

เอกสารอ้างอิง

- คณะกรรมการสิ่งแวดล้อมแห่งชาติ, สํานักงาน. 2523, รายงานสถานการณ์สิ่งแวดล้อมของประเทศไทย, ประจำปี 2523, โรงพิมพ์สำนักเลขานุการคณะกรรมการสิ่งแวดล้อมแห่งชาติ. กกม. คุ้มครองธรรมชาติไทยสัมภាន, สถาบันวิจัยสิ่งแวดล้อม, 2520, ข้อมูลภาวะของโลหะหนักในสิ่งแวดล้อมในประเทศไทย, รายงานการสำรวจนาทังวิชาการ เอกสารหมายเลขอารามณ์ 2, โรงพิมพ์คุ้มครองธรรมชาติไทยสัมภាន. กกม.
- คุ้มครองธรรมชาติไทยสัมภាន, สถาบันวิจัยสิ่งแวดล้อม, 2525, คู่มือการวิเคราะห์น้ำเสีย, ชุดพัฒนาก้าวหน้า, โรงพิมพ์คุ้มครองธรรมชาติไทยสัมภាន. กกม.
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ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

ภาคบันวอก

ศูนย์วิทยทรัพยากร
อุปางกรณ์มหาวิทยาลัย

សាខាអង់គ្លេសរាជាណាចក្រកម្ពុជា

| Date (1982) | Wanted | pH | Alkalinity as CaCO ₃ | Suspended Solids | BOD _c | COD | | | NH ₃ -N | | | Cr ₆₊ - Ni | | | NO ₂ -N / NO ₃ -N | | | Lead Concentration | | | | | | | | | | | | | | | |
|----------------|--------|-----|---------------------------------|------------------|------------------|---------------|--------------|--------------|--------------------|--------------|--------------|-----------------------|--------------|--------------|---|--------------|--------------|--------------------|--------------|--------------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|---|---|
| | | | | | | Infl. mg/l | Eff. mg/l | inf. mg/l | Infl. mg/l | Eff. mg/l | inf. mg/l | Infl. mg/l | Eff. mg/l | inf. mg/l | Infl. mg/l | Eff. mg/l | inf. mg/l | Infl. mg/l | Eff. mg/l | inf. mg/l | | | | | | | | | | | | | |
| 2-10-82 | 1.40 | 7.2 | 7.8 | 562 | 448 | 74 | 13.47 | 1340 | 1060 | 60.30 | 34 | 51.57 | 477.80 | 68.87 | 24.10 | 85.59 | 94.96 | 53.53 | 53.23 | 51.04 | 3.97 | 7.92 | 21.77 | 6.18 | 6.45 | 71.61 | 20.37 | 0.28 | 14.4 | 0.00 | - | - | |
| 3-10-82 | 1.40 | 7.2 | 7.8 | 574 | 432 | 82 | 18.28 | 1145 | 81.20 | 80 | 4.27 | 173.89 | 60.24 | 24.10 | 87.29 | 91.91 | 52.68 | 51.04 | 44.45 | 3.11 | 15.62 | 21.77 | 9.41 | 10.48 | 56.78 | 51.86 | 1.2 | 14.4 | 0.00 | - | - | | |
| 4-10-82 | 1.40 | 7.2 | 7.8 | 588 | 515 | 73 | 12.41 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | |
| 5-10-82 | 1.40 | 7.2 | 7.8 | 562 | 439 | 63 | 11.21 | 1410 | 1100 | 78.01 | 60 | 4.75 | 612.95 | 56.22 | 16.06 | 88.36 | 96.67 | 57.08 | 52.96 | 45.30 | 7.22 | 23.62 | 22.85 | 5.11 | 9.94 | 77.64 | 56.50 | 1.2 | 6.8 | 0.00 | - | - | |
| 6-10-82 | 1.40 | 7.2 | 7.7 | 610 | 539 | 81 | 13.28 | 1205 | 1160 | 96.26 | 56 | 4.60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | |
| 7-10-82 | 1.40 | 7.2 | 7.7 | 528 | 510 | 18 | 2.67 | 1360 | 915 | 69.48 | 60 | 4.69 | 470.81 | 35.86 | 15.91 | 92.38 | 96.61 | 58.25 | 47.74 | 46.65 | 15.13 | 17.07 | 22.04 | 4.03 | 6.45 | 81.72 | 70.74 | 6.4 | 8.2 | 0.00 | - | - | |
| 8-10-82 | 1.40 | 7.2 | 7.8 | 568 | 479 | 89 | 15.67 | 1260 | 1040 | 62.54 | 48 | 4.92 | 478.08 | 43.02 | 23.90 | 90.83 | 95.00 | 58.14 | 47.20 | 48.57 | 9.47 | 6.85 | 20.97 | 4.57 | 1.68 | 76.21 | 91.03 | 7.2 | 8.2 | 0.00 | - | - | |
| 9-10-82 | 1.40 | 7.2 | 7.8 | 578 | 546 | 32 | 5.91 | 1320 | 1075 | 81.44 | 30 | 5.63 | 478.08 | 53.82 | 19.92 | 90.83 | 95.03 | 53.15 | 48.57 | 47.47 | 13.93 | 13.92 | 20.97 | 6.30 | 2.42 | 79.50 | 85.46 | 7.5 | 6.0 | 0.00 | - | - | |
| Average* | 1.40 | 7.2 | 7.8 | 571 | 507 | 64 | 11.03 | 1346 | 1075 | 81.32 | 38 | 4.59 | 476.94 | 51.47 | 20.67 | 89.21 | 95.66 | 54.79 | 50.12 | 47.01 | 8.47 | 14.08 | 21.73 | 5.60 | 6.27 | 76.24 | 71.50 | 4.0 | 9.7 | 0.00 | - | - | |
| 21-10-82 | 1.00 | 7.2 | 6.8 | 538 | 192 | 596 | 68.31 | 1475 | 1230 | 83.39 | 80 | 5.20 | 485.94 | 56.28 | 32.13 | 88.42 | 93.79 | 55.16 | 11.41 | 19.55 | 75.88 | 61.56 | 27.84 | 6.38 | 5.54 | 76.75 | 70.81 | 7.2 | 15.6 | 0.00 | - | - | |
| 22-10-82 | 1.00 | 7.2 | 6.8 | 530 | 200 | 330 | 62.26 | 1445 | 1260 | 87.20 | 36 | 7.02 | 468.37 | 25.11 | 16.06 | 99.02 | 96.50 | 52.67 | 15.25 | 16.86 | 71.05 | 67.93 | 25.78 | 2.21 | 4.53 | 72.03 | 82.53 | 41.0 | 17.6 | 0.00 | - | - | |
| 23-10-82 | 1.00 | 7.2 | 7.5 | 617 | 572 | 196 | 57.6 | 1570 | 1320 | 91.35 | 50 | 4.68 | 481.92 | 51.21 | 40 | 16.06 | 89.17 | 96.67 | 72.72 | 15.12 | 15.12 | 72.36 | 72.85 | 26.06 | 3.92 | 2.24 | 84.95 | 91.40 | 21.0 | 16.2 | 0.00 | - | - |
| 24-10-82 | 1.00 | 7.2 | 6.8 | 570 | 185 | 385 | 67.54 | 1445 | 1320 | 91.35 | 50 | 8.03 | 485.94 | 93.37 | 8.03 | 80.99 | 96.35 | 54.88 | 12.13 | 10.92 | 77.90 | 80.10 | 22.63 | 4.67 | 1.96 | 79.41 | 91.36 | 22.0 | 20.4 | 0.00 | - | - | |
| 25-10-82 | 1.00 | 7.2 | 6.8 | 576 | 178 | 376 | 67.87 | 1405 | 1215 | 85.26 | 62 | 5.75 | 473.59 | 56.22 | 28.10 | 88.19 | 96.91 | 56.56 | 9.52 | 9.42 | 85.17 | 83.17 | 28.56 | 4.17 | 1.69 | 83.35 | 91.00 | 20.0 | 21.4 | 0.00 | - | - | |
| 26-10-82 | 1.00 | 7.2 | 6.4 | 518 | 488 | 426 | 62.88 | 1310 | 1285 | 98.09 | 48 | 6.16 | 497.98 | 56.32 | 16.06 | 98.21 | 96.77 | 54.89 | 15.29 | 16.36 | 75.28 | 73.47 | 28.48 | 5.51 | 0.40 | 80.62 | 98.60 | 7.0 | 0.00 | - | - | - | |
| 27-10-82 | 1.00 | 7.2 | 6.8 | 514 | 182 | 532 | 65.59 | 1805 | - | 51 | 6.05 | 493.97 | 48.11 | 23.08 | 90.26 | 95.93 | 53.44 | 16.97 | 15.52 | 73.00 | 23.00 | 31.52 | 6.10 | 4.99 | 80.52 | 64.07 | 4.0 | 0.00 | - | - | - | | |
| Average* | 1.00 | 7.2 | 6.7 | 542 | 174 | 367 | 67.88 | 1611 | 1262 | 89.06 | 54 | 6.11 | 484.32 | 55.64 | 10.93 | 88.53 | 96.03 | 55.04 | 13.53 | 14.58 | 75.38 | 73.45 | 27.19 | 5.31 | 3.05 | 79.66 | 86.68 | 20.2 | 18.6 | 0.00 | - | - | |
| 27-9-82 | 0.67 | 7.2 | 6.7 | 580 | 154 | 426 | 73.45 | 1615 | 1285 | 87.95 | 42 | 8.44 | 510.32 | 85.02 | 23.95 | 83.33 | 95.30 | 59.54 | 0.69 | 1.07 | 98.84 | 98.86 | 95.85 | 25.38 | 11.11 | 3.98 | 56.32 | 84.32 | 18.0 | 23.0 | 0.00 | - | - |
| 28-9-82 | 0.67 | 7.2 | 6.5 | 570 | 132 | 443 | 75.50 | 1515 | 1330 | 91.03 | 66 | 7.02 | 510.12 | 117.72 | 52.52 | 76.92 | 89.74 | 55.43 | 0.63 | 1.73 | 98.86 | 95.85 | 25.38 | 11.11 | 3.98 | 56.32 | 84.32 | 9.8 | 15.0 | 0.00 | - | - | |
| 29-9-82 | 0.67 | 7.2 | 6.5 | 580 | 150 | 440 | 74.58 | 1580 | 1300 | 86.08 | 58 | 4.56 | 485.94 | 113.36 | 4.50 | 51.60 | 70.72 | 90.26 | 50.17 | 0.55 | 1.04 | 99.05 | 98.21 | 23.74 | 10.02 | 3.70 | 57.79 | 84.41 | 8.8 | 19.0 | 0.00 | - | - |
| 30-9-82 | 0.67 | 7.2 | 6.6 | 586 | 140 | 446 | 75.61 | 1530 | 1330 | 93.86 | 46 | 8.63 | 485.76 | 109.00 | 69.76 | 86.21 | 95.92 | 56.00 | 0.27 | 0.94 | 99.34 | 99.39 | 28.01 | 10.29 | 2.88 | 57.14 | 88.00 | 17.4 | 21.0 | 0.00 | - | - | |
| 1-10-82 | 0.67 | 7.2 | 6.5 | 600 | 138 | 462 | 77.00 | 1515 | 1320 | 88.45 | 48 | 8.20 | 510.12 | 95.92 | 61.04 | 89.20 | 88.03 | - | - | - | - | - | - | - | - | - | - | 20.0 | 23.0 | 0.00 | - | - | |
| 2-10-82 | 0.67 | 7.2 | 6.5 | 596 | 132 | 464 | 77.85 | 1680 | 1495 | 88.99 | 56 | 8.01 | 483.96 | 61.00 | 21.80 | 87.39 | 95.90 | - | - | - | - | - | - | - | - | - | - | 20.0 | 23.0 | 0.00 | - | - | |
| Average* | 0.67 | 7.2 | 6.6 | 587 | 139 | 448 | 76.26 | 1556 | 1352 | 89.41 | 53 | 7.99 | 494.74 | 97.00 | 45.42 | 80.34 | 90.04 | 58.04 | 0.54 | 1.05 | 99.07 | 98.47 | 28.12 | 10.42 | 3.52 | 56.82 | 85.40 | 14.0 | 20.7 | 0.00 | - | - | |
| 9-9-82 | 1.00 | 7.1 | 6.3 | 592 | 120 | 422 | 77.66 | 1625 | 1485 | 91.28 | 10 | 9.05 | 535.98 | 59.90 | 41.47 | 85.82 | 92.26 | 52.30 | 5.88 | 85.76 | 98.49 | 21.42 | 0.83 | 89.80 | 95.60 | 15.2 | 20.3 | 0.00 | - | - | | | |
| 10-9-82 | 1.00 | 7.2 | 6.5 | 566 | 130 | 436 | 77.03 | 1680 | 1530 | 91.07 | 27 | 7.85 | 520.70 | 59.90 | 23.04 | 88.50 | 95.98 | 55.56 | 5.92 | 82.80 | 92.94 | 9.36 | 22.73 | 3.02 | 86.21 | 96.35 | 15.0 | 23.0 | 0.00 | - | - | | |
| 11-9-82 | 1.00 | 7.1 | 6.2 | 585 | 124 | 402 | 76.42 | 1735 | 1510 | 87.03 | 8 | 9.27 | 548.35 | 36.85 | 32.26 | 93.68 | 98.12 | 51.56 | 3.64 | 92.04 | 96.20 | 24.59 | 3.82 | 5.38 | 90.90 | 86.14 | 13.8 | 21.0 | 0.00 | - | - | | |
| 12-9-82 | 1.00 | 7.1 | 6.3 | 530 | 110 | 420 | 79.24 | 1535 | 1380 | 89.90 | 18 | 8.54 | 516.10 | 63.00 | 31.38 | 87.20 | 93.94 | 49.62 | 6.16 | 93.36 | 87.58 | 93.43 | 25.76 | 4.71 | 79.56 | 81.73 | 19.2 | 19.0 | 0.00 | - | - | | |
| Average* | 1.00 | 7.1 | 6.3 | 551 | 121 | 420 | 77.64 | 1644 | 1496 | 89.84 | 16 | 6.63 | 530.20 | 59.91 | 32.01 | 89.40 | 93.98 | 52.36 | 6.90 | 92.06 | 95.70 | 24.35 | 3.44 | 86.74 | 90.20 | 17.8 | 20.8 | 0.00 | - | - | | | |

