Johnathan Szeliga et al., J Aquac Res Development 2017, 8:8 (Suppl)
DOI: 10.4172/2155-9546-C1-017

Airlift pump technology for sustainable aquaculture production

Johnathan Szeliga, Wael Ahmed and **Dominique Bureau**
University of Guelph, Canada

One of the major operating costs in recirculating aquaculture systems is the energy cost needed to operate centrifugal pumps in such systems. Due to the economic and environmental impact of maintaining high-power usage of this equipment, energy saving technologies in aquaculture operations will significantly impact both the profitability and sustainability of the business. Therefore, a novel airlift pump design was developed in order to reduce power consumption in these facilities. The new technology offers a sustainable solution for aquaculture systems. This will be achieved by using airlift pumps for simultaneous water circulation and aeration in these systems. The new design of airlift pumps will significantly improve the system efficiency and consequently reduces the total energy consumption in aquaculture systems compared to systems operating by conventional pumps. In order to test the applicability of the novel airlift, experiments were carried out in the field at commercial aquaculture sites to evaluate their operational performance. Air is supplied by an air compressor (a) into a line which gets split two ways between an airline feeding the radial mode of injection (b) and the axial mode of injection (c). The endings of these lines lead into compartments in the pump (d) which allow for different gas bubble sizes to be formed. The arrows depict the movement of water in and out of the pump. The frame for suspending the pump in the water has not been depicted as that part of the design varies for each testing site. The trial locations include: circular flow-through tanks, floating pond raceways, and indoor recirculating systems. Parameters being measured in these systems include: flow, velocity, and oxygenation; with future trials to include potential of carbon dioxide stripping and flow effect on removal of ammonia. So far, velocity and aeration tests have been performed at the flow-through circular tank, as well as water flow readings at raceways. When comparing velocity readings of the circular fish tank using the novel airlifts to the aeration/water dispersion system already in use at the farm, the new pumps provide equivalent or better velocity readings, with much more energy savings. Water oxygenation was also found to be slightly better when comparing the present technology and the conventional methods used by the farms. Also, Initial water flow readings are slightly underperforming the performance curves modeled in the lab for 4" diameter pipe airlifts, yet are over performing ones for the 6" diameter airlifts. In conclusion, the initial tests show significant potential for using the present airlift design over conventional systems that are currently used in fish production. However, there are still further studies that are needed in order to fully compare airlift pumps to centrifugal pumps in terms of total energy efficiency in aquaculture.

Biography

Johnathan Szeliga is a graduate student at the University of Guelph working on his master's thesis in Animal Nutrition in Dr. Dominique Bureau's Fish Nutrition Lab. As part of his thesis he has joined Dr. Wael Ahmed's Research Team from the University of Guelph's School of Engineering that is working on improving the energy efficiency in aquaculture through the testing and implementation of the novel airlift design. His focus on the project will be assessing the pump's ability to maintain ideal water quality conditions for rainbow trout through oxygenation, carbon dioxide stripping and waste removal through water flow.

jszeliga@uoguelph.ca

Notes: