is solved an economical analysis was performed, comparing the expenditure for sea lice and the expenditure for the air-dome. The cost for the sea lice is very large and are assumed to be of an much larger expend than the cost for the air-dome. In 2010 the cost for salmon lice was estimated to 1.5 NOK/Kg, by 2016 the price increased to 6 NOK/Kg. The comparison to the air-dome cost gave an impression that the air-dome could get quite expensive and still be an advantage in an economical perspective.

References

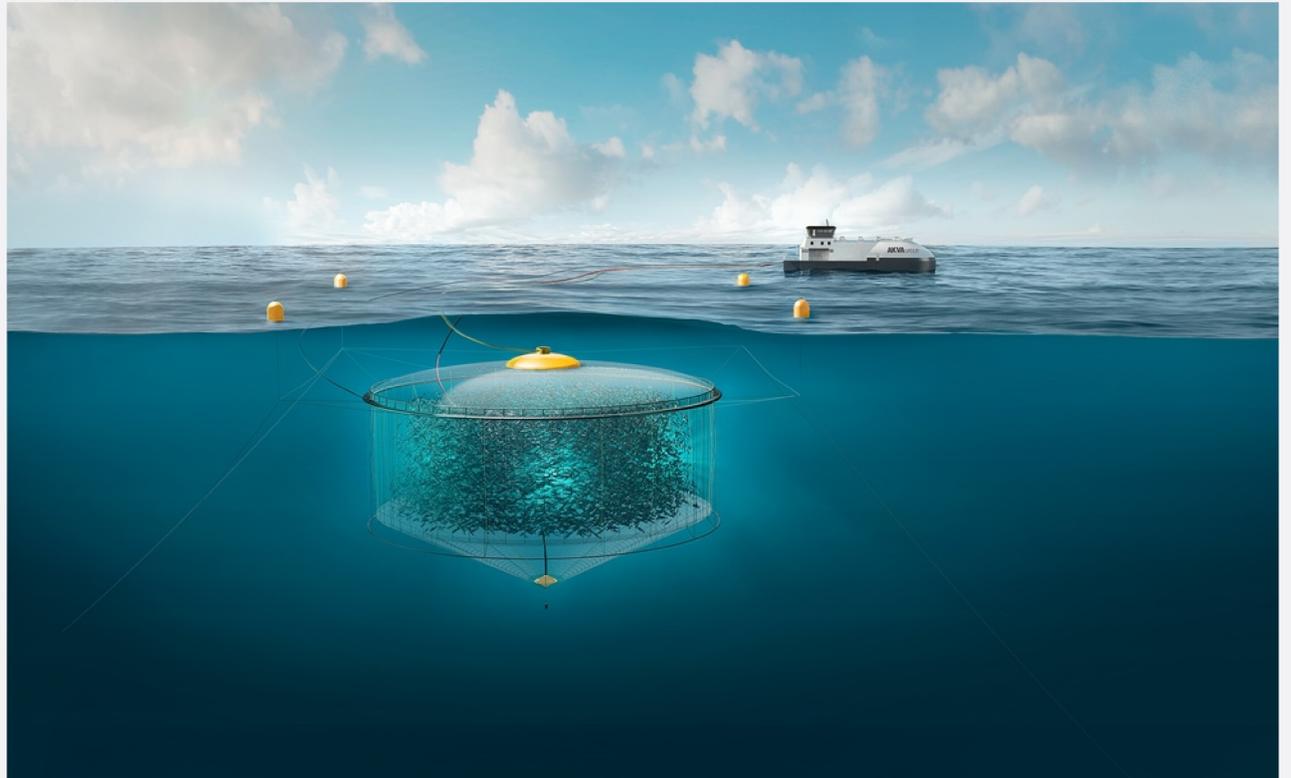
[1] AKVA Group ASA: *Atlantis Subsea Farming: Fortsatt stor tro på prosjektet etter avslag - AKVA group 2018*, <http://www.akvagroup.com/nyheter/>

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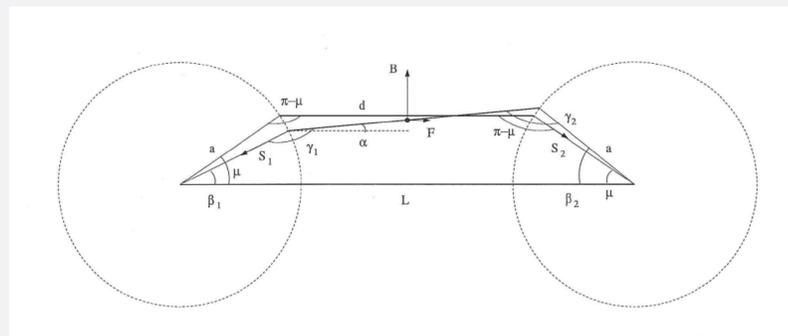
Concept

The aquaculture is experiencing a rapid development towards developing new designs of fish farms that can be placed outside the fjords in Norway and can withstand a harsher climate in more exposed waters. These new design concepts need to be profitable while still satisfying the fish welfare standards. The new designs for the aquaculture aims to solve the problems concerning the sea lice as well as several of the environmental challenges that the aquaculture in the fjords has faced in recent years. The objective of this master thesis was to investigate the new concept concerning an air-dome in a submerged condition through analyzing the hydrodynamic aspects of the air-dome and checking the expenditures for this type of fish farm vs the expenditure for sea lice procedures. Based on this information a Tradespace analysis are to be performed to find good design options for the air-dome.



Method

To identify the maximum angle before the air-dome begins to lose air, the complex air-dome problem is simplified to a static 2D problem.



From the static 2D problem, the three derived independent equations can be plotted together to find the interception, which correspond to the tilting-angle for a given force.