inf. = Influent
 eff. = Effluent
 un. = Uninfluent
 fl. = Flattest
 sus. = Suspended Solids.

HLSS = Hand Liquor Suspended Solids.

HLLS = Mixed Liquor Suspended Solids.

VLSL = Volumetric Suspended Solids.

EFLS = Effluent Suspended Solids.

ESLS = Suspended Solids Concentration in Effluent.

Note. = Lead Concentration in Residue.

ឧប្បជ្ជការារាងទាញរាយប្រភាក្សាហេមប្រព័ន្ធគ្នត់ប្រា 1.02 នៃគីឡូតិចទិន្នន័យ

| Date (1982) | Treated | pH | Alkalinity as CaCO_3 mg/l | Inf. eff. mg/l | inf. eff. Change mg/l | Suspended Solids mg/l | COD | | | NH ₃ -N | | | Cr ₆ + H | | | Hg^{+2} | | | Hg^{+2} | | | | | | | | | | | | | | | | | |
|----------------|---------|------|---------------------------------------|-------------------|-----------------------------|-----------------------------|----------|--------------|--------------|---------------------|--------------|--------------|---------------------|--------------|--------------|---------------------|--------------|--------------|---------------------|--------------|--------------|---------------------|-------|-------|-------|-------|--------|--------|------|------|------|-------|-------|--------|--------|-------|
| | | | | | | | % day | inf. mg/l | eff. mg/l | Residue un. % | | | | | | | | | | | | | | |
| 16-10-82 | 1 | 7.5 | 515 | 408 | 107 | 20.78 | 1315 | 1180 | 89.73 | 8 | 4.77 | 453.69 | 31.11 | 7.78 | 92.98 | 98.25 | 57.41 | 39.31 | 28.17 | 31.53 | 20.93 | 26.50 | 4.52 | 8.37 | 82.81 | 68.17 | 28.6 | 1.01 | 3.44 | 0.16 | 0.14 | 34.16 | | | | |
| 17-10-82 | 2 | - | - | - | - | - | - | - | - | - | - | 478.72 | 35.03 | 31.14 | 92.68 | 92.50 | 54.46 | 37.90 | 5.09 | 30.92 | 30.72 | 21.60 | 5.37 | 2.26 | 28.17 | 90.81 | 28.6 | 1.13 | 3.50 | 0.21 | 0.16 | 81.42 | | | | |
| 18-10-82 | 2 | 7.2 | 7.4 | 586 | 394 | 192 | 52.76 | 1170 | 1045 | 89.32 | 42 | 3.68 | 453.15 | 27.24 | 31.14 | 98.12 | 93.28 | 53.99 | 33.94 | 22.62 | 37.14 | 28.10 | 24.01 | 6.22 | 1.98 | 76.13 | 91.76 | 56.0 | 19.4 | 4.81 | 0.13 | 0.09 | 88.39 | | | |
| 19-10-82 | 2 | 7.3 | 7.2 | 609 | 374 | 235 | 38.59 | 1330 | 1075 | 80.83 | 50 | 3.88 | 450.39 | 42.81 | 38.92 | 91.27 | 92.06 | 57.97 | 33.09 | 32.21 | 42.92 | 44.44 | 12.89 | 3.57 | 1.98 | 77.62 | 92.04 | 36.0 | 19.4 | 5.76 | 0.07 | 0.20 | 95.52 | | | |
| * 20-10-82 | 2 | 7.2 | 7.0 | 549 | 240 | 369 | 56.28 | 1210 | 1095 | 90.50 | 42 | 3.91 | 454.28 | 46.70 | 55.03 | 90.55 | 98.91 | 56.28 | 28.58 | 58.74 | 49.22 | 26.04 | 5.09 | 2.03 | 76.83 | 91.35 | 36.0 | 18.0 | 1.05 | 0.10 | 0.22 | 90.48 | | | | |
| 21-10-82 | 2 | 7.2 | 7.5 | 538 | 324 | 214 | 39.78 | 1375 | 1251 | 90.98 | 22 | 4.53 | 456.28 | 46.70 | 27.24 | 90.55 | 98.49 | 57.41 | 27.68 | 56.07 | 51.78 | 51.68 | 25.73 | 5.96 | 3.59 | 76.88 | 86.82 | 32.9 | 20.4 | 5.87 | 0.16 | 0.16 | 86.44 | | | |
| 22-10-82 | 2 | 7.7 | 7.6 | 538 | 340 | 190 | 36.80 | 1280 | 1125 | 87.89 | 12 | 4.65 | 456.50 | 35.03 | 23.35 | 92.80 | 92.20 | 56.56 | 25.58 | 26.87 | 53.00 | 52.49 | 32.19 | 5.37 | 2.26 | 76.81 | 90.25 | 37.0 | 20.0 | 1.06 | 0.11 | 0.17 | 89.62 | | | |
| Average | 2 | 7.4 | 7.4 | 556 | 367 | 209 | 37.50 | 1280 | 1120 | 88.21 | 29 | 4.25 | 478.72 | 37.61 | 27.80 | 92.32 | 98.24 | 56.35 | 32.43 | 34.22 | 52.29 | 57.32 | 21.68 | 5.44 | 3.19 | 77.90 | 87.51 | 33.6 | 19.2 | 0.99 | 0.72 | 0.16 | 84.58 | | | |
| 16-10-82 | 1 | 4.40 | 7.6 | 6.4 | 550 | 251 | 299 | 54.36 | 1410 | 1230 | 87.23 | 24 | 5.94 | 473.72 | 40.70 | 19.46 | 91.50 | 95.93 | 58.51 | 14.99 | 15.84 | 71.39 | 72.94 | 24.32 | 3.69 | 1.70 | 84.83 | 93.01 | 25.5 | 17.4 | 1.35 | 6.75 | 0.84 | 0.15 | 37.76 | 88.89 |
| 17-10-82 | 1 | 4.40 | - | - | - | - | - | - | - | - | - | 467.04 | 46.70 | 27.48 | 90.00 | 94.17 | 55.99 | 12.83 | 14.39 | 77.08 | 75.00 | 21.60 | 5.58 | 0.56 | 85.04 | 97.72 | 20.8 | 15.8 | 1.16 | 5.36 | 0.31 | 0.16 | 73.28 | 85.21 | | |
| 18-10-82 | 1 | 4.40 | 7.2 | 6.8 | 594 | 221 | 373 | 62.79 | 1305 | 1180 | 90.42 | 60 | 4.62 | 443.69 | 54.49 | 19.46 | 87.72 | 93.61 | 50.83 | 9.62 | 18.25 | 68.80 | 40.80 | 23.19 | 3.39 | 0.55 | 85.33 | 98.45 | 20.8 | 14.7 | 0.99 | 7.44 | 0.44 | 0.10 | 21.11 | 88.89 |
| 19-10-82 | 1 | 4.40 | 7.3 | 6.5 | 622 | 234 | 388 | 62.79 | 1260 | 1065 | 89.52 | 50 | 4.86 | 453.15 | 54.49 | 15.57 | 88.23 | 96.61 | 61.32 | 11.61 | 11.88 | 81.07 | 80.53 | 23.52 | 4.17 | 0.28 | 82.27 | 98.81 | 20.2 | 9.8 | 1.03 | 4.73 | 0.18 | 0.06 | 82.86 | 86.95 |
