



BAB IV HASIL PENELITIAN

➤ Data Percobaan 1

Nama sample : Bengkuang
Ukuran sample : Tebal : 0.2 cm
Panjang : 2.0 cm
Lebar : 2.0 cm
Suhu : 30 °C
Tekanan kompresor : 2 Bar
Berat gelas arloji : 25.1 gr
Jumlah sample : 1
Berat basah bahan : 1.6 gr

Table 1 pengaruh waktu terhadap penurunan suhu

| No | Waktu (menit) | Berat (gram) | Td (°C) | Tw (°C) |
|----|---------------|--------------|---------|---------|
| 1 | 0 | 1.6 | 29 | 26 |
| 2 | 10 | 1.6 | 29 | 26 |
| 3 | 20 | 1.6 | 29 | 26 |
| 4 | 30 | 1.5 | 29 | 26 |
| 5 | 40 | 1.5 | 29 | 27 |
| 6 | 50 | 1.5 | 29 | 27 |
| 7 | 60 | 1.4 | 29 | 27 |
| 8 | 70 | 1.4 | 30 | 27 |
| 9 | 80 | 1.4 | 30 | 27 |
| 10 | 90 | 1.3 | 30 | 28 |
| 11 | 100 | 1.3 | 30 | 28 |
| 12 | 110 | 1.3 | 30 | 28 |
| 13 | 120 | 1.3 | 30 | 28 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkang pada suhu 30°C–60°C

1. Menentukan kandungan air dalam bahan (X)

$$X = \frac{(S_0 - S_s)}{S_s}$$

2. Menentukan kecepatan pengeringan (N)

$$N = - \left(\frac{S_s}{A} \right) x \left(\frac{dx}{dt} \right)$$

Luas permukaan (A)

$$A = (PxL) + 2(Lxt) + 2(Pxt)$$

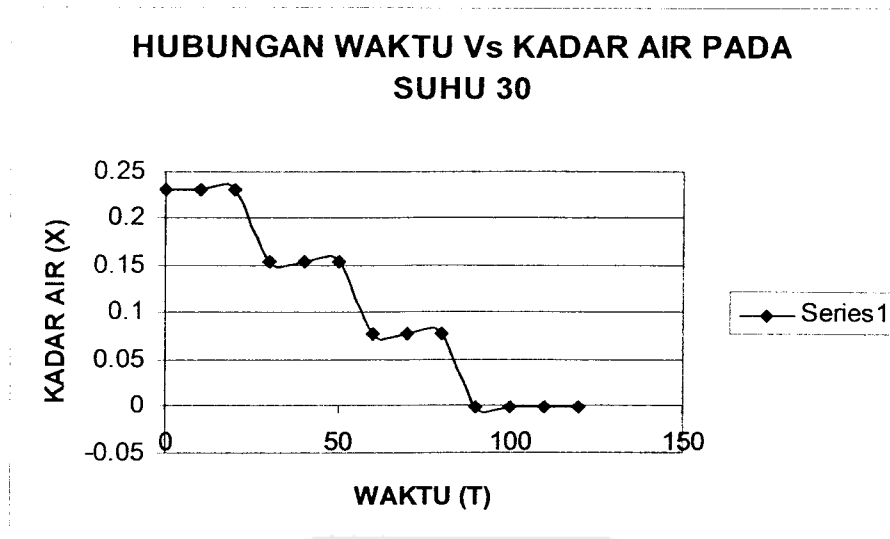
$$A = (2 \times 2) \text{cm} + 2(2 \times 0.2) \text{cm} + 2(2 \times 0.2) \text{cm}$$

$$A = 5.6 \text{ cm}$$

Berat kering (Ss) = 1.3 gram

Table 2. pengaruh penurunan berat bahan terhadap kandungan air (X)

| No | Waktu (menit) | Berat (gram) | Kandungan air (X) |
|----|----------------|--------------|-------------------|
| 1 | 0 | 1.6 | 0.230769 |
| 2 | 10 | 1.6 | 0.230769 |
| 3 | 20 | 1.6 | 0.230769 |
| 4 | 30 | 1.5 | 0.153846 |
| 5 | 40 | 1.5 | 0.153846 |
| 6 | 50 | 1.5 | 0.153846 |
| 7 | 60 | 1.4 | 0.076923 |
| 8 | 70 | 1.4 | 0.076923 |
| 9 | 80 | 1.4 | 0.076923 |
| 10 | 90 | 1.3 | 0 |
| 11 | 100 | 1.3 | 0 |
| 12 | 110 | 1.3 | 0 |
| 13 | 120 | 1.3 | 0 |



Grafik 4.1 hubungan waktu Vs kadar air pada suhu 30° C

3. Menentukan T's, Y' dan Ky

Secara analisis

$$Y's = 0.662 \times \left(\frac{PAs}{(Pt - PAs)} \right)$$

$$Y' = \left(\frac{(Y'sx\lambda w) - 1005(Td - Tw)}{(\lambda w + 1884(Td - Tw))} \right)$$

$$Ky = \frac{N}{(Y's - Y')}$$

Dari data Tw maka Pt dan Pas dapat dicari dari steam table (SMITH 4 ed)

Table 3. pengaruh perubahan T_d dan T_w terhadap $T's$ dan Y'

| No | T_d (°C) | T_w (°C) | P_t | P_{as} | λ_w | $Y's$ | Y' |
|----|------------|------------|-------|----------|-------------|----------|----------|
| 1 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 2 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 3 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 4 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 5 | 29 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.31441 |
| 6 | 29 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.31441 |
| 7 | 29 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.31441 |
| 8 | 30 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.36542 |
| 9 | 30 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.36542 |
| 10 | 30 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.31454 |
| 11 | 30 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.31454 |
| 12 | 30 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.31454 |
| 13 | 30 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.31454 |

Table 4. pengaruh kecepatan pengeringan (N) terhadap koefisien transfer massa (K_y)

| No | waktu | kandungan air (X) | $dx/d\theta$ | Kecepatan pengeringan (N) | K_y |
|----|-------|-------------------|--------------|---------------------------|----------|
| 1 | 0 | 0.230769 | 0 | 0 | 0 |
| 2 | 10 | 0.230769 | 0 | 0 | 0 |
| 3 | 20 | 0.230769 | -0.00769 | 0.001785713 | 0.004597 |
| 4 | 30 | 0.153846 | 0 | 0 | 0 |
| 5 | 40 | 0.153846 | 0 | 0 | 0 |
| 6 | 50 | 0.153846 | -0.00769 | 0.001785713 | 0.005275 |
| 7 | 60 | 0.076923 | 0 | 0 | 0 |
| 8 | 70 | 0.076923 | 0 | 0 | 0 |
| 9 | 80 | 0.076923 | -0.00769 | 0.001785713 | 0.004584 |
| 10 | 90 | 0 | 0 | 0 | 0 |
| 11 | 100 | 0 | 0 | 0 | 0 |
| 12 | 110 | 0 | 0 | 0 | 0 |
| 13 | 120 | 0 | 0 | 0 | 0 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkoang pada suhu 30°C–60°C

