

EXPERIMENTAL ANALYSIS OF CONVERGENT NOZZLE OF DIFFERENT DIAMETER FOR DO LEVEL IMPROVEMENT WITH REDUCED BACK PRESSURE IN AQUACULTURE INDUSTRY

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ABSTRACT

In Aquaculture industry the Biofloc fish farming technique has got lot of attraction from farmer since past years due to its simplicity and zero or minimal water exchange. The major requirements of the system are to maintain the desired DO level in water and to keep the water in motion in order to provide the floc medium is suspended condition which is generally achieved by proper aeration system. The survey from last four to five years shows that the most of the fish farmers fails in Biofloc technique as the farmers fails to achieve the required condition. Considering the failure of farmers the author proposed a work of performance evaluation of convergent nozzle to enhance do level with improved water circulation in aqua-culture system, in which three different set of nozzles are placed in aeration pipe and the DO level and water movement is observed and the optimum one is selected for improved Biofloc system.

Keyword: - Aquaculture, Aeration, Biofloc, DO Level, Nozzle, Suspension, etc.

1. INTRODUCTION

The biofloc is one of the advanced techniques to culture the fishes in a high density in an aquaculture industry. As the density of fishes to be cultured is high enough, some water parameters critically to be maintained within the desired limit such as DO, pH, NH₃, Nitrate, Nitrite, etc. Out of which the DO is an external parameter which can be varied with the changes in aeration system. In biofloc system the percentage of oxygen to be dissolved is depends on the air bubbles produced by aeration system and hence by modifying the aeration system the DO level can be varied. Therefore considering the same problem the author proposed the experimental analysis of convergent nozzle to improve DO level. In this work the three set of convergent nozzle system is formed by installing the nozzle in an aeration pipe and DO level is measured. As the nozzle diameter changes there is back pressure on the system hence it is also necessary to measure the back pressure to improve the life of air blower.

2. FABRICATION OF DIFFERENT DIAMETER CONVERGENT NOZZLE SET

In order to study the DO level and back pressure, the three sets of convergent nozzle is prepared mainly of diameter 10mm, 5mm and 3mm. Each set of specimen pipe is provided with four nozzles installed at a distance of 200mm apart. The figure 1 shows the three different pipes fitted with the set of nozzle of different diameter used for the analysis.

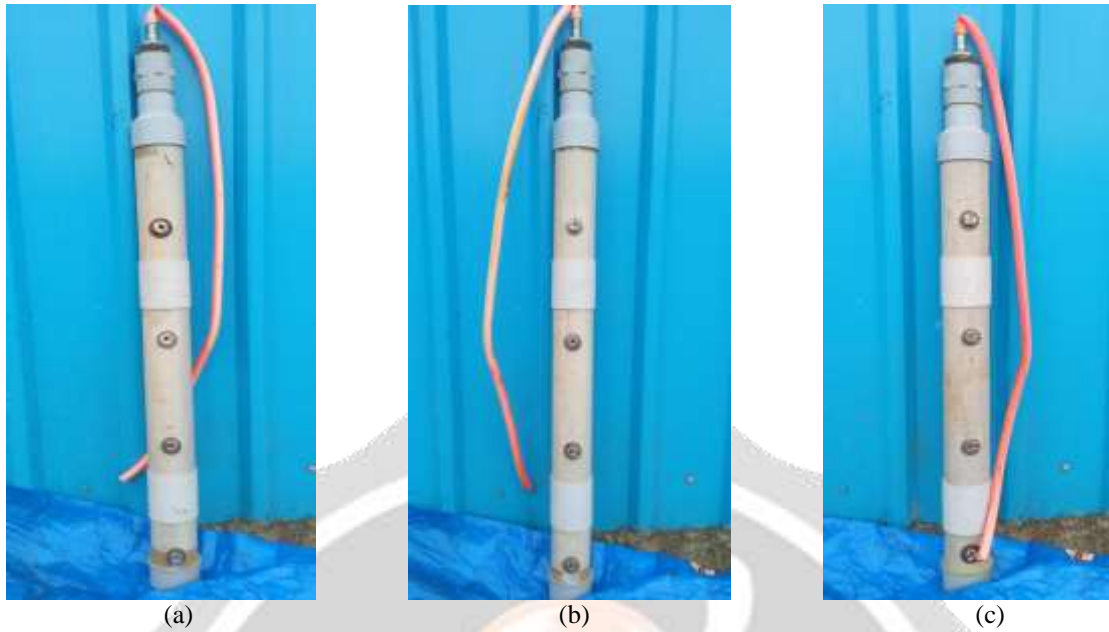


Fig- 1Set of Nozzle (a) 10mm (b) 5mm (c) 3mm

2.1 Experimental Setup

To measure the back pressure produced by different nozzle set, a setup is to be fabricated which indicate the pressure with the rate of air flow. The figure 2 shows an arrangement of differential pressure gauge and rotameter provided with ball valve to measure the back pressure of all nozzles set.



Fig-3 Experimental setup to measure Back presure

3. MEASUREMENT OF DO LEVEL AND BACK PRESSURE

The DO level and back pressure is measured at a constant flow rate of 50LPH as the flow is limited to the single tank. The setup shown in figure 2 is used to measure back pressure while the DO level is measured by chemical reagent.

3.1 Back Pressure Measurement

The pipe on which the nozzles are installed is placed in the tank and flow rate is adjusted and pressure readings are recorded. The table 1 gives the back pressure values of all set of nozzle.

Table 1. Back Pressure value for all Nozzle set

Sr. No.	Type of Nozzle	Back Pressure [Pa]
1.	10mm Nozzle Set	1030.05
2.	5mm Nozzle Set	1373.40
3.	3mm Nozzle Set	1618.65

3.2 DO Level Measurement

To measure the DO level the aeration pipe fitted with nozzle is placed in the biofloc tank one by one for 24 hr as the mixing of air to the water bodies requires 18 to 20hrs. the water sample is collected from the tank and the reagent is added to give the percentage of oxygen dissolved. The table 2 shows the values for DO level for all nozzle set.

Table 2. DO Measured by all Nozzle set

Sr. No.	Type of Nozzle	DO Level [ppm]
1.	10mm Nozzle Set	6
2.	5mm Nozzle Set	8
3.	3mm Nozzle Set	8 to 10

4. CONCLUSIONS

The values of back pressure measured and DO level from table 1 and table 2 concluded that the DO level increases with reduction in the nozzle diameter this is because the mixing of oxygen depends on the bubble formation inside the tank. Also from the table 1 it is concluded that as the area of nozzle reduces there is increase in the back pressure value which may affect on the performance of the air blower. Hence it is necessary to have the nozzle set which can produce maximum mixing of oxygen with comparatively reduced back pressure therefore the nozzle set two i.e. of 5mm nozzle is selected as an optimum nozzle set which has 8ppm DO level at moderate back pressure.

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