| 20-10-82 | 1 | 4.40 | 7.2 | 6.3 | 553 | 198 | 355 | 64.20 | 1285 | 1166 | 89.18 | 54 | 4.77 | 455.90 | 54.49 | 31.48 | 87.59 | 92.05 | 60.42 | 11.88 | 12.44 | 80.28 | 79.35 | 21.38 | 2.85 | 1.13 | 87.01 | 94.31 | 20.2 | 9.5 | 1.05 | 5.28 | 0.18 | 0.06 | 75.33 | 86.87 |
| 21-10-82 | 1 | 4.40 | 7.2 | 6.5 | 561 | 117 | 444 | 79.14 | 1395 | 1155 | 82.80 | 58 | 4.78 | 486.30 | 50.60 | 35.62 | 83.40 | 82.40 | 53.06 | 15.94 | 13.69 | 76.72 | 78.31 | 22.00 | 6.00 | 0.99 | 92.67 | 100.00 | 20.6 | 8.5 | 1.18 | 5.76 | 0.44 | 0.06 | 62.71 | 89.83 |
| 22-10-82 | 1 | 4.40 | 7.5 | 6.9 | 570 | 200 | 370 | 64.91 | 1315 | 1130 | 85.93 | 40 | 5.25 | 488.06 | 101.17 | 67.46 | 78.86 | 86.18 | 62.32 | 10.75 | 16.68 | 82.72 | 73.19 | 25.73 | 1.67 | 1.67 | 93.51 | 95.91 | 20.2 | 10.8 | 0.82 | 6.62 | 0.14 | 0.06 | 62.93 | 81.71 |
| Average | 1 | 4.40 | 7.3 | 6.6 | 575 | 204 | 372 | 64.70 | 1328 | 1151 | 86.68 | 48 | 5.04 | 466.15 | 57.60 | 37.99 | 87.63 | 91.97 | 56.03 | 12.52 | 14.39 | 71.91 | 71.97 | 26.30 | 3.66 | 0.81 | 87.24 | 96.62 | 21.2 | 15.3 | 1.07 | 6.11 | 0.38 | 0.14 | 66.28 | 86.16 |
| 26-9-82 | 1 | 7.2 | 6.1 | 561 | 143 | 421 | 74.68 | 1716 | 1505 | 87.70 | 48 | 6.76 | 453.81 | 68.27 | 24.10 | 86.96 | 96.59 | 49.31 | 4.20 | 1.12 | 91.57 | 97.25 | 26.64 | 5.32 | 0.00 | 78.51 | 100.00 | 7.4 | 16.0 | 0.78 | 4.86 | 0.23 | 0.00 | 70.51 | 100.00 | |
| 27-9-82 | 1 | 7.4 | 6.5 | 606 | 450 | 456 | 75.25 | 1935 | 1710 | 88.37 | 62 | 6.47 | 472.05 | 92.20 | 3.69 | 89.47 | 99.22 | 88.21 | 1.95 | 1.67 | 96.00 | 96.58 | 26.49 | 7.25 | 0.28 | 72.63 | 98.94 | 1.6 | 16.0 | 0.96 | 5.12 | 0.18 | 0.06 | 61.35 | 100.00 | |
| 28-9-82 | 1 | 7.2 | 6.7 | 584 | 191 | 433 | 74.14 | 1540 | 1360 | 88.31 | 50 | 6.48 | 413.06 | 81.14 | 47.94 | 83.36 | 88.39 | 54.30 | 1.93 | 1.67 | 96.41 | 96.93 | 23.42 | 5.86 | 0.00 | 24.98 | 100.00 | 1.4 | 21.0 | 0.67 | 3.86 | 0.19 | 0.06 | 78.16 | 100.00 | |
| 29-9-82 | 1 | 7.2 | 6.6 | 592 | 141 | 451 | 76.18 | 1455 | 1273 | 87.63 | 42 | 6.71 | 301.20 | 66.58 | 40.57 | 77.96 | 86.53 | 55.16 | 0.28 | 0.84 | 99.49 | 98.48 | 16.80 | 3.92 | 1.12 | 75.67 | 93.33 | 1.4 | 23.0 | 0.07 | 4.97 | 0.22 | 0.06 | 79.44 | 100.00 | |
| 30-9-82 | 1 | 7.2 | 6.6 | 568 | 127 | 441 | 77.61 | 1525 | 1425 | 89.54 | 58 | 7.12 | 442.56 | 98.38 | 64.26 | 85.48 | 94.10 | 80.80 | 1.39 | 98.52 | 97.43 | 21.25 | 6.13 | 1.39 | 71.82 | 93.61 | 2.0 | 11.4 | 0.65 | 5.56 | 0.46 | 0.06 | 59.56 | 100.00 | | |
| 1-10-82 | 1 | 7.2 | 6.7 | 570 | 139 | 431 | 75.61 | 1720 | 1490 | 86.63 | 42 | 7.07 | 442.56 | 98.38 | 64.26 | 85.48 | 94.28 | 80.56 | 0.56 | 0.28 | 98.86 | 92.83 | 22.40 | 7.28 | 3.12 | 67.50 | 95.67 | 2.0 | 11.4 | 0.65 | 5.52 | 0.23 | 0.06 | 76.04 | 100.00 | |
| Average | 1 | 7.2 | 6.5 | 581 | 162 | 439 | 75.58 | 1660 | 1461 | 88.00 | 47 | 6.76 | 420.88 | 77.10 | 40.80 | 81.47 | 89.96 | 51.53 | 1.62 | 1.16 | 96.81 | 97.77 | 22.58 | 5.96 | 0.98 | 73.67 | 95.32 | 1.6 | 19.1 | 0.95 | 4.96 | 0.26 | 0.06 | 79.50 | 100.00 | |
| 13-11-82 | 0.67 | 7.5 | 6.9 | 580 | 120 | 461 | 79.45 | 2256 | 1944 | 86.91 | 40 | 10.48 | 476.00 | 53.00 | 36.00 | 89.08 | 92.44 | 57.12 | 1.40 | 0.28 | 97.55 | 99.54 | 25.76 | 1.68 | 0.28 | 93.48 | 98.91 | 13.0 | 17.8 | 0.81 | 8.50 | 0.18 | 0.06 | 77.76 | 100.00 | |
| 14-11-82 | 0.67 | 7.4 | 6.6 | 540 | 104 | 436 | 60.74 | 2112 | 1684 | 79.73 | 32 | 6.41 | 481.90 | 64.00 | 40.00 | 86.70 | 91.74 | 53.76 | 0.25 | 0.28 | 99.48 | 91.48 | 21.28 | 1.82 | 0.21 | 95.86 | 5.4 | 19.4 | 0.13 | 0.13 | 0.06 | 0.06 | 99.03 | 100.00 | | |
| 15-11-82 | 0.67 | 7.4 | 6.5 | 586 | 126 | 460 | 78.50 | 2031 | 1783 | 87.99 | 20 | 11.90 | 448.00 | 61.00 | 52.00 | 88.88 | 93.44 | 55.72 | 0.55 | 0.56 | 98.99 | 98.99 | 27.44 | 1.40 | 0.00 | 98.90 | 100.00 | 4.2 | 18.6 | 0.05 | 6.88 | 0.10 | 0.06 | 90.48 | 100.00 | |
| 16-11-82 | 0.67 | 7.5 | 6.6 | 564 | 140 | 428 | 75.18 | 2068 | 1800 | 87.04 | 40 | 9.95 | 460.00 | 52.00 | 21.00 | 85.70 | 91.74 | 51.40 | 0.56 | 0.56 | 98.91 | 98.91 | 26.85 | 1.36 | 0.00 | 92.70 | 97.91 | 3.6 | 12.0 | 0.30 | 8.59 | 0.17 | 0.06 | 81.11 | 100.00 | |
| 17-11-82 | 0.67 | 7.5 | 6.6 | 570 | 160 | 410 | 71.93 | 2196 | 1856 | 86.08 | 38 | 10.78 | 476.00 | 56.00 | 40.40 | 88.24 | 91.50 | 54.10 | 0.80 | 0.81 | 98.52 | 98.45 | 21.75 | 1.12 | 0.28 | 98.71 | 5.4 | 15.4 | 1.05 | 9.42 | 0.08 | 0.06 | 92.48 | 100.00 | | |
| Average | 0.67 | 7.5 | 6.5 | 569 | 130 | 439 | 77.46 | 2121 | 1814 | 85.56 | 35 | 10.71 | 476.80 | 57.60 | 36.40 | 87.94 | 92.80 | 54.39 | 0.71 | 0.50 | 98.69 | 97.67 | 21.62 | 1.46 | 0.40 | 98.13 | 98.28 | 5.8 | 16.0 | 0.37 | 8.59 | 0.11 | 0.06 | 85.48 | 100.00 | |