➤ **Data Percobaan 2**

Nama sample : Bengkoang
Ukuran sample : Tebal : 0.2 cm
Panjang : 2.0 cm
Lebar : 2.0 cm
Suhu : 35 °C
Tekanan kompresor : 2 Bar
Berat gelas arloji : 25.1 gr
Jumlah sample : 1
Berat basah bahan : 1.6 gr

Table 1 pengaruh waktu terhadap penurunan suhu

| No | Waktu (menit) | Berat (gram) | Td (°C) | Tw (°C) |
|----|---------------|--------------|---------|---------|
| 1 | 0 | 1.6 | 29 | 26 |
| 2 | 10 | 1.6 | 29 | 26 |
| 3 | 20 | 1.5 | 29 | 26 |
| 4 | 30 | 1.5 | 29 | 26 |
| 5 | 40 | 1.5 | 30 | 26 |
| 6 | 50 | 1.4 | 30 | 27 |
| 7 | 60 | 1.4 | 30 | 27 |
| 8 | 70 | 1.4 | 30 | 27 |
| 9 | 80 | 1.3 | 30 | 27 |
| 10 | 90 | 1.3 | 31 | 27 |
| 11 | 100 | 1.2 | 31 | 27 |
| 12 | 110 | 1.2 | 31 | 28 |
| 13 | 120 | 1.2 | 31 | 28 |
| 14 | 130 | 1.2 | 31 | 28 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkuang pada suhu 30°C–60°C

1. Menentukan kandungan air dalam bahan (X)

$$X = \frac{(S_o - S_s)}{S_s}$$

2. Menentukan kecepatan pengeringan (N)

$$N = - \left(\frac{S_s}{A} \right) x \left(\frac{dx}{dt} \right)$$

Luas permukaan (A)

$$A = (P \times L) + 2(L \times t) + 2(P \times t)$$

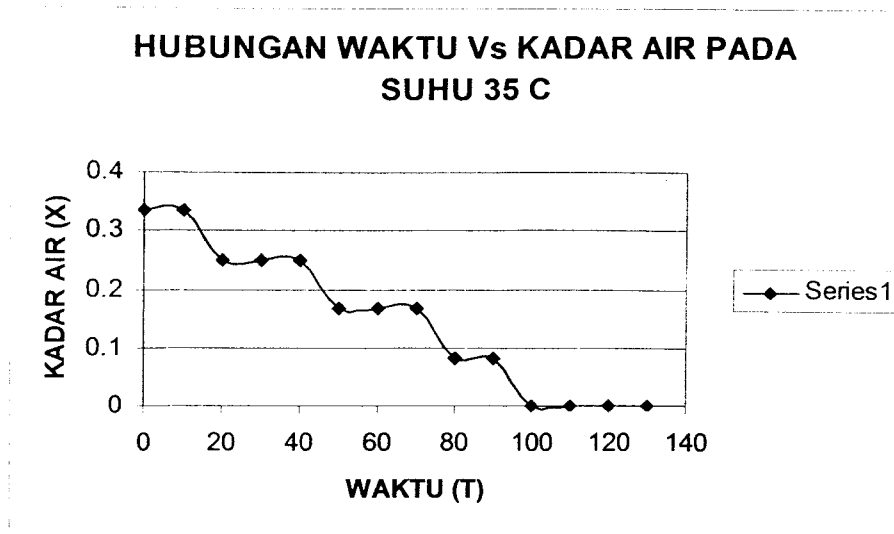
$$A = (2 \times 2) \text{cm} + 2(2 \times 0.2) \text{cm} + 2(2 \times 0.2) \text{cm}$$

$$A = 5.6 \text{ cm}$$

Berat kering (S_s) = 1.3 gram

Table 2. pengaruh penurunan berat bahan terhadap kandungan air (X)

| No | Waktu (menit) | Berat (gram) | Kandungan air (X) |
|----|---------------|--------------|-------------------|
| 1 | 0 | 1.6 | 0.333333 |
| 2 | 10 | 1.6 | 0.333333 |
| 3 | 20 | 1.5 | 0.25 |
| 4 | 30 | 1.5 | 0.25 |
| 5 | 40 | 1.5 | 0.25 |
| 6 | 50 | 1.4 | 0.166667 |
| 7 | 60 | 1.4 | 0.166667 |
| 8 | 70 | 1.4 | 0.166667 |
| 9 | 80 | 1.3 | 0.083333 |
| 10 | 90 | 1.3 | 0.083333 |
| 11 | 100 | 1.2 | 0 |
| 12 | 110 | 1.2 | 0 |
| 13 | 120 | 1.2 | 0 |
| 14 | 130 | 1.2 | 0 |



Grafik 4.2 hubungan waktu Vs kadar air pada suhu 35 C

3. Menentukan $T's$, Y' dan K_y

Secara analisis

$$Y's = 0.662 \times \left(\frac{PAs}{(Pt - PAs)} \right)$$

$$Y' = \left(\frac{(Y's \lambda w) - 1005(Td - Tw)}{(\lambda w + 1884(Td - Tw))} \right)$$

$$K_y = \frac{N}{(Y's - Y')}$$

Dari data T_w maka P_t dan P_{as} dapat dicari dari steam table (SMITH 4 ed)



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkang pada suhu 30°C–60°C

Table 3. pengaruh perubahan T_d dan T_w terhadap $T's$ dan Y'

| No | T_d (°C) | T_w (°C) | Pt | Pas | λ_w | $Y's$ | Y' |
|----|------------|------------|-------|-------|-------------|----------|----------|
| 1 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 2 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 3 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 4 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 5 | 30 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.3974 |
| 6 | 30 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.36542 |
| 7 | 30 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.36542 |
| 8 | 30 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.36542 |
| 9 | 30 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.36542 |
| 10 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 11 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 12 | 31 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.36508 |
| 13 | 31 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.36508 |
| 14 | 31 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.36508 |

