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Oxygen Utilization Rate (OUR)Evaluation

OUR= Oxygen utilized/Oxygen supplied (1)

It is difficult to obtain the data of oxygen utilized. So in most cases people intend to approximate OUR with the following formula:

OUR=Oxygen requirement/Oxygen supplied (2)

The result from formula (2) can be appreciated only in the condition where the dissovled oxygen $\leq 2mg/L$. Otherwise the OUR will either be underestimated (DO>2mg/L) or over -estimated(DO<2mg/L). This conclusion comes from the formula as below:

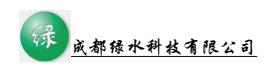
$$AOTR = (\alpha \cdot SOTR \cdot \theta / C_{S20}) \times (\tau \cdot \Omega \cdot \beta \cdot C_{S20} - C_{OP})$$
 (3)

$$C_{ST} = \tau \cdot \Omega \cdot \beta \cdot C_{S20}$$

Assuming other factors remain the same as designed, the actual oxygen transfer rate(AOTR) depends on the data of C_{S20} - C_{OP} . The bigger the C_{OP} (operational oxygen concentration) is, the smaller the AOTR will be. Manufacturers of the aerators normally set the designed OUR at the point of C_{OP} =2mg/L. So it is not a supprise to see the OUR calculated by the formula (2) deviate from the data given by the manufacturer when the C_{OP} exceed or below the 2mg/L.

To better evaluate the OUR, it is recommended to proceed three steps:

- 1. measure and record DO data along with time length
- 2. obtain weighted means of DO as C_{OP}
- 3. Using weighted mean as C_{OP} and formula (3) to correct the date from formula (2)



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OUR*=(Oxygen requirement/Oxygen supplied)* $(\tau \cdot \Omega \cdot \beta \cdot C_{S20} - 2)/(\tau \cdot \Omega \cdot \beta \cdot C_{S20} - C_{OP})$

For example:

Assuming τ , Ω and β =1, C_{S20} =9.08, weighted mean of DO= C_{OP} =3.8, (Oxygen requirement/Oxygen supplied)=70%

Then

$$OUR^* = 70\%*(9.08-2)/(9.08-3.8)=93.86\%$$

OUR*— real oxygen utilized rate