Inf. = Influent.
eff. = Effluent.
un. = Unfiltrate.
fill. = Filtrate.

MISB. = Mixed Liquor Suspended Solids.
MLVSS. = Mixed Liquor Volatile Suspended Solids.
VBH. = Volatile Suspended Solids Concentration in Effluent.
ESS. = Suspended Solids Concentration in Reactor.

ບໍລິສັດກາງກາງທາຫະລວງຕາຍກວາງ ຫ້າມປານອະຈຸດກຳ 4-28 ນັກສັກຮັນຄວດສົດທະນາ

| Date (1982) | Tested | pH | Alkalinity as CaCO ₃ , mg/l | Suspended solids, mg/l | COD mg/l | NH ₃ -N | | | NO ₂ -N | | | NO ₃ -N | | | Lead Concentration mg/l | | | | | | | | | | | | | | | | | | | | |
|----------------|--------|-----|--|------------------------------|-------------|--------------------|-------|-------------|--------------------|-------|-------------|--------------------|--------|-------------|----------------------------|--------|--------|-------|-------|--------|--------|--------|-------|-------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | | | | inf. | eff. | un. mg/l | inf. | eff. | un. mg/l | inf. | eff. | un. mg/l | | | | | | | | | | | | | | | | | | | | | |
| 14-11-82 | 2 | 7.6 | 6.9 | 566 | 158 | 408 | 72.08 | 115h | 1056 | 89.19 | 5h | 13.66 | 505.9h | 71.42 | 51.45 | 82.83 | 89.76 | 55.16 | 18.36 | 20.40 | 66.72 | 63.02 | 26.88 | 71.00 | 6.16 | 75.96 | 77.08 | 16.01 | 4.30 | 23.10 | 0.70 | 0.22 | 65.72 | 94.88 | |
| 15-11-82 | 2 | 7.5 | 6.8 | 62h | 15% | 470 | 75.32 | 880 | 776 | 88.18 | 32 | 3.87 | 539.45 | 67.46 | 87.50 | 88.97 | 55.48 | 16.25 | 14.86 | 68.68 | 70.21 | 26.04 | 5.6h | 2.68 | 78.3% | 85.57 | 16.0 | 2.10 | 6.35 | 20.83 | 0.9h | 0.45 | 77.24 | 89.10 | |
| 16-11-82 | 2 | 7.4 | 7.2 | 568 | 268 | 300 | 52.42 | 1056 | 850 | 81.44 | 54 | 3.55 | 539.65 | 107.1h | 42.62 | 80.45 | 91.18 | 56.28 | 19.88 | 19.88 | 6h.68 | 68.68 | 27.44 | 7.25 | 4.48 | 75.58 | 83.67 | 19.8 | 19.0 | 4.22 | 24.58 | 0.82 | 0.55 | 80.57 | 91.71 |
| 17-11-82 | 2 | 7.5 | 6.9 | 53h | 1h | 350 | 65.4h | 1180 | 1012 | 85.76 | 60 | 3.55 | 518.61 | 119.0h | 63.19 | 77.06 | 87.76 | 59.88 | 21.12 | 22.08 | 61.32 | 59.77 | 26.46 | 6.78 | 4.64 | 74.62 | 82.48 | 6.6 | 16.0 | 4.35 | 22.74 | 0.75 | 0.38 | 82.76 | 91.26 |
| 18-11-82 | 2 | 7.4 | 7.2 | 51h | 231 | 250 | 54.79 | - | - | - | - | 559.49 | 103.17 | 103.17 | 81.56 | 81.56 | 52.64 | 19.36 | 16.40 | 62.84 | 60.84 | 28.8h | 3.8h | 3.92 | 72.82 | 86.41 | 17.2 | 19.6 | 4.45 | 28.66 | 0.43 | 0.05 | 90.3% | 95.88 | |
| 19-11-82 | 2 | 7.4 | 7.4 | 52h | 265 | 260 | 49.71 | 1184 | 1004 | 84.80 | 49 | 3.76 | 535.65 | 95.23 | 63.4h | 82.22 | 88.15 | 59.32 | 20.45 | 19.38 | 62.35 | 61.24 | 27.4h | 6.78 | 5.82 | 75.51 | 78.57 | 16.0 | 19.4 | 2.35 | 22.57 | 0.17 | 0.24 | 95.58 | 93.77 |
| 20-11-82 | 2 | 7.5 | 7.2 | 54h | 243 | 300 | 55.23 | 1048 | 88.89 | 48 | 3.40 | 539.65 | 91.26 | 27.28 | 83.09 | 91.85 | 56.28 | 19.88 | 19.88 | 64.68 | 64.68 | 27.84 | 4.46 | 73.63 | 83.91 | 7.2 | - | 4.48 | 28.55 | 0.37 | 0.03 | 91.15 | 93.38 | | |
| 21-11-82 | 2 | 7.5 | 7.2 | 58h | 233 | 350 | 60.03 | 1120 | 940 | 85.93 | 54 | 4.02 | 433.52 | 71.42 | 47.62 | 83.68 | 89.12 | 50.40 | 19.52 | 19.80 | 61.37 | 60.71 | 25.4h | 6.72 | 3.6h | 73.63 | 85.71 | 16.4 | 15.0 | 3.6h | 25.24 | 0.60 | 0.15 | 85.52 | 95.88 |
| Average | 2 | 7.5 | 7.1 | 55h | 217 | 310 | 60.69 | 1118 | 952 | 86.03 | 47 | 3.7h | 521.80 | 90.77 | 58.03 | 82.64 | 88.92 | 51.18 | 19.44 | 19.08 | 64.09 | 64.76 | 27.06 | 6.90 | 5.61 | 74.8h | 82.96 | 14.1 | 18.3 | 4.1h | 24.57 | 0.60 | 0.23 | 85.61 | 94.5h |
| 14-11-82 | 1 | 7.6 | 7.2 | 52h | 249 | 277 | 52.66 | 1176 | 928 | 78.91 | 1h | 8.32 | 539.65 | 27.70 | 23.81 | 91.85 | 95.59 | 55.4h | 24.0h | 22.40 | 56.56 | 59.50 | 26.8h | 3.6h | 3.36 | 87.3h | 88.35 | 3h.8 | - | 6.15 | 47.19 | 0.37 | 0.08 | 91.08 | 98.07 |
| 15-11-82 | 1 | 7.5 | 6.9 | 53h | 18h | 553 | 55.2h | 1308 | 1156 | 65.85 | 10 | 8.85 | 515.36 | 35.21 | 19.8h | 93.4h | 96.36 | 53.1h | 11.76 | 12.32 | 72.2h | 76.47 | 29.6h | 3.16 | 3.08 | 88.6h | 89.62 | 29.0 | 21.4 | 8.35 | 39.76 | 0.17 | 0.07 | 96.12 | 98.4h |
| 16-11-82 | 1 | 7.4 | 6.9 | 59h | 70 | 580 | 69.7h | 1385 | 1155 | 83.28 | 18 | 8.19 | 537.26 | 27.7h | 27.9h | 95.01 | 91.99 | 99.8h | 10.08 | 9.52 | 82.27 | 89.25 | 31.0h | 3.6h | 3.94 | 88.2h | 87.52 | 4.0h | 4.1h | 4.35 | 33.5h | 0.03 | 0.13 | 99.32 | 97.03 |
| 17-11-82 | 1 | 7.5 | 6.7 | 54h | 123 | 425 | 72.55 | 1168 | 1216 | 82.83 | 26 | 7.68 | 565.84 | 66.60 | 23.28 | 88.23 | 95.53 | 56.84 | 8.40 | 8.40 | 85.22 | 92.61 | 29.6h | 4.0h | 1.12 | 65.85 | 96.23 | 29.6 | 23.4 | 5.25 | - | 0.08 | 0.03 | 98.12 | 92.29 |