Table 4. pengaruh kecepatan pengeringan (N) terhadap koefisien transfer massa (K_y)

| No | Waktu | Kandungan Air (X) | $dx/d\theta$ | Kecepatan Pengeringan (N) | K_y |
|----|-------|-------------------|--------------|---------------------------|----------|
| 1 | 0 | 0.333333 | 0 | 0 | 0 |
| 2 | 10 | 0.333333 | -0.00833 | 0.001934516 | 0.00498 |
| 3 | 20 | 0.25 | 0 | 0 | 0 |
| 4 | 30 | 0.25 | 0 | 0 | 0 |
| 5 | 40 | 0.25 | -0.00833 | 0.001934516 | 0.004605 |
| 6 | 50 | 0.166667 | 0 | 0 | 0 |
| 7 | 60 | 0.166667 | 0 | 0 | 0 |
| 8 | 70 | 0.166667 | -0.00833 | 0.001934539 | 0.004966 |
| 9 | 80 | 0.083333 | 0 | 0 | 0 |
| 10 | 90 | 0.083333 | -0.00833 | 0.001934516 | 0.004592 |
| 11 | 100 | 0 | 0 | 0 | 0 |
| 12 | 110 | 0 | 0 | 0 | 0 |
| 13 | 120 | 0 | 0 | 0 | 0 |
| 14 | 130 | 0 | 0 | 0 | 0 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkoang pada suhu 30°C–60°C

➤ **Data Percobaan 3**

Nama sample : Bengkoang
Ukuran sample : Tebal : 0.2 cm
Panjang : 2.0 cm
Lebar : 2.0 cm
Suhu : 40 °C
Tekanan kompresor : 2 Bar
Berat gelas arloji : 25.1 gr
Jumlah sample : 1
Berat basah bahan : 1.6 gr

Table 1 pengaruh waktu terhadap penurunan suhu

| No | Waktu (menit) | Berat (gram) | Td (°C) | Tw (°C) |
|----|---------------|--------------|---------|---------|
| 1 | 0 | 1.6 | 29 | 26 |
| 2 | 10 | 1.6 | 29 | 26 |
| 3 | 20 | 1.5 | 29 | 26 |
| 4 | 30 | 1.5 | 30 | 26 |
| 5 | 40 | 1.4 | 30 | 26 |
| 6 | 50 | 1.4 | 31 | 27 |
| 7 | 60 | 1.3 | 31 | 27 |
| 8 | 70 | 1.3 | 31 | 27 |
| 9 | 80 | 1.3 | 31 | 27 |
| 10 | 90 | 1.2 | 31 | 27 |
| 11 | 100 | 1.2 | 31 | 27 |
| 12 | 110 | 1.1 | 31 | 27 |
| 13 | 120 | 1.1 | 31 | 27 |
| 14 | 130 | 1 | 32 | 27 |
| 15 | 140 | 1 | 32 | 27 |
| 16 | 150 | 1 | 32 | 28 |
| 17 | 160 | 0.9 | 32 | 28 |
| 18 | 170 | 0.9 | 32 | 28 |
| 19 | 180 | 0.9 | 32 | 28 |
| 20 | 190 | 0.9 | 32 | 28 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkuang pada suhu 30°C–60°C

1. Menentukan kandungan air dalam bahan (X)

$$X = \frac{(S_o - S_s)}{S_s}$$

2. Menentukan kecepatan pengeringan (N)

$$N = - \left(\frac{S_s}{A} \right) x \left(\frac{dx}{dt} \right)$$

Luas permukaan (A)

$$A = (PxL)+2(Lxt)+2(Pxt)$$

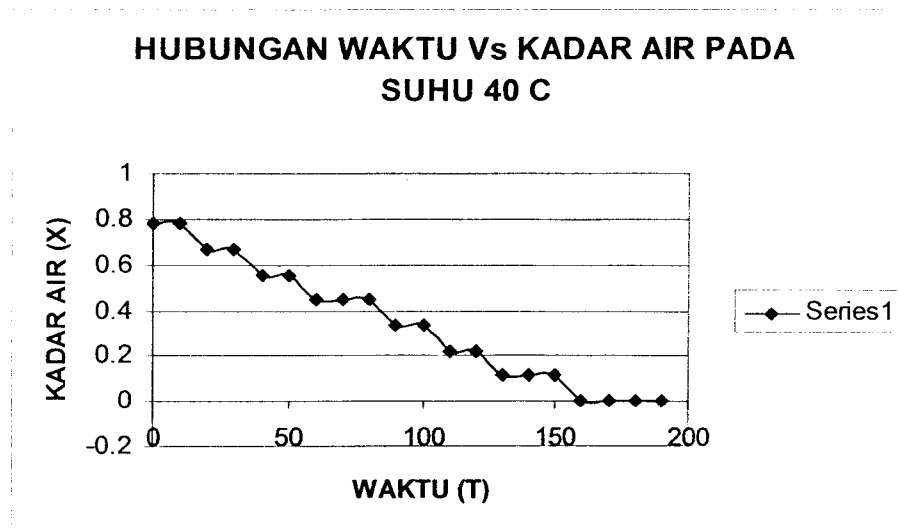
$$A = (2x2)\text{cm} + 2(2x0.2)\text{cm} + 2(2x0.2)\text{cm}$$

$$A = 5.6 \text{ cm}$$

Berat kering (Ss) = 1.3 gram

Table 2. pengaruh penurunan berat bahan terhadap kandungan air (X)

| No | Waktu (menit) | Berat (gram) | Kandungan Air (X) |
|----|---------------|--------------|-------------------|
| 1 | 0 | 1.6 | 0.777778 |
| 2 | 10 | 1.6 | 0.777778 |
| 3 | 20 | 1.5 | 0.666667 |
| 4 | 30 | 1.5 | 0.666667 |
| 5 | 40 | 1.4 | 0.555556 |
| 6 | 50 | 1.4 | 0.555556 |
| 7 | 60 | 1.3 | 0.444444 |
| 8 | 70 | 1.3 | 0.444444 |
| 9 | 80 | 1.3 | 0.444444 |
| 10 | 90 | 1.2 | 0.333333 |
| 11 | 100 | 1.2 | 0.333333 |
| 12 | 110 | 1.1 | 0.222222 |
| 13 | 120 | 1.1 | 0.222222 |
| 14 | 130 | 1 | 0.111111 |
| 15 | 140 | 1 | 0.111111 |
| 16 | 150 | 1 | 0.111111 |
| 17 | 160 | 0.9 | 0 |
| 18 | 170 | 0.9 | 0 |
| 19 | 180 | 0.9 | 0 |
| 20 | 190 | 0.9 | 0 |



