

# LAMPIRAN

Tabel . Sifat-Sifat Udara Pada Tekanan Atmosfer.

Nilai  $\mu$ ,  $k$ ,  $c_D$ , dan Pr tidak terlalu bergantung pada tekanan dan dapat digunakan untuk tekanan yang cukup luas.

| $T, K$ | $\rho$<br>kg/m <sup>3</sup> | $c_p$<br>kJ/kg. <sup>o</sup> C | $\mu$<br>kg/m.s x 10 <sup>5</sup> | $\nu$<br>m <sup>2</sup> /s x 10 <sup>4</sup> | $k$<br>W/m. <sup>o</sup> C | $\alpha$<br>m <sup>2</sup> /s x 10 <sup>4</sup> | Pr    |
|--------|-----------------------------|--------------------------------|-----------------------------------|----------------------------------------------|----------------------------|-------------------------------------------------|-------|
| 100    | 3.6010                      | 1.0266                         | 0.6924                            | 1.923                                        | 0.009246                   | 0.02501                                         | 0.770 |
| 150    | 2.3675                      | 1.0099                         | 1.0283                            | 4.343                                        | 0.013735                   | 0.0574                                          | 0.753 |
| 200    | 1.7684                      | 1.0061                         | 1.3289                            | 7.490                                        | 0.01809                    | 0.10165                                         | 0.739 |
| 250    | 1.4128                      | 1.0053                         | 1.5990                            | 11.31                                        | 0.02227                    | 0.15675                                         | 0.722 |
| 300    | 1.1774                      | 1.0057                         | 1.8462                            | 15.69                                        | 0.02624                    | 0.22160                                         | 0.708 |
| 350    | 0.9980                      | 1.0090                         | 2.075                             | 20.76                                        | 0.03003                    | 0.2983                                          | 0.697 |
| 400    | 0.8826                      | 1.0140                         | 2.286                             | 25.90                                        | 0.03365                    | 0.3760                                          | 0.689 |
| 450    | 0.7833                      | 1.0207                         | 2.484                             | 31.71                                        | 0.03707                    | 0.4222                                          | 0.683 |
| 500    | 0.7048                      | 1.0295                         | 2.671                             | 37.90                                        | 0.04038                    | 0.5564                                          | 0.680 |
| 550    | 0.6423                      | 1.0392                         | 2.848                             | 44.34                                        | 0.04360                    | 0.6532                                          | 0.680 |
| 600    | 0.5879                      | 1.0551                         | 3.018                             | 51.35                                        | 0.04659                    | 0.7512                                          | 0.680 |
| 650    | 0.5430                      | 1.0635                         | 3.177                             | 58.51                                        | 0.04953                    | 0.8578                                          | 0.682 |
| 700    | 0.5030                      | 1.0752                         | 3.332                             | 66.25                                        | 0.05230                    | 0.9672                                          | 0.684 |
| 750    | 0.4709                      | 1.0856                         | 3.481                             | 73.91                                        | 0.05509                    | 1.0774                                          | 0.686 |
| 800    | 0.4405                      | 1.0978                         | 3.625                             | 82.29                                        | 0.05779                    | 1.1951                                          | 0.689 |
| 850    | 0.4149                      | 1.1095                         | 3.765                             | 90.75                                        | 0.06028                    | 1.3097                                          | 0.692 |
| 900    | 0.3925                      | 1.1212                         | 3.899                             | 99.3                                         | 0.06279                    | 1.4271                                          | 0.696 |
| 950    | 0.3716                      | 1.1321                         | 4.023                             | 108.2                                        | 0.06525                    | 1.5510                                          | 0.699 |
| 1000   | 0.3524                      | 1.1417                         | 4.152                             | 117.8                                        | 0.06752                    | 1.6779                                          | 0.702 |
| 1100   | 0.3204                      | 1.160                          | 4.44                              | 138.6                                        | 0.0732                     | 1.969                                           | 0.704 |
| 1200   | 0.2947                      | 1.179                          | 4.69                              | 159.1                                        | 0.0782                     | 2.251                                           | 0.707 |
| 1300   | 0.2707                      | 1.197                          | 4.93                              | 182.1                                        | 0.0837                     | 2.583                                           | 0.705 |
| 1400   | 0.2515                      | 1.214                          | 5.17                              | 205.5                                        | 0.0891                     | 2.920                                           | 0.705 |
| 1500   | 0.2355                      | 1.230                          | 5.40                              | 229.1                                        | 0.0946                     | 3.262                                           | 0.705 |
| 1600   | 0.2211                      | 1.248                          | 5.63                              | 254.5                                        | 0.100                      | 3.609                                           | 0.705 |
| 1700   | 0.2082                      | 1.467                          | 5.85                              | 280.5                                        | 0.105                      | 3.977                                           | 0.705 |
| 1800   | 0.1970                      | 1.287                          | 6.07                              | 308.1                                        | 0.111                      | 4.379                                           | 0.704 |
| 1900   | 0.1858                      | 1.309                          | 6.29                              | 338.5                                        | 0.117                      | 4.811                                           | 0.704 |
| 2000   | 0.1762                      | 1.338                          | 6.50                              | 369.0                                        | 0.124                      | 5.260                                           | 0.702 |
| 2100   | 0.1682                      | 1.372                          | 6.72                              | 399.6                                        | 0.131                      | 5.715                                           | 0.700 |
| 2200   | 0.1602                      | 1.419                          | 6.93                              | 432.6                                        | 0.139                      | 6.120                                           | 0.707 |
| 2300   | 0.1538                      | 1.482                          | 7.14                              | 464.0                                        | 0.149                      | 6.540                                           | 0.710 |
| 2400   | 0.1458                      | 1.574                          | 7.35                              | 504.0                                        | 0.161                      | 7.020                                           | 0.718 |
| 2500   | 0.1394                      | 1.688                          | 7.57                              | 543.5                                        | 0.175                      | 7.441                                           | 0.730 |