| 18-11-82 | 1 | 7.4 | 6.4 | 54h | 89 | 456 | 83.67 | - | - | - | - | 540.96 | 50.68 | 19.6h | 90.63 | 96.38 | 53.20 | 1.68 | 6.72 | 96.8h | 87.37 | 33.0h | 3.6h | 0.00 | 90.68 | 100.00 | 34.4 | 21.0 | 4.2h | 48.4h | 0.02 | 0.14 | 99.33 | 96.70 | |
| 19-11-82 | 1 | 7.4 | 7.1 | - | - | - | - | 1612 | 1392 | 86.35 | 12 | 8.88 | - | - | - | - | - | - | - | - | - | - | - | - | 92.17 | 100.00 | 16.16 | 12.0 | 4.1h | 49.76 | 0.13 | 0.07 | 96.86 | 98.31 | |
| 20-11-82 | 1 | 7.5 | 7.0 | 62h | 192 | 431 | 69.4h | 1816 | 1192 | 84.18 | 0 | 17.00 | 47.00 | 27.4h | 90.41 | 98.49 | 50.40 | 0.00 | 0.00 | 100.00 | 100.00 | 25.7h | 3.6h | 1.40 | 97.83 | 94.56 | 6.8 | 25.2 | 4.4h | 47.02 | 0.03 | 0.13 | 98.85 | 97.0h | |
| 21-11-82 | 1 | 7.5 | 6.9 | 62h | 150 | 472 | 75.88 | 1292 | 95.68 | 6 | 9.37 | 533.12 | 35.28 | 0.00 | 108.00 | 108.00 | 100.00 | 28.28 | 3.92 | 0.00 | 86.1h | 100.00 | 8.0 | 21.0 | 3.9h | 16.62 | 0.03 | 0.18 | 99.83 | 95.5h | | | | | |
| Average | 1 | 7.5 | 6.9 | 56h | 165 | 399 | 70.5h | 1111 | 1187 | 84.01 | 12 | 8.76 | 538.88 | 41.55 | 23.03 | 92.38 | 95.3h | 54.19 | 7.00 | 6.90 | 87.3h | 87.41 | 29.82 | 3.12 | 1.61 | 89.6h | 94.51 | 22.9 | 22.4 | 4.23 | 47.6h | 0.11 | 0.10 | 97.39 | 97.53 |
| 5-12-82 | 0.67 | 7.5 | 6.5 | 572 | 100 | 472 | 82.5h | 1880 | 1638 | 86.81 | 0 | 11.92 | 467.76 | 40.4h | 23.4h | 94.3h | 93.70 | 57.12 | 9.52 | 5.60 | 83.5h | 90.20 | 22.12 | 1.9h | 0.8h | 91.1h | 94.2h | 0.5 | 5.6 | 5.0h | 62.9h | 0.58 | 0.02 | 71.05 | 99.5h |
| 6-12-82 | 0.67 | 7.5 | 6.5 | 532 | 196 | 536 | 62.16 | 1680 | 1608 | 85.53 | 10 | 11.92 | 474.72 | 53.12 | 0.00 | 91.02 | 90.00 | 97.96 | 28.00 | 12.50 | 51.6h | 70.26 | 22.4h | 0.28 | 90.00 | 98.75 | 0.6 | 21.8 | 4.5h | 64.50 | 0.48 | 0.05 | 88.59 | 98.6h | |
| 7-12-82 | 0.67 | 7.4 | 6.5 | 580 | 93 | 482 | 83.4h | 1950 | 1588 | 79.31 | 10 | 13.00 | 479.72 | 51.52 | 47.8h | 89.15 | 89.92 | 57.12 | 9.80 | 5.92 | 82.8h | 93.14 | 25.7h | 1.6h | 1.6h | 93.4h | 100.00 | 0.6 | 17.0 | 4.6h | 63.50 | 0.61 | 0.01 | 86.80 | 97.76 |
| 8-12-82 | 0.67 | 7.5 | 6.5 | 55h | 106 | 448 | 80.87 | 1940 | 1564 | 80.62 | 22 | 11.5h | 475.40 | 47.8h | 37.4h | 90.00 | 92.18 | 55.4h | 2.52 | 3.6h | 85.4h | 93.4h | 26.0h | 0.00 | 100.00 | 100.00 | 0.7 | 12.0 | 4.7h | 77.20 | 0.52 | 0.66 | 89.03 | 98.0h | |
| 9-12-82 | 0.67 | 7.5 | 6.5 | 56h | 104 | 464 | 81.6h | 1628 | 1522 | 87.69 | 0 | 11.92 | 500.4h | 40.4h | 33.12 | 91.91 | 93.38 | 56.8h | 3.92 | 1.96 | 93.4h | 94.55 | 23.8h | 0.00 | 100.00 | 100.00 | 0.6 | 13.8 | 4.5h | 69.70 | 0.58 | 0.1h | 87.3h | 95.9h | |
| Average | 0.67 | 7.4 | 6.6 | 56h | 121 | 440 | 78.27 | 1860 | 1965 | 85.99 | 6 | 13.86 | 479.22 | 42.6h | 91.0h | 93.8h | 95.90 | 50.7h | 5.5h | 81.2h | 90.32 | 25.0h | 1.1h | 0.22 | 94.92 | 98.39 | 0.6 | 18.0 | 4.26 | 57.5h | 0.61 | 0.18 | 84.3h | 96.20 | |
| 7-12-82 | 0.50 | 7.4 | 6.5 | 56h | 88 | 478 | 84.45 | 2140 | 2052 | 91.61 | 4 | 15.8h | 503.6h | 43.6h | 35.7h | 92.91 | 92.6h | 2.8h | 1.4h | 98.6h | 97.5h | 24.0h | 0.00 | 0.28 | 100.00 | 98.5h | 0.2 | 18.0 | 4.43 | 75.30 | 0.83 | 0.13 | 81.26 | 97.06 | |
| 6-12-82 | 0.50 | 7.5 | 6.5 | 542 | 90 | 452 | 83.39 | 2412 | 2056 | 85.2h | 0 | 20.00 | 488.0h | 59.6h | 27.7h | 91.87 | 94.31 | 54.52 | 0.8h | 0.56 | 98.11 | 99.7h | 23.5h | 0.00 | 100.00 | 100.00 | 0.2 | 8.0 | 4.26 | 77.80 | 0.18 | 0.00 | 91.77 | 98.12 | |
| 7-12-82 | 0.50 | 7.4 | 6.5 | 542 | 94 | 444 | 81.92 | 235h | 1768 | 77.41 | 0 | 20.00 | 481.6h | 48.0h | 27.7h | 91.87 | 92.62 | 52.0h | 0.75 | 0.56 | 93.2h | 100.00 | 23.4h | 0.00 | 100.00 | 100.00 | 0.2 | 17.4 | 4.5h | 82.20 | 0.37 | 0.00 | 91.67 | 97.80 | |
| 8-12-82 | 0.50 | 7.5 | 6.5 | 556 | 100 | 495 | 82.01 | 2480 | 1912 | 85.1h | 20 | 20.00 | 508.22 | 47.62 | 37.4h | 89.83 | 92.37 | 52.0h | 0.00 | 0.28 | 90.4h | 100.00 | 20.4h | 0.00 | 100.00 | 100.00 | 0.3 | 10.0 | 4.4h | 4.5h | 0.62 | 0.16 | 86.49 | 95.51 | |
| 9-12-82 | 0.50 | 7.5 | 6.5 | 532 | 101 | 422 | 80.8h | 2356 | 1936 | 85.82 | 0 | 20.00 | 511.87 | 43.65 | 35.2h | 91.47 | 93.02 | 54.0h | 0.00 | 0.00 | 100.00 | 100.00 | 22.12 | 0.00 | 100.00 | 100.00 | 0.3 | 10.0 | 4.5h | 53.40 | 0.62 | 0.16 | 86.49 | 95.51 | |
| Average | 0.50 | 7.5 | 6.5 | 546 | 95 | 450 | 82.52 | 2322 | 1965 | 84.6h | 1 | 19.76 | 491.23 | 42.6h | 36.12 | 91.26 | 93.05 | 50.7h | 1.4h | 0.59 | 97.23 | 99.22 | 22.6h | 0.17 | 0.06 | 99.18 | 99.77 | 0.2 | 18.8 | 4.46 | 75.28 | 0.54 | 0.13 | 88.09 | 97.06 |

Inf. = Influent,
eff. = Effluent,
un. = Uninflated,
vol. = Volatile Suspended Solids,
sus. = Suspended Solids Concentration in Effluent.

Note. = Lead Concentration in Reactor.