Grafik 4.3 hubungan waktu Vs kadar air pada suhu 40°C

3. Menentukan T^s , Y^s dan K_y

Secara analisis

$$Y^s = 0.662 \times \left(\frac{PAs}{(Pt - PAs)} \right)$$

$$Y^s = \left(\frac{(Y' s x \lambda w) - 1005(Td - Tw)}{(\lambda w + 1884(Td - Tw))} \right)$$

$$K_y = \frac{N}{(Y^s - Y')}$$

Dari data T_w maka P_t dan P_{as} dapat dicari dari steam table (SMITH 4 ed)



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkuang pada suhu 30°C–60°C

Table 3. pengaruh perubahan T_d dan T_w terhadap $T's$ dan Y'

| No | T_d (°C) | T_w (°C) | Pt | Pas | λ_w | $Y's$ | Y' |
|----|------------|------------|-------|-------|-------------|----------|----------|
| 1 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 2 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 3 | 29 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.36573 |
| 4 | 30 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.3974 |
| 5 | 30 | 26 | 101.3 | 3.36 | 2440.2 | 0.022711 | -0.3974 |
| 6 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 7 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 8 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 9 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 10 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 11 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 12 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 13 | 31 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.39716 |
| 14 | 32 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.41881 |
| 15 | 32 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.41881 |
| 16 | 32 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.39689 |
| 17 | 32 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.39689 |
| 18 | 32 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.39689 |
| 19 | 32 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.39689 |
| 20 | 32 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.39689 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkang pada suhu 30°C–60°C

Table 4. pengaruh kecepatan pengeringan (N) terhadap koefisien transfer massa (Ky)

| No | Waktu | Kandungan Air (X) | $dx/d\theta$ | Kecepatan Pengeringan (N) | Ky |
|----|-------|-------------------|--------------|---------------------------|----------|
| 1 | 0 | 0.777778 | 0 | 0 | 0 |
| 2 | 10 | 0.777778 | -0.01111 | -0.002579363 | -0.00664 |
| 3 | 20 | 0.666667 | 0 | 0 | 0 |
| 4 | 30 | 0.666667 | -0.01111 | -0.002579363 | -0.00614 |
| 5 | 40 | 0.555556 | 0 | 0 | 0 |
| 6 | 50 | 0.555556 | -0.01111 | -0.002579386 | -0.00612 |
| 7 | 60 | 0.444444 | 0 | 0 | 0 |
| 8 | 70 | 0.444444 | 0 | 0 | 0 |
| 9 | 80 | 0.444444 | -0.01111 | -0.002579363 | -0.00612 |
| 10 | 90 | 0.333333 | 0 | 0 | 0 |
| 11 | 100 | 0.333333 | -0.01111 | -0.002579363 | -0.00612 |
| 12 | 110 | 0.222222 | 0 | 0 | 0 |
| 13 | 120 | 0.222222 | -0.01111 | -0.002579363 | -0.00612 |
| 14 | 130 | 0.111111 | 0 | 0 | 0 |
| 15 | 140 | 0.111111 | 0 | 0 | 0 |
| 16 | 150 | 0.111111 | -0.01111 | -0.002579363 | -0.0061 |
| 17 | 160 | 0 | 0 | 0 | 0 |
| 18 | 170 | 0 | 0 | 0 | 0 |
| 19 | 180 | 0 | 0 | 0 | 0 |
| 20 | 190 | 0 | 0 | 0 | 0 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkoang pada suhu 30°C–60°C

➤ **Data Percobaan 4**

Nama sample : Bengkoang
Ukuran sample : Tebal : 0.2 cm
Panjang : 2.0 cm
Lebar : 2.0 cm
Suhu : 45 °C
Tekanan kompresor : 2 Bar
Berat gelas arloji : 25.1 gr
Jumlah sample : 1
Berat basah bahan : 1.6 gr

Table 1 pengaruh waktu terhadap penurunan suhu

| No | Waktu (menit) | Berat (gram) | Td (°C) | Tw (°C) |
|----|---------------|--------------|---------|---------|
| 1 | 0 | 1.6 | 32 | 27 |
| 2 | 10 | 1.5 | 32 | 27 |
| 3 | 20 | 1.5 | 33 | 27 |
| 4 | 30 | 1.4 | 33 | 28 |
| 5 | 40 | 1.3 | 33 | 28 |
| 6 | 50 | 1.3 | 33 | 28 |
| 7 | 60 | 1.3 | 34 | 28 |
| 8 | 70 | 1.2 | 34 | 28 |
| 9 | 80 | 1.2 | 34 | 28 |
| 10 | 90 | 1.1 | 34 | 28 |
| 11 | 100 | 1.1 | 34 | 28 |
| 12 | 110 | 1 | 35 | 28 |
| 13 | 120 | 0.9 | 35 | 28 |
| 14 | 130 | 0.9 | 35 | 28 |
| 15 | 140 | 0.9 | 35 | 28 |
| 16 | 150 | 0.9 | 35 | 28 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkang pada suhu 30°C–60°C

1. Menentukan kandungan air dalam bahan (X)

$$X = \frac{(S_o - S_s)}{S_s}$$

2. Menentukan kecepatan pengeringan (N)

$$N = - \left(\frac{S_s}{A} \right) x \left(\frac{dx}{dt} \right)$$

Luas permukaan (A)

$$A = (PxL) + 2(Lxt) + 2(Pxt)$$

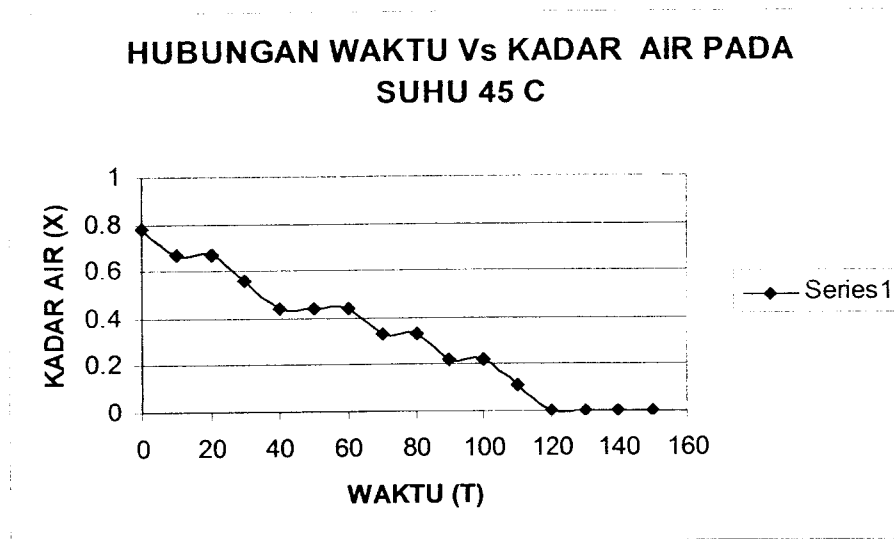
$$A = (2 \times 2) \text{cm} + 2(2 \times 0.2) \text{cm} + 2(2 \times 0.2) \text{cm}$$