Dari Natl Bur stand (U.S) Circ. 564. 1965

Tabel. Sifat-sifat bukan logam.

| Bahan                                  | Temperatur<br>°C | $k$ ,<br>W/m.°C | $\rho$<br>kg/m <sup>3</sup> | $c$<br>kJ/kg.°C | $\alpha$<br>m <sup>2</sup> /s x 10 <sup>7</sup> |
|----------------------------------------|------------------|-----------------|-----------------------------|-----------------|-------------------------------------------------|
| Bahan-bahan bangunan dan penahan kalor |                  |                 |                             |                 |                                                 |
| Aspal                                  | 20-55            | 0.74-0.76       |                             |                 |                                                 |
| Bata:                                  |                  |                 |                             |                 |                                                 |
| Bata bangunan                          | 20               | 0.69            | 1600                        | 0.84            | 5.2                                             |
| Biasa                                  |                  |                 |                             |                 |                                                 |
| Muka                                   |                  | 1.32            | 2000                        |                 |                                                 |
| Bata karborundum                       | 600              | 18.5            |                             |                 |                                                 |
|                                        | 1400             | 11.1            |                             |                 |                                                 |
| Bata krom                              | 200              | 2.32            | 3000                        | 0.84            | 9.2                                             |
|                                        | 550              | 2.47            |                             |                 | 9.8                                             |
|                                        | 900              | 1.99            |                             |                 | 7.9                                             |
| Tanah diatomea                         |                  |                 |                             |                 |                                                 |
| Dicetak dan                            | 200              | 0.24            |                             |                 |                                                 |
| Dibakar                                | 870              | 0.31            |                             |                 |                                                 |
| Bata tahan api                         | 500              | 1.04            | 2000                        | 0.96            | 5.4                                             |
| Dibakar 2426°F                         | 800              | 1.07            |                             |                 |                                                 |
|                                        | 1100             | 1.09            |                             |                 |                                                 |
| Dibakar 2642°F                         | 500              | 1.28            | 2300                        | 0.96            | 5.8                                             |
|                                        | 800              | 1.37            |                             |                 |                                                 |
|                                        | 1100             | 1.40            |                             |                 |                                                 |
| Missouri                               | 200              | 1.00            | 2600                        | 0.96            | 4.0                                             |
|                                        | 600              | 1.47            |                             |                 |                                                 |
|                                        | 1400             | 1.47            |                             |                 |                                                 |
| Magnesit                               | 200              | 3.81            |                             | 1.13            |                                                 |
|                                        | 650              | 2.77            |                             |                 |                                                 |
|                                        | 1200             | 1.90            |                             |                 |                                                 |
| Semen, portland                        |                  | 0.29            | 1500                        |                 |                                                 |
| Moster                                 | 23               | 1.16            |                             |                 |                                                 |
| Beton, sinder                          | 23               | 0.76            |                             |                 |                                                 |
