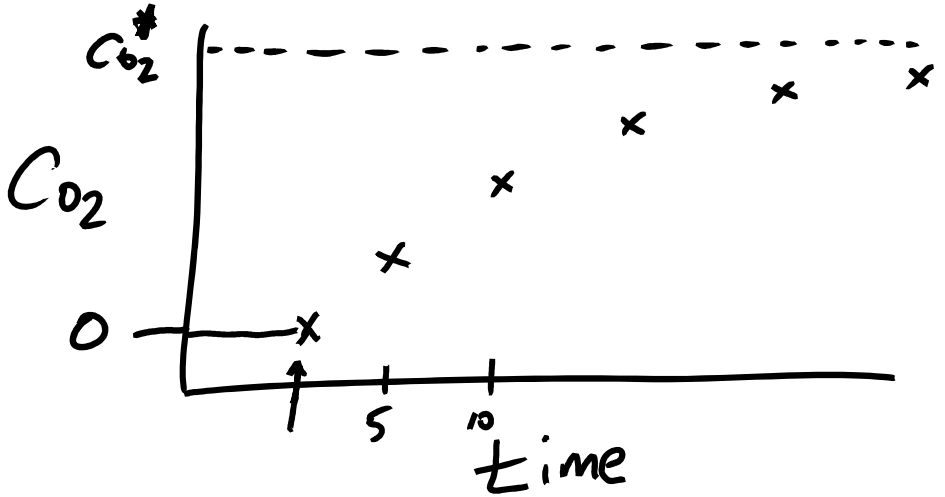
COMMENTS ABOUT STATIC GASSING OUT & POWER

SEE §H7b

STATIC GASSING OUT



time	C_{O_2}
5	~
10	~
15	~
20	~
25	~

$$DO = \frac{C_{O_2}}{C_{O_2}^*}$$

$$\ln\left(C_{O_2}^* - C_{O_2}\right) = -k_L a\, t + \ln\left(C_{O_2}^*\right)$$

"Y" "x"

SLOPE = $-k_L a$

CAN'T USE GROWING CELLS

WHAT IS EFFECT OF CHANGING PARAMETERS?

1) POWER

$P_O = C$ (TURBULENT)

UNGASSED POWER = $C \rho N^3 d^5$

READ THE VALUE OF "C" OFF PLOT OF POWER NUMBER VERSUS REYNOLDS NUMBER.

2) $k_L a$

YAGI & YOSHIDA, 1975

$$Sh = 0.060 Re^{1.5} Fr^{0.19} Sc^{0.5} \left(\frac{\mu U_{sf}}{\sigma}\right)^{0.6} \left(\frac{Nd}{U_{sf}}\right)^{0.32}$$

WHAT IS RELATIONSHIP BETWEEN $k_L a$ AND μ?

$$Sh = \frac{k_L a d^2}{D_L} \qquad Re = \frac{\rho N d^2}{\mu} \qquad Fr = \frac{N^2 d}{g}$$

$$Sc = \frac{\mu}{\rho D_L}$$

$$k_L a \propto \left[\left(\frac{1}{\mu}\right)^{1.5} (1)^{0.19} (\mu)^{0.5} (\mu)^{0.6} (1)^{0.32}\right]$$

$$k_L a \propto \mu^{-1.5}\ \mu^{0.5}\ \mu^{0.6}$$

$$\boxed{k_L a \propto \mu^{-0.4}}$$

DOUBLE μ?

$$\frac{k_L a_2}{k_L a_1} = \left(\frac{\mu_2}{\mu_1}\right)^{-0.4} = \left(\frac{2}{1}\right)^{-0.4}$$

$$= 0.758$$

24% DECREASE IN $k_L a$

3) P_{GASSED}

(HUGHMARK, 1980)

$$\frac{P_{GASSED}}{P_{UNGASSED}} = 0.10\left(\frac{Q}{NV_L}\right)^{-0.25}\left(\frac{N^2 d^4}{gBV_L^{2/3}}\right)^{-0.20}$$

NOTE PROPORTIONALITIES

$$P_{UNGASSED} \propto d^5$$

$$P_{GASSED} \propto P_{UNGASSED}\, d^{-0.80}$$

$$P_{GASSED} \propto d^{4.20}$$