$$A = 5.6 \text{ cm}$$

Berat kering (Ss) = 1.3 gram

Table 2. pengaruh penurunan berat bahan terhadap kandungan air (X)

| No | Waktu (menit) | Berat (gram) | Kandungan Air (X) |
|----|---------------|--------------|-------------------|
| 1 | 0 | 1.6 | 0.777778 |
| 2 | 10 | 1.5 | 0.666667 |
| 3 | 20 | 1.5 | 0.666667 |
| 4 | 30 | 1.4 | 0.555556 |
| 5 | 40 | 1.3 | 0.444444 |
| 6 | 50 | 1.3 | 0.444444 |
| 7 | 60 | 1.3 | 0.444444 |
| 8 | 70 | 1.2 | 0.333333 |
| 9 | 80 | 1.2 | 0.333333 |
| 10 | 90 | 1.1 | 0.222222 |
| 11 | 100 | 1.1 | 0.222222 |
| 12 | 110 | 1 | 0.111111 |
| 13 | 120 | 0.9 | 0 |
| 14 | 130 | 0.9 | 0 |
| 15 | 140 | 0.9 | 0 |
| 16 | 150 | 0.9 | 0 |



Grafik 4.4 hubungan waktu Vs kadar air pada suhu 45°C

3. Menentukan T's, Y' dan Ky

Secara analisis

$$Y's = 0.662 \times \left(\frac{PAs}{(Pt - PAs)} \right)$$

$$Y' = \left(\frac{(Y's \times \lambda w) - 1005(Td - Tw)}{(\lambda w + 1884(Td - Tw))} \right)$$

$$Ky = \frac{N}{(Y's - Y')}$$

Dari data Tw maka Pt dan Pas dapat dicari dari steam table (SMITH 4 ed)



Table 3. pengaruh perubahan Td dan Tw terhadap T's dan Y'

| No | Td (°C) | Tw (°C) | Pt | Pas | λ_w | Y's | Y' |
|----|---------|---------|-------|-------|-------------|----------|----------|
| 1 | 32 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.41881 |
| 2 | 32 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.41881 |
| 3 | 33 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.43452 |
| 4 | 33 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.41859 |
| 5 | 33 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.41859 |
| 6 | 33 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.41859 |
| 7 | 34 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.43434 |
| 8 | 34 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.43434 |
| 9 | 34 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.43434 |
| 10 | 34 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.43434 |
| 11 | 34 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.43434 |
| 12 | 35 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.44629 |
| 13 | 35 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.44629 |
| 14 | 35 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.44629 |
| 15 | 35 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.44629 |
| 16 | 35 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.44629 |

Table 4. pengaruh kecepatan pengeringan (N) terhadap koefisien transfer massa (Ky)

| No | waktu | kandungan air (X) | $dx/d\theta$ | Kecepatan pengeringan (N) | Ky |
|----|-------|-------------------|--------------|---------------------------|----------|
| 1 | 0 | 0.777778 | -0.01111 | -0.180555607 | -0.40762 |
| 2 | 10 | 0.666667 | 0 | -0.154761982 | -0.34939 |
| 3 | 20 | 0.666667 | -0.01111 | -0.154761982 | -0.33742 |
| 4 | 30 | 0.555556 | -0.01111 | -0.128968357 | -0.29032 |
| 5 | 40 | 0.444444 | 0 | -0.1031745 | -0.23225 |
| 6 | 50 | 0.444444 | 0 | -0.1031745 | -0.23225 |
| 7 | 60 | 0.444444 | -0.01111 | -0.1031745 | -0.2243 |
| 8 | 70 | 0.333333 | 0 | -0.077380875 | -0.16823 |
| 9 | 80 | 0.333333 | -0.01111 | -0.077380875 | -0.16823 |
| 10 | 90 | 0.222222 | 0 | -0.05158725 | -0.11215 |
| 11 | 100 | 0.222222 | -0.01111 | -0.05158725 | -0.11215 |
| 12 | 110 | 0.111111 | -0.01111 | -0.025793625 | -0.05466 |
| 13 | 120 | 0 | 0 | 0 | 0 |
| 14 | 130 | 0 | 0 | 0 | 0 |
| 15 | 140 | 0 | 0 | 0 | 0 |
| 16 | 150 | 0 | 0 | 0 | 0 |



➤ **Data Percobaan 5**

Nama sample : Bengkoang
Ukuran sample : Tebal : 0.2 cm
Panjang : 2.0 cm
Lebar : 2.0 cm
Suhu : 50 °C
Tekanan kompresor : 2 Bar
Berat gelas arloji : 25.1 gr
Jumlah sample : 1
Berat basah bahan : 1.6 gr

Table 1 pengaruh waktu terhadap penurunan suhu

| No | Waktu (menit) | Berat (gram) | Td (°C) | Tw (°C) |
|----|---------------|--------------|---------|---------|
| 1 | 0 | 1.6 | 33 | 27 |
| 2 | 10 | 1.5 | 33 | 27 |
| 3 | 20 | 1.4 | 34 | 28 |
| 4 | 30 | 1.3 | 35 | 28 |
| 5 | 40 | 1.2 | 35 | 28 |
| 6 | 50 | 1.2 | 35 | 28 |
| 7 | 60 | 1.1 | 35 | 28 |
| 8 | 70 | 1 | 35 | 29 |
| 9 | 80 | 1 | 35 | 29 |
| 10 | 90 | 0.9 | 35 | 29 |
| 11 | 100 | 0.9 | 35 | 29 |
| 12 | 110 | 0.9 | 35 | 29 |
| 13 | 120 | 0.9 | 35 | 29 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkang pada suhu 30°C–60°C

