

FORM VIII

DATA FORM FOR CALCULATING THE
MASS TRANSFER COEFFICIENT FOR AN AERATED SURFACE IMPOUNDMENT

Facility Name: _____

Waste Stream Compound: _____

Enter the following:

J - Oxygen transfer rating of surface aerator, (lb O₂/hr-hp) _____

POWR - Total power to aerators, (hp) _____

T - Water temperature, (°C) _____

O_t - Oxygen transfer correction factor _____

MW_L - Molecular weight of liquid _____

A_t - Turbulent surface area of impoundment, (ft²) _____

(If unknown, use values from Table 1)

A - Total surface area of impoundment, (ft²) _____

ρ_L - Density of liquid, (lb/ft³) _____

D_w - Diffusivity of constituent in water, (cm²/s) _____

D_{O₂, w} - Diffusivity of oxygen in water, (cm²/s) _____

d - Impeller diameter, (cm) _____

w - Rotational speed of impeller, (rad/s) _____

ρ_a - Density of air, (gm/cm³) _____

N - Number of aerators _____

g_c - Gravitation constant, (lb_m-ft/s²/lb_f) _____

d^{*} - Impeller diameter, (ft) _____

D_a - Diffusivity of constituent in air, (cm²/s) _____

MW_a - Molecular weight of air _____

R - Universal gas constant, (atm-m³/g mol. °C) _____

H = Henry's law constant, (atm-m³/g mol) _____

Calculate the following:

- A. Calculate the liquid phase mass transfer coefficient, k_L, using the following Equation from Thibodeaux:^{3, 4}

$$k_L = [8.22 \times 10^{-9} J (POWR)(1.024)^{T-20} O_t 10^6 MW_L / (V_a \rho_L)] (D_w / D_{O_2, w})^{0.5}, (m/s)$$

³GCA Corporation. Emissions Data and Model Review for Wastewater Treatment Operations. Draft Technical Note. Prepared for U.S. Environmental Protection Agency. Contract No. 68-01-6871, Assignment 49. August 1985. p. 4-2.

⁴Hwang, S. T. Toxic Emissions from Land Disposal Facilities. Environmental Progress. 1:46-52. February 1982.