| Batu, 1.2-4 campur                     | 20               | 1.37            | 1900-                       | 0.88            | 8.2-6.8                                         |
| Gelas, jendela                         | 20               | 0.78 (avg)      | 2300                        | 0.84            | 3.4                                             |
| Korosilikat                            | 30-75            | 1.09            | 2700                        |                 |                                                 |
| Plaster, gips                          | 20               | 0.48            | 2200                        | 0.84            | 4.0                                             |
| La logam                               | 20               | 0.47            | 1440                        |                 |                                                 |
| Lat kayu                               | 20               | 0.28            |                             |                 |                                                 |
| Batu:                                  |                  |                 |                             |                 |                                                 |
| Granit                                 |                  | 1.79-3.98       |                             | 0.82            | 8-18                                            |
| Batu kapur                             | 100-300          | 1.26-1.33       | 2640                        | 0.90            | 3.6-5.9                                         |
| Marmer                                 |                  | 2.07-2.94       | 2500                        | 0.80            | 10-13.6                                         |
| Batu pasir                             | 40               | 1.83            | 2500-                       | 0.71            | 11.2-11.9                                       |
| Kayu (melintas serat)                  |                  |                 | 2700                        |                 |                                                 |
| Balsa, 8,8 lb/ft <sup>3</sup>          | 30               | 0.55            | 2160-                       |                 |                                                 |
| Sipres                                 | 30               | 0.097           | 2300                        |                 |                                                 |
| Fir                                    | 23               | 0.11            |                             | 2.72            | 0.96                                            |
| Mapel atau oak                         | 30               | 0.166           | 140                         | 2.4             | 1.28                                            |
| Pinus kuning                           | 23               | 0.147           | 460                         | 2.8             | 0.82                                            |
| Pinus putih                            | 30               | 0.112           | 420                         |                 |                                                 |
|                                        |                  |                 | 540                         |                 |                                                 |
|                                        |                  |                 | 640                         |                 |                                                 |
|                                        |                  |                 | 430                         |                 |                                                 |

Tabel *ABSORBER TEST MATERIAL*

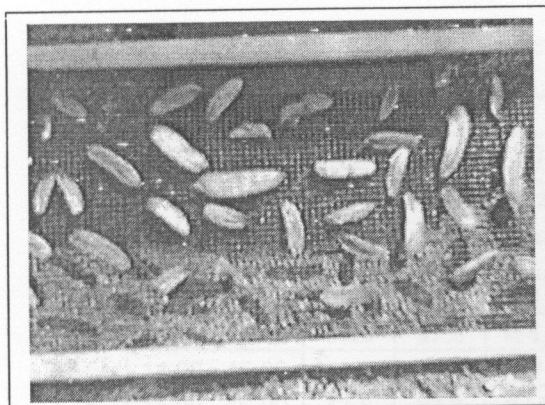
| Code* | Absorber Material       |                        | Optical Popertiest |           |
|-------|-------------------------|------------------------|--------------------|-----------|
|       | Coating                 | Substrate              | Absorptance        | Emittance |
| A     | <i>Black nickel</i>     | <i>Steel</i>           | 0.87               | 0.13      |
| C     | <i>Flat black paint</i> | <i>Copper</i>          | 0.98               | 0.92      |
| D     | <i>Black chrome</i>     | <i>Steel (nickel-</i>  | 0.97               | 0.07      |
| E     | <i>flashed)</i>         |                        | 0.95               | 0.87      |
| F     | <i>Flat balck paint</i> | <i>Copper</i>          | 0.96               | 0.75      |
| G     | <i>Copper oxide</i>     | <i>Copper</i>          | 0.93               | 0.86      |
| H     | <i>Black porcelain</i>  | <i>Steel</i>           | 0.95               | 0.89      |
| I     | <i>Flat black paint</i> | <i>Aluminum</i>        | 0.88               | 0.19      |
| J     | <i>Black chrome</i>     | <i>Stainlees steel</i> | 0.98               | 0.14      |
| L     | <i>Black chrome</i>     | <i>Aluminum</i>        | 0.99               | 0.29      |
| M     | <i>Laed oxide</i>       | <i>Copper</i>          | 0.94               | 0.10      |
| N     | <i>Oxide anodized</i>   | <i>Aluminum</i>        | 0.93               | 0.51      |
| P     | <i>Oxide conversion</i> | <i>Aluminum</i>        |                    |           |
|       | <i>Coating</i>          |                        | 0.96               | 0.08      |
|       | <i>Black chrome</i>     | <i>Copper</i>          |                    |           |