1. Menentukan kandungan air dalam bahan (X)

$$X = \frac{(S_o - S_s)}{S_s}$$

2. Menentukan kecepatan pengeringan (N)

$$N = - \left(\frac{S_s}{A} \right) x \left(\frac{dx}{dt} \right)$$

Luas permukaan (A)

$$A = (PxL) + 2(Lxt) + 2(Pxt)$$

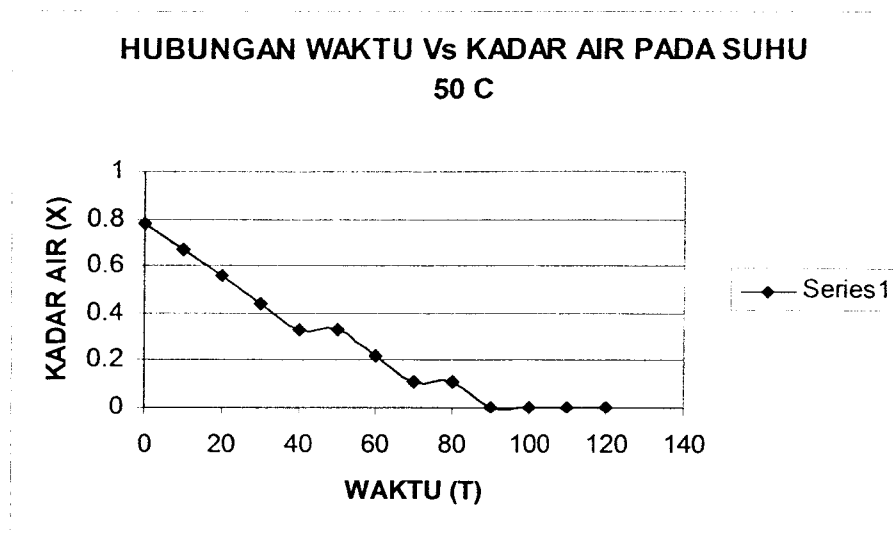
$$A = (2 \times 2) \text{cm} + 2(2 \times 0.2) \text{cm} + 2(2 \times 0.2) \text{cm}$$

$$A = 5.6 \text{ cm}$$

Berat kering (Ss) = 1.3 gram

Table 2. pengaruh penurunan berat bahan terhadap kandungan air (X)

| No | Waktu (menit) | Berat (gram) | Kandungan Air (X) |
|----|---------------|--------------|-------------------|
| 1 | 0 | 1.6 | 0.777778 |
| 2 | 10 | 1.5 | 0.666667 |
| 3 | 20 | 1.4 | 0.555556 |
| 4 | 30 | 1.3 | 0.444444 |
| 5 | 40 | 1.2 | 0.333333 |
| 6 | 50 | 1.2 | 0.333333 |
| 7 | 60 | 1.1 | 0.222222 |
| 8 | 70 | 1 | 0.111111 |
| 9 | 80 | 1 | 0.111111 |
| 10 | 90 | 0.9 | 0 |
| 11 | 100 | 0.9 | 0 |
| 12 | 110 | 0.9 | 0 |
| 13 | 120 | 0.9 | 0 |



Grafik 4.5 hubungan waktu Vs kadar air pada suhu 50° C

3. Menentukan T's, Y' dan Ky

Secara analisis

$$Y's = 0.662 \times \left(\frac{PAs}{(Pt - PAs)} \right)$$

$$Y' = \left(\frac{(Y's \times \lambda w) - 1005(Td - Tw)}{(\lambda w + 1884(Td - Tw))} \right)$$

$$Ky = \frac{N}{(Y's - Y')}$$

Dari data Tw maka Pt dan Pas dapat dicari dari steam table (SMITH 4 ed)



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkuang pada suhu 30°C–60°C

Table 3. pengaruh perubahan T_d dan T_w terhadap $T's$ dan Y'

| No | T_d (°C) | T_w (°C) | Pt | Pas | λ_w | $Y's$ | Y' |
|----|------------|------------|-------|-------|-------------|----------|----------|
| 1 | 33 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.43452 |
| 2 | 33 | 27 | 101.3 | 3.564 | 2437.8 | 0.02414 | -0.43452 |
| 3 | 34 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.43434 |
| 4 | 35 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.44629 |
| 5 | 35 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.44629 |
| 6 | 35 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.44629 |
| 7 | 35 | 28 | 101.3 | 3.778 | 2435.4 | 0.025646 | -0.44629 |
| 8 | 35 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.43413 |
| 9 | 35 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.43413 |
| 10 | 35 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.43413 |
| 11 | 35 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.43413 |
| 12 | 35 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.43413 |
| 13 | 35 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.43413 |

Table 4. pengaruh kecepatan pengeringan (N) terhadap koefisien transfer massa (K_y)

| No | waktu | kandungan air (X) | $dx/d\theta$ | Kecepatan pengeringan (N) | K_y |
|----|-------|-------------------|--------------|---------------------------|----------|
| 1 | 0 | 0.777778 | -0.01111 | 0.002579363 | 0.005624 |
| 2 | 10 | 0.666667 | -0.01111 | 0.002579363 | 0.005624 |
| 3 | 20 | 0.555556 | -0.01111 | 0.002579386 | 0.005608 |
| 4 | 30 | 0.444444 | -0.01111 | 0.002579363 | 0.005466 |
| 5 | 40 | 0.333333 | 0 | 0 | 0 |
| 6 | 50 | 0.333333 | -0.01111 | 0.002579363 | 0.005466 |
| 7 | 60 | 0.222222 | -0.01111 | 0.002579363 | 0.005466 |
| 8 | 70 | 0.111111 | 0 | 0 | 0 |
| 9 | 80 | 0.111111 | -0.01111 | 0.002579363 | 0.005591 |
| 10 | 90 | 0 | 0 | 0 | 0 |
| 11 | 100 | 0 | 0 | 0 | 0 |
| 12 | 110 | 0 | 0 | 0 | 0 |
| 13 | 120 | 0 | 0 | 0 | 0 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkoang pada suhu 30°C–60°C

➤ **Data Percobaan 6**

Nama sample : Bengkoang
Ukuran sample : Tebal : 0.2 cm
Panjang : 2.0 cm
Lebar : 2.0 cm
Suhu : 55 °C
Tekanan kompresor : 2 Bar
Berat gelas arloji : 25.1 gr
Jumlah sample : 1
Berat basah bahan : 1.6 gr

Table 1 pengaruh waktu terhadap penurunan suhu

| No | Waktu (menit) | Berat (gram) | Td (°C) | Tw (°C) |
|----|---------------|--------------|---------|---------|
| 1 | 0 | 1.6 | 35 | 29 |
| 2 | 10 | 1.6 | 35 | 29 |
| 3 | 20 | 1.4 | 37 | 29 |
| 4 | 30 | 1.3 | 37 | 30 |
| 5 | 40 | 1.2 | 37 | 30 |
| 6 | 50 | 1.1 | 38 | 30 |
| 7 | 60 | 1 | 38 | 30 |
| 8 | 70 | 0.9 | 38 | 30 |
| 9 | 80 | 0.9 | 39 | 31 |
| 10 | 90 | 0.9 | 39 | 31 |
| 11 | 100 | 0.9 | 39 | 31 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkang pada suhu 30°C–60°C

