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ON THE OPTIMIZATION OF RECIRCULATED AQUACULTURE SYSTEMS

Stepan Papacek[(1)], Karel Petera[(2)]

[(1)]University of South Bohemia, Czech Republic
spapacek@seznam.cz

[(2)]Czech Technical University in Prague, Faculty of Mechanical Engineering, Technicka 4, 166 07 Prague 6, Czech Republic, Czech Republic
karel.petera@fs.cvut.cz

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Abstract: The improved design of recirculated aquaculture systems (RAS) is needed facing the demand for increased fish production as well as increased concern of fish wellbeing. Here, we make a step towards use of computational fluid dynamics (CFD) for optimizing the design of fish tanks. The proposed CFD based methodology allows the modeler (the designer) to manipulate both the tank geometry and operating conditions, in order to minimize an appropriate objective function. The objective function is quantifying multiple criteria, dealing mainly with the rearing conditions for fish (a determined average velocity, low velocity variance and fast biosolids removal), and the cost of energy and place. As an example of our methodology, we present one case study involving the CFD analysis of three different RAS: (i) circular, (ii) rectangular multivortex without baffle, and (iii) rectangular multivortex with an additional geometrical element, being the plate baffle between two water inlets. Based on the simplified description of the flow field within each RAS geometry, the optimization of either design and operating parameters is performed.