- Code letters A through H indicate material coupon specimens cut from solar collector A through H. codes I through P test at the materials level only.
- These properties are dependent on the formulation and manufacturing processes used, other product within a generic class of materials may have significantly different properties.
- Everage values based on s minimum of 10 test specimens from NBS TN 1136,1981. NBS Solar collector durability and reliability test program plan by D. Wakman , E. street, and T. seiler

Tabel 1. Data Massa Bahan Yang Dikeringkan

| Lama (jam) | Jam (Wib) | MASSA BAHAN YANG DIKERINGKAN (kg) |       |       |       |       |
|------------|-----------|-----------------------------------|-------|-------|-------|-------|
|            |           | Rak 1                             | Rak 2 | Rak 3 | Rak 4 | Total |
| 9          | 12.00     | 155                               | 132   | 112   | 104   | 198   |
| 10         | 13.00     | 134                               | 130   | 110   | 100   | 198   |
| 11         | 14.00     | 122                               | 122   | 105   | 100   | 198   |
| 12         | 15.00     | 118                               | 115   | 102   | 98    | 198   |
| 13         | 16.00     | 115                               | 108   | 100   | 95    | 198   |
| 14         | 17.00     | 115                               | 105   | 100   | 95    | 198   |

Gambar Alat Pengering Surya Jenis Pemanasan Langsung



Gambar Pisang yang dikeringkan dan proses pengambilan data pengujian

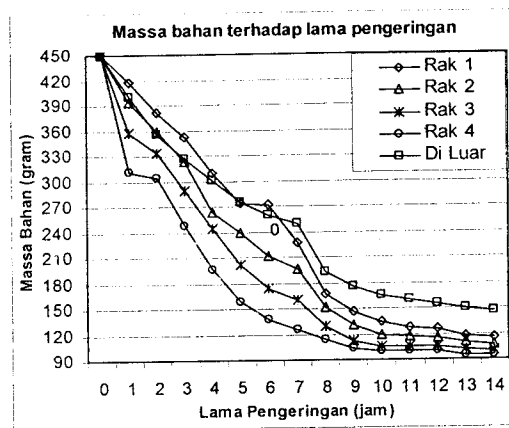
|           |               |       |       |      |       |       |      |       |       |      |
|-----------|---------------|-------|-------|------|-------|-------|------|-------|-------|------|
| 7         | 16.00 - 17.00 | 42.5  | 67.5  | 51.5 | 53.1  | 53    | 67.2 | 54.3  | 58.9  | 33.2 |
| 1         | 10.00 - 11.00 | 43.3  | 65.5  | 53.5 | 50.8  | 53.8  | 66.5 | 71.7  | 64.2  | 33.2 |
| 2         | 11.00 - 12.00 | 48    | 67.3  | 52.6 | 53.4  | 71.9  | 78.2 | 58.6  | 77.2  | 33.5 |
| 3         | 12.00 - 13.00 | 46.8  | 70.8  | 51.5 | 54.2  | 67.4  | 70   | 65.9  | 68.2  | 34.2 |
| 4         | 13.00 - 14.00 | 42.4  | 61.7  | 70.3 | 51.8  | 53.5  | 56.5 | 59.2  | 55.8  | 34.5 |
| 5         | 14.00 - 15.00 | 39.4  | 60.5  | 55   | 47.2  | 56.3  | 52.9 | 55.5  | 53    | 34   |
| 6         | 15.00 - 16.00 | 54.9  | 55.1  | 51.5 | 58.9  | 77.6  | 80   | 85.5  | 74.5  | 33.3 |
| 7         | 16.00 - 17.00 | 33    | 54.9  | 55.7 | 49.7  | 49.2  | 51.4 | 53.4  | 51.9  | 32.2 |
| Rata-rata |               | 40.37 | 70.43 | 50.5 | 53.41 | 59.85 | 53.1 | 65.67 | 70.53 | 33.2 |