1. Menentukan kandungan air dalam bahan (X)

$$X = \frac{(S_o - S_s)}{S_s}$$

2. Menentukan kecepatan pengeringan (N)

$$N = - \left(\frac{S_s}{A} \right) x \left(\frac{dx}{dt} \right)$$

Luas permukaan (A)

$$A = (PxL) + 2(Lxt) + 2(Pxt)$$

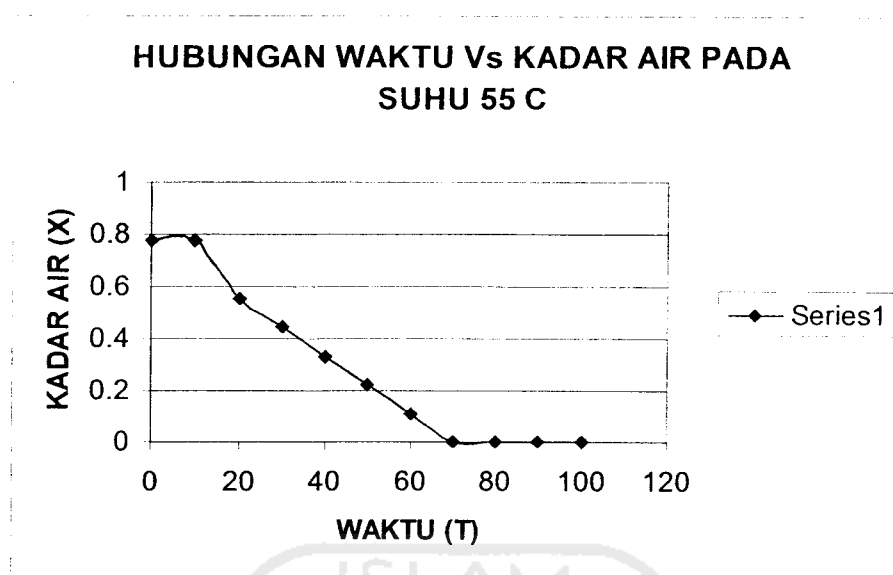
$$A = (2 \times 2) \text{cm} + 2(2 \times 0.2) \text{cm} + 2(2 \times 0.2) \text{cm}$$

$$A = 5.6 \text{ cm}$$

Berat kering (Ss) = 1.3 gram

Table 2. pengaruh penurunan berat bahan terhadap kandungan air (X)

| No | Waktu (menit) | Berat (gram) | Kandungan Air (X) |
|----|---------------|--------------|-------------------|
| 1 | 0 | 1.6 | 0.777778 |
| 2 | 10 | 1.6 | 0.777778 |
| 3 | 20 | 1.4 | 0.555556 |
| 4 | 30 | 1.3 | 0.444444 |
| 5 | 40 | 1.2 | 0.333333 |
| 6 | 50 | 1.1 | 0.222222 |
| 7 | 60 | 1 | 0.111111 |
| 8 | 70 | 0.9 | 0 |
| 9 | 80 | 0.9 | 0 |
| 10 | 90 | 0.9 | 0 |
| 11 | 100 | 0.9 | 0 |



Grafik 4.6 hubungan waktu Vs kadar air pada suhu 55° C

3. Menentukan $T's$, Y' dan K_y

Secara analisis

$$Y's = 0.662 \times \left(\frac{PAs}{(Pt - PAs)} \right)$$

$$Y' = \left(\frac{(Y's \times \lambda w) - 1005(Td - Tw)}{(\lambda w + 1884(Td - Tw))} \right)$$

$$K_y = \frac{N}{(Y's - Y')}$$

Dari data T_w maka P_t dan P_{as} dapat dicari dari steam table (SMITH 4 ed)



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkuang pada suhu 30°C–60°C

Table 3. pengaruh perubahan T_d dan T_w terhadap $T's$ dan Y'

| No | T_d (°C) | T_w (°C) | P_t | P_{as} | λ_w | $Y's$ | Y' |
|----|------------|------------|-------|----------|-------------|----------|----------|
| 1 | 35 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.43413 |
| 2 | 35 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.43413 |
| 3 | 37 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.45551 |
| 4 | 37 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.44592 |
| 5 | 37 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.44592 |
| 6 | 38 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.45534 |
| 7 | 38 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.45534 |
| 8 | 38 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.45534 |
| 9 | 39 | 31 | 101.3 | 4.491 | 2428.3 | 0.03071 | -0.45516 |
| 10 | 39 | 31 | 101.3 | 4.491 | 2428.3 | 0.03071 | -0.45516 |
| 11 | 39 | 31 | 101.3 | 4.491 | 2428.3 | 0.03071 | -0.45516 |

Table 4. pengaruh kecepatan pengeringan (N) terhadap koefisien transfer massa (K_y)

| No | Waktu | Kandungan Air (X) | $dx/d\theta$ | Kecepatan Pengeringan (N) | K_y |
|----|-------|-------------------|--------------|---------------------------|----------|
| 1 | 0 | 0.777778 | 0 | 0 | 0 |
| 2 | 10 | 0.777778 | -0.02222 | 0.005158725 | 0.011181 |
| 3 | 20 | 0.555556 | -0.01111 | 0.002579386 | 0.005343 |
| 4 | 30 | 0.444444 | -0.01111 | 0.002579363 | 0.005432 |
| 5 | 40 | 0.333333 | -0.01111 | 0.002579363 | 0.005432 |
| 6 | 50 | 0.222222 | -0.01111 | 0.002579363 | 0.005326 |
| 7 | 60 | 0.111111 | -0.01111 | 0.002579363 | 0.005326 |
| 8 | 70 | 0 | 0 | 0 | 0 |
| 9 | 80 | 0 | 0 | 0 | 0 |
| 10 | 90 | 0 | 0 | 0 | 0 |
| 11 | 100 | 0 | 0 | 0 | 0 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkoang pada suhu 30°C–60°C

➤ **Data Percobaan 7**

Nama sample : Bengkoang
Ukuran sample : Tebal : 0.2 cm
Panjang : 2.0 cm
Lebar : 2.0 cm
Suhu : 60 °C
Tekanan kompresor : 2 Bar
Berat gelas arloji : 25.1 gr
Jumlah sample : 1
Berat basah bahan : 1.6 gr

Table 1 pengaruh waktu terhadap penurunan suhu

| No | Waktu (menit) | Berat (gram) | Td (°C) | Tw (°C) |
|----|---------------|--------------|---------|---------|
| 1 | 0 | 1.6 | 36 | 29 |
| 2 | 10 | 1.5 | 38 | 29 |
| 3 | 20 | 1.3 | 39 | 30 |
| 4 | 30 | 1.2 | 39 | 30 |
| 5 | 40 | 1.1 | 40 | 30 |
| 6 | 50 | 1 | 40 | 30 |
| 7 | 60 | 1 | 40 | 30 |
| 8 | 70 | 0.9 | 40 | 30 |
| 9 | 80 | 0.9 | 40 | 30 |
| 10 | 90 | 0.9 | 40 | 30 |
| 11 | 100 | 0.9 | 40 | 30 |



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkang pada suhu 30°C–60°C

1. Menentukan kandungan air dalam bahan (X)

$$X = \frac{(S_o - S_s)}{S_s}$$

2. Menentukan kecepatan pengeringan (N)

$$N = - \left(\frac{S_s}{A} \right) x \left(\frac{dx}{dt} \right)$$

Luas permukaan (A)

$$A = (PxL)+2(Lxt)+2(Pxt)$$

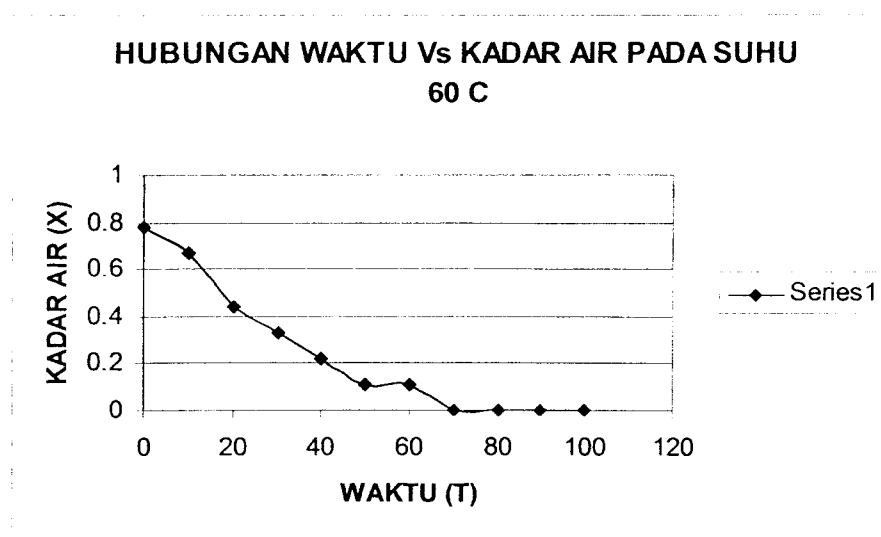
$$A = (2 \times 2) \text{cm} + 2(2 \times 0.2) \text{cm} + 2(2 \times 0.2) \text{cm}$$

$$A = 5.6 \text{ cm}$$

Berat kering (Ss) = 1.3 gram

Table 2. pengaruh penurunan berat bahan terhadap kandungan air (X)

| No | Waktu (menit) | Berat (gram) | Kandungan Air (X) |
|----|---------------|--------------|-------------------|
| 1 | 0 | 1.6 | 0.777778 |
| 2 | 10 | 1.5 | 0.666667 |
| 3 | 20 | 1.3 | 0.444444 |
| 4 | 30 | 1.2 | 0.333333 |
| 5 | 40 | 1.1 | 0.222222 |
| 6 | 50 | 1 | 0.111111 |
| 7 | 60 | 1 | 0.111111 |
| 8 | 70 | 0.9 | 0 |
| 9 | 80 | 0.9 | 0 |
| 10 | 90 | 0.9 | 0 |
| 11 | 100 | 0.9 | 0 |



Grafik 4.7 hubungan waktu Vs kadar air pada suhu 60°C

3. Menentukan $T's$, Y' dan K_y

Secara analisis

$$Y's = 0.662 \times \left(\frac{PAs}{(Pt - PAs)} \right)$$

$$Y' = \left(\frac{(Y'sx\lambda w) - 1005(Td - Tw)}{(\lambda w + 1884(Td - Tw))} \right)$$

$$K_y = \frac{N}{(Y's - Y')}$$

Dari data T_w maka P_t dan P_{As} dapat dicari dari steam table (SMITH 4 ed)



Menentukan koefisien transfer massa optimum
Pada pengeringan bengkuang pada suhu 30°C–60°C

Table 3. pengaruh perubahan T_d dan T_w terhadap $T's$ dan Y'

| No | T_d (°C) | T_w (°C) | Pt | Pas | λ_w | $Y's$ | Y' |
|----|------------|------------|-------|-------|-------------|----------|----------|
| 1 | 36 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.44611 |
| 2 | 38 | 29 | 101.3 | 4.004 | 2433.1 | 0.027243 | -0.46308 |
| 3 | 39 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.46293 |
| 4 | 39 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.46293 |
| 5 | 40 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.46918 |
| 6 | 40 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.46918 |
| 7 | 40 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.46918 |
| 8 | 40 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.46918 |
| 9 | 40 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.46918 |
| 10 | 40 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.46918 |
| 11 | 40 | 30 | 101.3 | 4.241 | 2430.7 | 0.028926 | -0.46918 |

Table 4. pengaruh kecepatan pengeringan (N) terhadap koefisien transfer massa (K_y)

| No | Waktu | Kandungan Air (X) | $dx/d\theta$ | Kecepatan Pengeringan (N) | K_y |
|----|-------|-------------------|--------------|---------------------------|----------|
| 1 | 0 | 0.777778 | -0.01111 | 0.002579363 | 0.001221 |
| 2 | 10 | 0.666667 | -0.02222 | 0.005158748 | 0.002529 |
| 3 | 20 | 0.444444 | -0.01111 | 0.002579363 | 0.001269 |
| 4 | 30 | 0.333333 | -0.01111 | 0.002579363 | 0.001269 |
| 5 | 40 | 0.222222 | -0.01111 | 0.002579363 | 0.001285 |
| 6 | 50 | 0.111111 | 0 | 0 | 0 |
| 7 | 60 | 0.111111 | -0.01111 | 0.002579363 | 0.001285 |
| 8 | 70 | 0 | 0 | 0 | 0 |
| 9 | 80 | 0 | 0 | 0 | 0 |
| 10 | 90 | 0 | 0 | 0 | 0 |
| 11 | 100 | 0 | 0 | 0 | 0 |