รายงานผลการทดลองทางเคมีของน้ำเสีย 10-63 แม่น้ำกั่งห้องต่อสีขาว

| Date (1963) | Waste, ppm | pH | Alkalinity as CaCO ₃ , mg/l | Change Mg/Hg/Va mg/l | Suspended Solids mg/l | ODD | | | | ODR = N | | | | Lead Concentration | | | | | | |
|----------------|---------------|-----|--|----------------------------|-----------------------------|---------------|--------------|--------------|-----------------|---------------|--------------|--------------|-----------------|--------------------|--------------|--------------|-------|-------|-------|------|
| | | | | | | Infl. mg/l | eff. mg/l | inf. mg/l | Residue mg/l | Infl. mg/l | eff. mg/l | inf. mg/l | Residue mg/l | Infl. mg/l | eff. mg/l | inf. mg/l | | | | |
| 21-1-63 | 1 | 7.3 | 7.8 | 24.2 | 206 | 36 | 6.64 | 1530 | 1216 | 80.00 | 0.5 | 513.00 | 76.00 | 1.30 | 85.18 | 91.89 | 56.45 | 51.87 | | |
| 21-1-63 | 2 | 7.3 | 7.8 | 24.2 | 500 | 42 | 7.75 | 1136 | 74.15 | 0 | 5 | 513.00 | 60.50 | 45.50 | 91.11 | 54.32 | 51.40 | 50.86 | | |
| 22-1-63 | 2 | 7.3 | 7.8 | 59.0 | 70 | 12.73 | 1580 | 1144 | 72.40 | 0 | 5 | 516.80 | 64.60 | 54.20 | 87.50 | 93.98 | 54.88 | 50.12 | | |
| 23-1-63 | 2 | 7.3 | 7.8 | 59.0 | 80 | 1118 | 81.60 | 0 | 5 | 516.80 | 68.40 | 41.50 | 86.76 | 91.91 | 54.04 | 54.82 | | | | |
| 24-1-63 | 2 | 7.3 | 7.8 | 59.0 | 80 | 1136 | 72.17 | 0 | 5 | 516.80 | 55.20 | 53.20 | 89.70 | 89.20 | 55.72 | 54.88 | | | | |
| 25-1-63 | 2 | 7.3 | 7.8 | 59.0 | 52 | 5.86 | 1576 | 1146 | 72.72 | 0 | 5 | 535.80 | 63.60 | 49.40 | 90.70 | 53.76 | 51.80 | 51.52 | | |
| Average | 2 | 7.3 | 7.8 | 59.0 | 502 | 43 | 7.82 | 1235 | 1149 | 75.51 | 0 | 5 | 518.70 | 67.77 | 44.35 | 86.99 | 91.46 | 54.88 | 52.32 | |
| 11-1-63 | 1 | 7.4 | 6.4 | 51.8 | 82 | 466 | 65.04 | 1800 | 1388 | 76.89 | 12 | 8.93 | 931.79 | 29.76 | 17.86 | 91.20 | 96.38 | 51.88 | 50.88 | |
| 12-1-63 | 1 | 7.3 | 6.4 | 56.6 | 82 | 484 | 85.51 | 1936 | 1629 | 86.57 | 12 | 9.05 | 565.48 | 29.76 | 21.62 | 91.76 | 97.52 | 57.96 | 56.00 | |
| 13-1-63 | 1 | 7.3 | 6.4 | 57.0 | 80 | 490 | 85.96 | 1940 | 1568 | 80.82 | 22 | 8.38 | 585.44 | 37.70 | 35.79 | 93.44 | 99.03 | 59.52 | 58.54 | |
| 14-1-63 | 1 | 7.3 | 6.4 | 56.0 | 84 | 476 | 85.00 | 1930 | 1588 | 85.21 | 4 | 9.66 | 519.57 | 57.94 | 89.16 | 94.28 | 99.01 | 56.56 | 54.04 | |
| 15-1-63 | 1 | 7.3 | 6.4 | - | - | - | - | - | - | - | - | 59.11 | 63 | 49.60 | 37.86 | 96.70 | 66.92 | 1.40 | | |
| 16-1-63 | 1 | 7.3 | 6.4 | 57.4 | 80 | 494 | 86.06 | 1880 | 1520 | 80.85 | 10 | 9.17 | 527.50 | 33.73 | 25.70 | 93.95 | 92.37 | 55.44 | 0.28 | |
| Average | 1 | 7.3 | 6.4 | 56.6 | 82 | 482 | 85.51 | 1895 | 1547 | 81.27 | 12 | 9.03 | 530.23 | 29.75 | 23.11 | 92.77 | 95.81 | 58.92 | 1.49 | |
| 26-12-62 | 0.67 | 7.4 | 6.6 | 57.6 | 90 | 485 | 81.43 | 1992 | - | - | 4.2 | 9.66 | 456.68 | 88.20 | 76.44 | 80.69 | 83.26 | 56.86 | 1.40 | |
| 25-12-62 | 0.67 | 7.4 | 6.6 | 55.8 | 88 | 470 | 81.25 | 2104 | 1788 | 84.98 | 60 | 8.59 | 472.36 | 68.60 | 45.08 | 85.48 | 90.56 | 53.48 | 3.08 | |
| 26-12-62 | 0.67 | 7.4 | 6.5 | 54.1 | 66 | 478 | 82.87 | 2108 | 1832 | 86.91 | 77 | 7.67 | 464.52 | 60.72 | 39.24 | 86.93 | 91.25 | 55.44 | 0.00 | |
| 27-12-62 | 0.67 | 7.4 | 6.5 | 54.1 | 80 | 464 | 85.29 | 1932 | 1564 | 80.95 | 40 | 9.72 | 468.44 | 45.08 | 41.16 | 91.21 | 95.16 | 56.00 | 1.00 | |
| 28-12-62 | 0.67 | 7.4 | 6.5 | 53.8 | 74 | 464 | 85.24 | 2050 | 1564 | 75.19 | 70 | 9.32 | 460.60 | 52.92 | 53.24 | 93.54 | 95.16 | 55.16 | 0.28 | |
| 29-12-62 | 0.67 | 7.4 | 6.4 | 53.8 | 74 | 459 | 85.98 | 2136 | 1793 | 79.73 | 49 | 9.32 | 462.52 | 45.08 | 49.00 | 89.30 | 89.45 | 53.20 | 0.00 | |
| 30-12-62 | 0.67 | 7.4 | 6.5 | 55.6 | 80 | 478 | 85.66 | 2100 | 1764 | 84.00 | 0 | 15.00 | 488.04 | 49.00 | 33.32 | 89.96 | 93.17 | 56.50 | 0.36 | |
| Average | 0.67 | 7.4 | 6.5 | 55.0 | 79 | 471 | 85.67 | 2065 | 1702 | 81.96 | 48 | 9.71 | 487.85 | 58.51 | 49.36 | 90.46 | 95.46 | 55.11 | 0.76 | |
| 24-12-62 | 0.50 | 7.3 | 6.5 | 56.0 | 74 | 486 | 86.28 | 2804 | - | - | 52 | 12.13 | 429.21 | 60.76 | 25.46 | 85.84 | 94.06 | 52.92 | 1.40 | |
| 25-12-62 | 0.50 | 7.3 | 6.5 | 53.0 | 150 | 380 | 71.70 | 3004 | 2379 | 79.09 | 62 | 11.61 | 460.60 | 41.16 | 29.40 | 91.06 | 93.82 | 53.48 | 1.26 | |
| 26-12-62 | 0.50 | 7.4 | 6.6 | 57.0 | 104 | 455 | 81.75 | 294 | 2161 | 83.70 | 50 | 12.51 | 460.60 | 41.16 | 33.32 | 91.06 | 92.75 | 55.72 | 1.40 | |
| 27-12-62 | 0.50 | 7.4 | 6.5 | 55.0 | 92 | 428 | 82.31 | 474 | 3192 | 2472 | 77.44 | 56 | 11.56 | 456.68 | 29.40 | 21.56 | 93.96 | 95.45 | 55.72 | 0.84 |
| 28-12-62 | 0.50 | 7.4 | 6.5 | 52.6 | 96 | 450 | 81.75 | 470 | 3156 | 2420 | 76.68 | 37 | 16.18 | 470.60 | 29.40 | 25.46 | 94.47 | 95.41 | 56.56 | 1.12 |
| 30-12-62 | 0.50 | 7.4 | 6.6 | 52.2 | 108 | 414 | 81.51 | 79.31 | 3160 | 2528 | 80.00 | 6 | 18.75 | 433.56 | 49.00 | 37.24 | 88.15 | 91.00 | 56.56 | 1.12 |
| Average | 0.50 | 7.4 | 6.6 | 52.7 | 101 | 436 | 81.11 | 3047 | 2497 | 78.97 | 44 | 13.59 | 450.52 | 40.60 | 27.72 | 90.89 | 93.40 | 55.20 | 1.22 | 0.96 |

Infl. = Influent.
eff. = Effluent.
unf. = Unfiltrate.
fil. = Filtrate.

MLS. = Mixed Liquor Suspended Solids.

MVS. = Mixed Liquor Volatile Suspended Solids.

VSS. = Volatile Suspended Solids.

SS. = Suspended Solids Concentration in Effluent.

Lead Concentration in Reactor.