Tabel 1. Data Massa Bahan Yang Dikeringkan

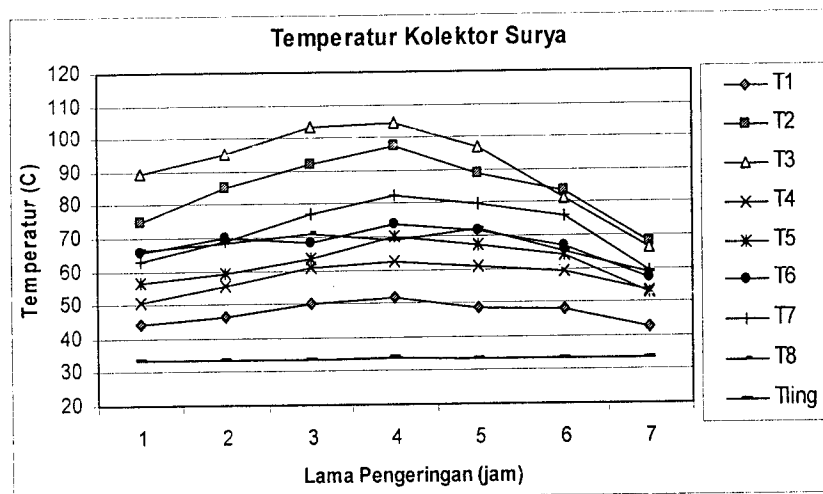
| Lama<br>(jam)                | Jam (Wib) | MASSA BAHAN YANG DIKERINGKAN (gr) |       |       |       |         |
|------------------------------|-----------|-----------------------------------|-------|-------|-------|---------|
|                              |           | Rak 1                             | Rak 2 | Rak 3 | Rak 4 | Di Luar |
| Hari Rabu, 26 November 2008  |           |                                   |       |       |       |         |
| 0                            | 10.00     | 450                               | 450   | 450   | 450   | 450     |
| 1                            | 11.00     | 418                               | 394   | 358   | 312   | 400     |
| 2                            | 12.00     | 382                               | 360   | 334   | 304   | 356     |
| 3                            | 13.00     | 352                               | 324   | 288   | 248   | 326     |
| 4                            | 14.00     | 310                               | 264   | 244   | 196   | 300     |
| 5                            | 15.00     | 274                               | 240   | 202   | 158   | 276     |
| 6                            | 16.00     | 272                               | 212   | 174   | 138   | 260     |
| Hari Kamis, 27 November 2008 |           |                                   |       |       |       |         |
| 7                            | 10.00     | 228                               | 196   | 160   | 126   | 250     |
| 8                            | 11.00     | 168                               | 151   | 130   | 114   | 192     |
| 9                            | 12.00     | 146                               | 132   | 112   | 104   | 176     |
| 10                           | 13.00     | 134                               | 120   | 106   | 100   | 166     |
| 11                           | 14.00     | 128                               | 118   | 106   | 100   | 160     |
| 12                           | 15.00     | 126                               | 116   | 106   | 100   | 156     |
| 13                           | 16.00     | 118                               | 110   | 102   | 96    | 150     |
| 14                           | 17.00     | 116                               | 108   | 100   | 96    | 146     |

