UDOH, UYUOUKOH FELIX
17/ENGO1/036
CHEMICAL ENGINEERING
ENG 382

9. $d = \alpha B^t$

$\log d = \log(\alpha B^t) = \log\alpha + \log B^t$

$\log d = \log\alpha + t \log B$

t(hr)	d	log d	t^2	t log d
0	2	0.3010	0	0
1	5	0.6990	1	0.6990
2	19	1.2788	4	2.5576
3	50	1.6990	9	5.097
4	151	2.1790	16	8.716
5	470	2.6721	25	13.3605
6	1435	3.1569	36	18.94111
7	4512	3.6544	49	25.58058
8	12935	4.1118	64	32.89444
9	41125	4.6141	81	41.52695
10	111021	5.0454	100	50.45405
$\Sigma t = 55$			$\Sigma t^2 = 385$	$\Sigma t \log d = 199.8269$

$\log d = \log\alpha + t\log\beta \Rightarrow \Sigma \log d = N\log\alpha + \Sigma t \log\beta$

$t\log d = t\log\alpha + t^2\log\beta \Rightarrow \Sigma t\log d = \log d \Sigma t + \log B \Sigma t^2$

$$\begin{bmatrix} N & \Sigma t \\ \Sigma t & \Sigma t^2 \end{bmatrix} \begin{bmatrix} \log\alpha \\ \log\beta \end{bmatrix} = \begin{bmatrix} \Sigma \log d \\ \Sigma t \log d \end{bmatrix}$$

$$\begin{bmatrix} 11 & 55 \\ 55 & 385 \end{bmatrix} \begin{bmatrix} \log\alpha \\ \log\beta \end{bmatrix} = \begin{bmatrix} 29.41133 \\ 199.8269 \end{bmatrix}$$

$A \quad X \quad B$

$X = A^{-1}B$

$$= \begin{bmatrix} 0.318182 & -0.04545 \\ -0.04545 & 0.009091 \end{bmatrix} \begin{bmatrix} 29.41133 \\ 199.8269 \end{bmatrix}$$

$$\begin{bmatrix} \log\alpha \\ \log\beta \end{bmatrix} = \begin{bmatrix} 0.27511 \\ 0.479729 \end{bmatrix}$$

$\log \alpha = 0.27511$

$\alpha = \text{antilog}(0.27511)$

$= 1.8841$

$\log \beta = 0.4779729$

$\beta = \text{antilog}(0.4779729)$

$= 3.0181$

t(hr)	d(m)	log d	logdsim	logdsimmerror	logdmerror
0	2	0.30103	0.27511	-2.398646894	-2.372727273
1	5	0.69897	0.75484	-1.918911515	-1.974787873
2	19	1.278754	1.234569	-1.439188135	-1.395003037
3	56	1.6987	1.714299	-0.959458758	-0.97478773
4	151	2.178977	2.194028	-0.479729379	-0.494780 4
5	470	2.672098	2.673757	0	-0.0016595
6	1435	3.156852	3.153487	0.479729379	0.483094 59
7	4512	3.654216	3.633216	0.959458758	0.980611 78
8	12936	4.112945	4.112945	1.439188135	1.438042 69
9	41125	4.529675	4.592675	1.918917515	1.940348 6
10	111021	5.072404	5.072404	2.398646894	2.371647 82.
				5.031444 1725	5.032225 01

$\log d_{sim} = \log d + t \log \beta$

$d_{mean} = \frac{0.27511 + 0.75484 + 1.234564 + 1.714299 + 2.194028 + 2.673757 + 3.153487 + 3.633216 + 4.112943 + 4.592675 + 5.072404}{11}$

$= 2.673757$

$\log d_{Simmerror} = \log d_{sim} - d_{mean}$

$\log d_{mmerror} = \log d - d_{mean}$

$$R = \sqrt{\frac{(\varepsilon \log d_{Simmerror})^2}{(\varepsilon \log d_{mmerror})^2}} = \sqrt{\frac{5.031444172^2}{5.032225012^2}} = 0.9998$$

$R^2 = 0.999$

There is a high Correlation between t and d because of the R value.