ความสัมพันธ์การละลายของตะกั่วในน้ำมีสุทธิกับ pH

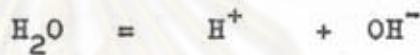
ผลการละลายของ $\text{Pb}(\text{OH})_2$



สารประกอบเชิงชั้นของตะกั่วในน้ำมีสุทธิ



การแยกตัวของน้ำ



ความสัมพันธ์ของสารละลายตะกั่วในสภาวะสมดุลย์ (Sawyer & McCarty)

$$[\text{Pb}^{2+}][\text{OH}^-]^2 = K_{sp} = 2.8 \times 10^{-16} \dots (1)$$

$$[\text{PbOH}^+] / [\text{Pb}^{2+}][\text{OH}^-] = K_1 = 6.6 \times 10^7 \dots (2)$$

$$[\text{Pb}(\text{OH})_2^0] / [\text{PbOH}^+][\text{OH}^-] = K_2 = 1.1 \times 10^3 \dots (3)$$

$$[\text{Pb}(\text{OH})_3^-] / [\text{Pb}(\text{OH})_2^0][\text{OH}^-] = K_3 = 1.1 \times 10^3 \dots (4)$$

$$[\text{H}^+][\text{OH}^-] = K_w = 1 \times 10^{-14} \dots (5)$$

ปริมาณตะกั่วในน้ำ

$$c = [\text{Pb}^{2+}] + [\text{PbOH}^+] + [\text{Pb}(\text{OH})_2^0] + [\text{Pb}(\text{OH})_3^-]$$

เมื่อ c คือความเข้มข้นสารประกอบเชิงชั้นของตะกั่ว

$$\text{จาก(5)} \quad -\log[\text{OH}^-] = \text{pH} + \log K_w \dots (6)$$

$$\text{จาก(1)} \quad \log[\text{Pb}^{2+}] = \log K_{sp} - 2\log[\text{OH}^-] \dots (7)$$

$$\text{แทน(6) แทน(7)} \quad \log[\text{Pb}^{2+}] = \log K_{sp} - 2(\text{pH} + \log K_w)$$

$$\text{แทนค่า pH=0; } \log[\text{Pb}^{2+}] = -15.5528 - 2(0 + (-14)) = 12.4472$$

$$\text{pH=8; } \log[\text{Pb}^{2+}] = -15.5528 - 2(8 + (-14)) = -3.5528$$

$$\text{pH=14; } \log[\text{Pb}^{2+}] = -15.5528 - 2(14 + (-14)) = -15.5528$$

$$\text{จาก(2)} \quad \log[\text{PbOH}^+] = \log K_1 + \log[\text{Pb}^{2+}] + \log[\text{OH}^-] \quad \dots\dots (8)$$

$$\text{แทนค่า(6) ใน(8)} \log[\text{PbOH}^+] = \log K_1 + \log[\text{Pb}^{2+}] + \text{pH} + \log K_w$$

$$\text{แทนค่า pH=0; } \log[\text{PbOH}^+] = 7.82 + 12.4472 + 0 + (-14) = 6.2672$$

$$\text{pH=8; } \log[\text{PbOH}^+] = 7.82 + (-3.5528) + 8 + (-14) = -1.7328$$

$$\text{pH=14; } \log[\text{PbOH}^+] = 7.82 + (-15.5528) + 14 + (-14) = -7.7328$$

$$\text{จาก(3)} \quad \log[\text{Pb(OH)}_2^0] = \log K_2 + \log[\text{PbOH}^+] + \log[\text{OH}^-] \quad \dots\dots (9)$$

$$\text{แทน(6) ใน(9)} \log[\text{Pb(OH)}_2^0] = \log K_2 + \log[\text{PbOH}^+] + \text{pH} + \log K_w$$

$$\text{แทนค่า pH=0; } \log[\text{Pb(OH)}_2^0] = 3.06 + 6.2672 + 0 + (-14) = -4.6728$$

$$\text{pH=8; } \log[\text{Pb(OH)}_2^0] = 3.06 + (-1.7328) + 8 + (-14) = -4.6728$$

$$\text{pH=14; } \log[\text{Pb(OH)}_2^0] = 3.06 + (-7.7328) + 14 + (-14) = -4.6728$$

$$\text{จาก(4)} \quad \log[\text{Pb(OH)}_3^-] = \log K_3 + \log[\text{Pb(OH)}_2^0] + \log[\text{OH}^-] \quad \dots\dots (10)$$

$$\text{แทน(6) ใน(10)} \log[\text{Pb(OH)}_3^-] = \log K_3 + \log[\text{Pb(OH)}_2^0] + \text{pH} + \log K_w$$

$$\text{แทนค่า pH=0; } \log[\text{Pb(OH)}_3^-] = 3.06 + (4.2672) + 0 + (-14) = 15.2072$$

$$\text{pH=8; } \log[\text{Pb(OH)}_3^-] = 3.06 + (4.2672) + 8 + (-14) = -7.2072$$

$$\text{pH=14; } \log[\text{Pb(OH)}_3^-] = 3.06 + (4.2672) + 14 + (-14) = -1.2072$$

การคำนวณหาค่า y_{\max} และโดย Least Square Method.

จากสมการ Least square

$$\text{เส้นแนวโน้ม } y = m \cdot x + b$$

$$\text{ค่าความลาก } m = \frac{n(\bar{x}\bar{y}) - (\bar{x}\bar{y})(\bar{x}\bar{y})}{n(\bar{x}\bar{x}) - (\bar{x}\bar{x})^2}$$

$$\text{และค่าคงที่ } b = \frac{(\bar{x}\bar{x})(\bar{x}\bar{y}) - (\bar{x}\bar{x})(\bar{x}\bar{y})}{n(\bar{x}\bar{x}) - (\bar{x}\bar{x})^2}$$

โดยให้

$$y = \frac{1}{c} = \text{อัตราการเจริญเก็บโภจนาณของชุนหรีบ, ต่อวัน.}$$

$$x = U = \text{อัตราการใช้สารอาหารจ้ำเหงา, ต่อวัน.}$$

$$m = Y_{\max} = \text{สัมประสิทธิ์การเจริญเก็บโภสัنجตุคของชุนหรีบ.}$$

$$b = b = \text{สัมประสิทธิ์การสลายตัวของชุนหรีบ, ต่อวัน.}$$

$$n = \text{จำนวนข้อมูล}$$

เมื่อ $Pb^{2+} = 0$ มีผลลัพธ์ดังนี้

| θ_c | $\frac{1}{\theta_c}$ as y | $U = \frac{Q(S_o - S)}{X V}$ as x | x^2 | $x \cdot y$ |
|------------|---------------------------|--|-------|-------------|
| 4.90 | 0.20 | $\frac{18(476.94-20.67)}{1075 \times 10} = 0.76$ | 0.578 | 0.152 |
| 6.11 | 0.16 | $\frac{18(484.22-18.93)}{1262 \times 10} = 0.66$ | 0.436 | 0.106 |
| 7.99 | 0.12 | $\frac{18(494.74-45.42)}{1392 \times 10} = 0.58$ | 0.336 | 0.070 |
| 8.63 | 0.12 | $\frac{18(530.28-32.01)}{1476 \times 10} = 0.61$ | 0.372 | 0.073 |
| Σ | 0.60 | | 2.61 | 1.722 |
| | | | | 0.401 |

$$Y_{max} = \frac{4(0.401) - (2.61)(0.60)}{4(1.722) - (2.61)^2} = \frac{0.038}{0.076} = 0.50$$

$$b = \frac{(1.722)(0.60) - (2.61)(0.401)}{4(1.722) - (2.61)^2} = \frac{-0.014}{0.076} = -0.18$$

$$\frac{1}{\theta_c} = 0.50U - 0.18$$

เมื่อ $Pb^{2+} = 1.02$ มีผลลัพธ์ดังนี้

| θ_c | $\frac{1}{\theta_c}$ as y | $U = \frac{Q(S_o - S)}{X V}$ as x | x^2 | $x \cdot y$ |
|------------|---------------------------|--|-------|-------------|
| 4.25 | 0.24 | $\frac{18(478.72-27.80)}{1128 \times 10} = 0.72$ | 0.518 | 0.173 |
| 5.04 | 0.20 | $\frac{18(466.15-37.99)}{1151 \times 10} = 0.67$ | 0.449 | 0.134 |
| 6.76 | 0.15 | $\frac{18(420.88-40.80)}{1461 \times 10} = 0.47$ | 0.221 | 0.071 |
| 10.71 | 0.09 | $\frac{18(476.80-34.40)}{1814 \times 10} = 0.44$ | 0.194 | 0.040 |
| Σ | 0.68 | | 2.30 | 1.382 |
| | | | | 0.418 |

$$Y_{max} = \frac{4(0.418) - (2.30)(0.68)}{4(1.382) - (2.30)^2} = \frac{0.108}{0.238} = 0.45$$

$$b = \frac{(1.382)(0.68) - (2.30)(0.418)}{4(1.382) - (2.30)^2} = \frac{-0.021}{0.238} = -0.09$$

$$\frac{1}{\theta_c} = 0.45U - 0.09$$

เมื่อ $Pb^{2+} = 4.28$ มีผลลัพธ์ดังนี้

| θ_c | $\frac{1}{\theta_c}$ as y | $U = \frac{Q(S_o - S)}{X V}$ as x | x^2 | $x \cdot y$ |
|------------|---------------------------|--|-------|-------------|
| 3.74 | 0.27 | $\frac{18(521.80-58.03)}{962 \times 10} = 0.87$ | 0.757 | 0.235 |
| 8.76 | 0.11 | $\frac{18(538.88-25.03)}{1187 \times 10} = 0.78$ | 0.608 | 0.086 |
| 13.86 | 0.07 | $\frac{18(479.22-29.56)}{1583 \times 10} = 0.51$ | 0.260 | 0.036 |
| 19.76 | 0.05 | $\frac{18(491.23-34.12)}{1965 \times 10} = 0.42$ | 0.176 | 0.021 |
| Σ | 0.50 | | 2.58 | 1.801 |
| | | | | 0.378 |

$$Y_{max} = \frac{4(0.378) - (2.58)(0.50)}{4(1.801) - (2.58)^2} = \frac{0.222}{0.548} = 0.40$$

$$b = \frac{(1.801)(0.50) - (2.58)(0.378)}{4(1.801) - (2.58)^2} = \frac{-0.075}{0.548} = -0.14$$

$$\frac{1}{\theta_c} = 0.40 U - 0.14$$

เมื่อ $Pb^{2+} = 10.63$ มีผลลัพธ์ดังนี้

| θ_c | $\frac{1}{\theta_c}$ as y | $U = \frac{Q(S_o - S)}{X V}$ as x | x^2 | $x \cdot y$ |
|------------|---------------------------|--|-------|-------------|
| 5 | 0.20 | $\frac{18(518.70-44.33)}{1149 \times 10} = 0.74$ | 0.548 | 0.148 |
| 9.05 | 0.11 | $\frac{18(550.23-23.11)}{1547 \times 10} = 0.61$ | 0.372 | 0.067 |
| 9.71 | 0.10 | $\frac{18(467.88-45.36)}{1702 \times 10} = 0.45$ | 0.203 | 0.045 |
| 13.59 | 0.07 | $\frac{18(450.52-27.72)}{2437 \times 10} = 0.31$ | 0.096 | 0.022 |
| Σ | 0.48 | | 2.11 | 1.219 |
| | | | | 0.282 |

$$Y_{max} = \frac{4(0.282) - (2.11)(0.48)}{4(1.219) - (2.11)^2} = \frac{0.115}{0.424} = 0.27$$

$$b = \frac{(1.219)(0.48) - (2.11)(0.282)}{4(1.219) - (2.11)^2} = \frac{-0.010}{0.424} = -0.02$$

$$\frac{1}{\theta_c} = 0.27 U - 0.02$$

ความสัมพันธ์ระหว่าง θ_c กับ \bar{Y}_{obs} โดยคำนวณจาก \bar{Y}_{max} และ b .