Tabel 2. Data Temperatur Pengeringan

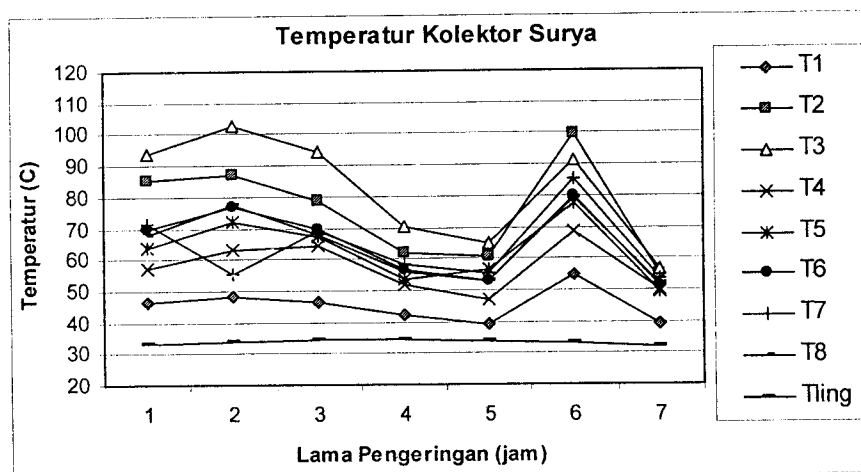
| No                           | Jam (Wib)     | TEMPERATUR °C |       |       |       |       |      |       |       |      |
|------------------------------|---------------|---------------|-------|-------|-------|-------|------|-------|-------|------|
|                              |               | T1            | T2    | T3    | T4    | T5    | T6   | T7    | T8    | T~   |
| Hari Rabu, 26 November 2008  |               |               |       |       |       |       |      |       |       |      |
| 1                            | 10.00 - 11.00 | 44.3          | 74.8  | 89.3  | 50.8  | 56.8  | 65.7 | 62.9  | 66.3  | 33.3 |
| 2                            | 11.00 - 12.00 | 46.4          | 85.3  | 95.1  | 55.4  | 59.2  | 70.1 | 69.1  | 68.5  | 33.4 |
| 3                            | 12.00 - 13.00 | 50.3          | 92.1  | 103.1 | 61.1  | 63.8  | 68.4 | 77.2  | 71.1  | 33.4 |
| 4                            | 13.00 - 14.00 | 51.8          | 97.3  | 104.2 | 62.6  | 69.9  | 73.8 | 82.1  | 69.1  | 34.2 |
| 5                            | 14.00 - 15.00 | 48.5          | 89    | 97    | 60.8  | 67.2  | 71.8 | 79.5  | 72.3  | 33.6 |
| 6                            | 15.00 - 16.00 | 47.8          | 83.2  | 81.5  | 59.4  | 64    | 67   | 76    | 65.3  | 33.2 |
| 7                            | 16.00 - 17.00 | 42.6          | 67.6  | 66.5  | 53.1  | 53    | 57.2 | 59.3  | 58.9  | 33.2 |
| Rata-rata                    |               | 40.37         | 78.43 | 90.5  | 55.51 | 59.39 | 63.1 | 69.67 | 70.83 | 33.2 |
| Hari Kamis, 27 November 2008 |               |               |       |       |       |       |      |       |       |      |
| 1                            | 10.00 - 11.00 | 46.3          | 85.3  | 93.8  | 56.9  | 63.6  | 69.5 | 71.7  | 68.2  | 33.2 |
| 2                            | 11.00 - 12.00 | 48            | 87.3  | 102.6 | 63.4  | 71.9  | 76.7 | 55.6  | 77.2  | 33.5 |
| 3                            | 12.00 - 13.00 | 46.6          | 78.8  | 94.3  | 64.2  | 67.4  | 70   | 68.9  | 68.2  | 34.2 |
| 4                            | 13.00 - 14.00 | 42.4          | 61.7  | 70.2  | 51.8  | 53.5  | 56.6 | 58.2  | 55.8  | 34.5 |
| 5                            | 14.00 - 15.00 | 39.4          | 60.5  | 65    | 47.2  | 56.3  | 52.9 | 55.6  | 53    | 34   |
| 6                            | 15.00 - 16.00 | 54.6          | 99.4  | 91.5  | 68.5  | 77.6  | 80   | 85.5  | 79.3  | 33.3 |
| 7                            | 16.00 - 17.00 | 39            | 54.9  | 56.7  | 49.7  | 49.2  | 51.4 | 53.4  | 51.9  | 32.2 |
| Rata-rata                    |               | 40.37         | 78.43 | 90.5  | 55.51 | 59.39 | 63.1 | 69.67 | 70.83 | 33.2 |



Gambar 1. Laju Pengeringan massa bahan



Gambar 2. Distribusi temperatur pengeringan hari 1



Gambar 3. Distribusi temperatur pengeringan hari 2