Temperature Effects on DO and ORP in the Wastewater Treatment

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Abstract: At present, there are some problems in the study of DO and ORP as control parameters, because the researches are usually developed in the invariable temperature. However, environmental temperature is changing in the wastewater treatment. The effect of environmental temperature on DO and ORP as control parameter was studied specially in some experiments carried on a sequencing batch reactor (SBR) fed with soybean wastewater in this paper. Results show that the law of variation in DO during organism removal were influenced with the environmental temperature, at different experiment condition of aeration intensity, MLSS concentration or inflow nutrition concentration, but the variation in ORP were not influenced with it. The reason that the DO was influenced was also discussed. This paper brought forward that the control parameter using ORP was accurate and reliable when environmental temperature changed. In addition, inflow COD concentration and the time that ORP concave value appeared was connected, and the speed that ORP in curve ascended related with the COD concentration during the degradation. So the end point of degradation may be estimated by applying ORP derivative. United ORP concave value and its derivative, it can be made on-line control of aeration intensity and aeration time.

Keywords: DO; ORP; SBR; temperature; on-line control

20°C ~ 37°C
Fig. 1 The schematic diagram of experimental system with control equipment in SBR process

Fig. 2 The relationships between the variation in DO and ORP and the concentration of COD during the degradation at invariable temperature

1

SBR

DO

ORP

COD

500 - 3200 mg/L

1 h

[31]

2

2.1

DO, ORP, COD

4 - 6

10 min

15 min

0.4 - 0.5 mg/L

60 min

80 %

120 min

2
2.2 **DO** ORP

\[
d\text{DO}/dt = K_L (\text{DO}_s - \text{DO})
\]

where \( K_L \) is the mass transfer coefficient (1/h); \( \text{DO}_s \) is DO (mg/L); \( \text{DO} \) is (mg/L).

![Graph showing variation of saturation DO with temperature](image1.png)

**Fig. 3** Variation of saturation DO with temperature

3. 3.5 ~ 3.9 g/L. 512 ~ 520 mg/L. 0.6 m³/h . 0.8 m³/h . 1.0 m³/h .

![Graph showing effect of temperature on DO at different aeration intensity](image2.png)

**Fig. 4** Effect of temperature on DO at different aeration intensity
Fig. 5 Effect of temperature on ORP at different aeration intensity

Fig. 6 Effect of temperature on DO at different MLSS concentration
Fig. 7 Effect of temperature on ORP at different MLSS concentration

Fig. 8 Effect of inflow COD concentration on DO at variable temperature

Fig. 9 Effect of inflow COD concentration on ORP at variable temperature
Fig. 10 Stability of the ORP control during COD removal

Fig. 11 The first derivative curve of ORP with time during COD removal
Fig. 12 The second derivative curve of ORP with time during COD removal.