$$\text{จาก } \bar{Y}_{obs} = \frac{1}{\theta_c} \cdot \frac{1}{U} = \frac{\bar{Y}_{max}}{1 + b \cdot \theta_c}$$

| θ_c | \bar{Y}_{obs} | | | |
|------------|---|---|---|---|
| | $Pb^{2+} = 0 \text{ mg/l}$ | $Pb^{2+} = 1.02 \text{ mg/l.}$ | $Pb^{2+} = 4.28 \text{ mg/l.}$ | $Pb^{2+} = 10.63 \text{ mg/l.}$ |
| | $\bar{Y}_{obs} = \frac{0.50}{1+0.18\theta_c}$ | $\bar{Y}_{obs} = \frac{0.45}{1+0.09\theta_c}$ | $\bar{Y}_{obs} = \frac{0.40}{1+0.14\theta_c}$ | $\bar{Y}_{obs} = \frac{0.27}{1+0.02\theta_c}$ |
| 2 | 0.37 | 0.38 | 0.31 | 0.26 |
| 4 | 0.29 | 0.33 | 0.26 | 0.25 |
| 6 | 0.24 | 0.29 | 0.22 | 0.24 |
| 8 | 0.20 | 0.26 | 0.19 | 0.23 |
| 10 | 0.18 | 0.24 | 0.17 | 0.22 |
| 12 | 0.16 | 0.22 | 0.15 | 0.21 |
| 14 | 0.14 | 0.20 | 0.14 | 0.21 |
| 16 | 0.13 | 0.18 | 0.12 | 0.20 |
| 18 | 0.12 | 0.17 | 0.11 | 0.20 |
| 20 | 0.11 | 0.16 | 0.11 | 0.19 |

ศูนย์วิทยาการ
อุปกรณ์มหาวิทยาลัย

ความสัมพันธ์ระหว่าง θ_c กับ U โดยคำนวณจาก Y_{max} และ b .

$$\text{จาก } \frac{1}{\theta_c} = Y_{max} \cdot U - b$$

$$U = \frac{\frac{1}{\theta_c} + b}{Y_{max}}$$

| θ_c | $Pb^{2+} = 0 \text{ mg/l.}$ | $Pb^{2+} = 1.02 \text{ mg/l.}$ | $Pb^{2+} = 4.28 \text{ mg/l.}$ | $Pb^{2+} = 10.63 \text{ mg/l.}$ |
|------------|--|--|--|--|
| | $U = \frac{\frac{1}{\theta_c} + 0.18}{0.50}$ | $U = \frac{\frac{1}{\theta_c} + 0.09}{0.45}$ | $U = \frac{\frac{1}{\theta_c} + 0.14}{0.40}$ | $U = \frac{\frac{1}{\theta_c} + 0.02}{0.27}$ |
| 2 | 1.30 | 1.31 | 1.60 | 1.93 |
| 4 | 0.86 | 0.76 | 0.98 | 1.00 |
| 6 | 0.69 | 0.57 | 0.77 | 0.69 |
| 8 | 0.61 | 0.48 | 0.66 | 0.54 |
| 10 | 0.56 | 0.42 | 0.60 | 0.44 |
| 12 | 0.53 | 0.39 | 0.56 | 0.38 |
| 14 | 0.50 | 0.36 | 0.53 | 0.34 |
| 16 | 0.49 | 0.34 | 0.51 | 0.31 |
| 18 | 0.47 | 0.32 | 0.49 | 0.28 |
| 20 | 0.46 | 0.31 | 0.48 | 0.26 |



ความสัมพันธ์ระหว่าง θ_c กับ X โดยคำนวณจาก Y_{max} และ b .

$$\text{ จาก } \frac{1}{\theta_c} = Y_{max} \cdot U - b$$

$$U = \frac{Q}{V} \cdot \frac{S_o - S}{X}$$

$$\frac{1}{\theta_c} = Y_{max} \cdot \frac{Q}{V} \cdot \frac{S_o - S}{X} - b$$

$$X = Y_{max} \cdot (S_o - S) \cdot \frac{Q}{V} \cdot \left(\frac{\theta_c}{1 + b \cdot \theta_c} \right)$$

$$Pb^{2+} = 0 \text{ mg/l; } X = 0.50(496.55 - 29.26) \left(\frac{18}{10} \right) \left(\frac{\theta_c}{1 + 0.18\theta_c} \right)$$

$$Pb^{2+} = 1.02 \text{ mg/l; } X = 0.45(460.64 - 35.25) \left(\frac{18}{10} \right) \left(\frac{\theta_c}{1 + 0.09\theta_c} \right)$$

$$Pb^{2+} = 4.28 \text{ mg/l; } X = 0.40(507.78 - 36.69) \left(\frac{18}{10} \right) \left(\frac{\theta_c}{1 + 0.14\theta_c} \right)$$

$$Pb^{2+} = 10.63 \text{ mg/l; } X = 0.27(486.83 - 35.13) \left(\frac{18}{10} \right) \left(\frac{\theta_c}{1 + 0.02\theta_c} \right)$$

| θ_c (day) | X (mg/l) | | | |
|---------------------|----------------------------|-------------------------------|-------------------------------|--------------------------------|
| | Pb ²⁺ = 0 mg/l. | Pb ²⁺ = 1.02 mg/l. | Pb ²⁺ = 4.28 mg/l. | Pb ²⁺ = 10.63 mg/l. |
| 2 | 618 | 584 | 530 | 432 |
| 4 | 978 | 1013 | 870 | 831 |
| 6 | 1213 | 1342 | 1106 | 1202 |
| 8 | 1379 | 1603 | 1280 | 1548 |
| 10 | 1502 | 1814 | 1413 | 1870 |
| 12 | 1597 | 1988 | 1519 | 2172 |
| 14 | 1673 | 2135 | 1604 | 2454 |
| 16 | 1734 | 2259 | 1675 | 2720 |
| 18 | 1785 | 2367 | 1734 | 2970 |
| 20 | 1828 | 2461 | 1785 | 3206 |

ความสัมพันธ์ระหว่าง θ_c กับ P_x ค่านวณโดย x ซึ่งได้จาก x_{max} และ b .

จาก

$$P_x = \frac{V \cdot X}{\theta_c}$$

| θ_c (day) | $Pb^{2+} = 0 \text{ mg/l.}$ | | $Pb^{2+} = 1.02 \text{ mg/l.}$ | | $Pb^{2+} = 4.28 \text{ mg/l.}$ | | $Pb^{2+} = 10.63 \text{ mg/l.}$ | |
|---------------------|-----------------------------|-------------------|--------------------------------|-------------------|--------------------------------|-------------------|---------------------------------|-------------------|
| | X (mg/l) | P_x (mg/day) | X (mg/l) | P_x (mg/day) | X (mg/l) | P_x (mg/day) | X (mg/l) | P_x (mg/day) |
| 2 | 618 | 3090 | 584 | 2920 | 530 | 2650 | 432 | 2160 |
| 4 | 978 | 2445 | 1013 | 2533 | 870 | 2175 | 831 | 2078 |
| 6 | 1213 | 2022 | 1342 | 2237 | 1106 | 1843 | 1202 | 2003 |
| 8 | 1379 | 1724 | 1603 | 2004 | 1280 | 1600 | 1548 | 1935 |
| 10 | 1502 | 1502 | 1814 | 1814 | 1413 | 1413 | 1870 | 1870 |
| 12 | 1597 | 1331 | 1988 | 1657 | 1519 | 1266 | 2172 | 1810 |
| 14 | 1673 | 1195 | 2155 | 1539 | 1604 | 1146 | 2454 | 1753 |
| 16 | 1734 | 1084 | 2259 | 1412 | 1675 | 1047 | 2720 | 1700 |
| 18 | 1785 | 992 | 2367 | 1315 | 1734 | 963 | 2970 | 1650 |
| 20 | 1828 | 914 | 2461 | 1231 | 1785 | 893 | 3206 | 1603 |

ศูนย์วิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

ประวัติผู้รับ

ชื่อผู้รับ นาย บุญคง อรหสีคำธรรมนิตย์

เกิด วันที่ 4 มีนาคม พ.ศ. 2498

ที่ สังฆาราม ศรีสัชนาลัย

การศึกษา สำเร็จปริญญา วิศวกรรมศาสตร์บัณฑิต สาขาวิชาโยธา
จาก คณะวิศวกรรมศาสตร์ มหาวิทยาลัยขอนแก่น
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กระทรวงฯ เกษตรและสหกรณ์



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย