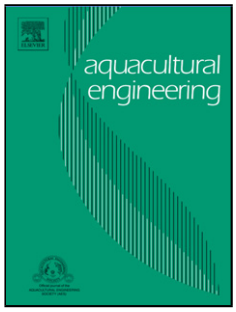

Title: Modelling and simulation of rotary feed spreaders with application to sea cage aquaculture - A study of common and alternative designs

Author: Kristoffer Rist Skøien Morten Omholt Alver Jo Arve Alfredsen

PII: S0144-8609(17)30063-8
DOI: https://doi.org/doi:10.1016/j.aquaeng.2017.11.002
Reference: AQUE 1924

To appear in: *Aquacultural Engineering*

Received date: 17-4-2017
Revised date: 15-11-2017
Accepted date: 19-11-2017

Please cite this article as: Kristoffer Rist Skoien, Morten Omholt Alver, Jo Arve Alfredsen, Modelling and simulation of rotary feed spreaders with application to sea cage aquaculture - A study of common and alternative designs, *<![CDATA[Aquacultural Engineering]]>* (2017), https://doi.org/10.1016/j.aquaeng.2017.11.002

Modelling and simulation of rotary feed spreaders with application to sea cage aquaculture - A study of common and alternative designs

Kristoffer Rist Skøien[a,*], Morten Omholt Alver[a,b], Jo Arve Alfredsen[a]

[a]*NTNU, Norwegian University of Science and Technology, Faculty of Information Technology, Mathematics and Electrical Engineering, department of Engineering Cybernetics, NO-7491 Trondheim, Norway*

[b]*SINTEF Fisheries and Aquaculture, Trondheim, NO-7465, Norway*

Abstract

Rotary feed spreaders are extensively used in large scale fish aquaculture and are tasked with distributing pelletized feed in a spatially uniform manner over the water surface. Questions have been raised with respect to the performance of classical spreader designs regarding the size and uniformity of the covered area as well as their inability to adapt to changing environmental conditions. This study presents a robotic model of rotary spreaders with experimental validations. Classic rotary spreaders are simulated as well as two alternative designs in the form of a spreader releasing pellets at an optimal initial ballistic angle and a motorized version to increase throw length and provide a more spatially homogeneous surface feed distribution. The alternative designs both yielded improved surface coverage without the need of higher conveying airspeed which may lead to increased pellet attrition. In addition, the motorized design may be used to position pellets at a given location within the sea cage, such as into the wind and current so that pellets can reside inside the sea cage for a prolonged period of time. The presented model may be of interest to researchers and equipment manufacturers who desire to explore performance of a given spreader design.

Keywords: Atlantic salmon, feed distribution, modelling, rotary spreader, sea cage aquaculture.

*NTNU, Norwegian University of Science and Technology, Faculty of Information Technology, Mathematics and Electrical Engineering, department of Engineering Cybernetics, NO-7491 Trondheim, Norway., E-mail address: koffes@gmail.com