

Calculation of Pure Water Permeability (PWP)

Used to check the current state of cleanliness of the membrane

Also see these documents:

- Annex 1 – Example of a PWP calculation
- Annex 2 – Example of Osmosis record
- Annex 3 – Correction Factors

1- When buying a new membrane, start the osmosis system, take the rate of flow (L/min or gal/min) and list it in Column C of the Osmosis Record.

[For a used membrane, soap can be used at the beginning of the season before calculation].

[If the flowmeter doesn't work, note the time required for a certain quantity of water to pass through the membrane. List the volume (L) and the time (minute) in Columns A and B. To obtain the flow rate, divide the volume by the time ($A \div B = L/min$) and list in Column C.]

2- Measure the temperature of filtrate and list in Column D.

3- With the table (see Annex 3), find the correction factor corresponding to the temperature of filtrate.

[The temperature of the filtrate can vary its speed, so a correction factor is used to obtain comparable results.]

4- Multiply the debit of filtrate by the correction factor and list the result in Column F ($C \times E = PWP L/min$).

[The first PWP result is our 100 %. This result is used to determine the loss of efficiency of the membrane during the season.]

5- To calculate the efficiency of membrane during the season, divide the PWP result calculated during the season by our first 100% PWP result. Then, multiply this result by 100 to obtain a percentage.

Soap can be used when efficiency is lower than 85%.

Note: Other similar tables exist. For some, the filtrate flow is divided (not multiplied) by the correction factor. In such cases, Table in Annex 3 is not representative. You must use another table of correction factors.

Annex 1

Example of Pure Water Permeability (PWP) Calculation

(See the record completed in Annex 2)

At the beginning of season:

Debit of 40 L/min for a filtrate at 10° C. The correction factor for this temperature is 1.088 (Annexe 3).

Calculation of PWP: $40 \times 1.088 = 43.52$ L/min

During the season:

Debit of 30 L/min for a filtrate at 7° C. The correction factor is 1.188.

Calculation of PWP: $30 \times 1.188 = 35.64$ L/min

Efficiency: $35.64 \div 43.52 \times 100 = 81.89\%$

(The result is lower than 85 %, a soap can be used)

Annex 2

Osmosis Record (Example)

| Date | Activity (Cleaning, rinse...) | Number of hours of operation | | A Volume used to fill (liters) | B Time required to fill Volume A (min) (sec) | C Filtrate flow (L/min) A / B (l/min) A/B * 60 | D T° at the outlet of filtrate (°C or F) | E Correction Factor (See Table) | F PWP C x E | G Efficiency of the membrane Actual PWP ÷ 100 % PWP | Product used | Qty of water used for rinsing | Person in charge |
|----------|----------------------------------|------------------------------|----------|--|---|--|--|---|-----------------------|---|--------------|-------------------------------|------------------|
| | | Hrs | Cum. hrs | | | | | | | | | | |
| March 23 | Cleaning | 5 | | | | 40 l/min | 10 C | 1,088 | 43,52 | 100% | Biomembrane | 600gal | i.b. |
| xxx | Rinsing | 5 | 10 | | | xx | xxx | xxx | xxx | xxx | | | |
| April 7 | Cleaning | 5 | 15 | | | 30 l/min | 7 C | 1,188 | 35,64 | 81,89% (35,64/43,5 2 * 100) | Biomembrane | 600gal | i.b. |

Annex 3

Correction Factors for all types of membrane*

| T° of filtrate Celsius | T° of filtrate Fahrenheit | Correction Factor |
|---------------------------|------------------------------|----------------------|
| 0 | 32 | 1,488 |
| 1 | 34 | 1,439 |
| 2 | 36 | 1,391 |
| 3 | 37 | 1,348 |
| 4 | 39 | 1,305 |
| 5 | 41 | 1,266 |
| 6 | 43 | 1,226 |
| 7 | 45 | 1,188 |
| 8 | 46 | 1,155 |
| 9 | 48 | 1,120 |
| 10 | 50 | 1,088 |
| 11 | 52 | 1,057 |
| 12 | 54 | 1,028 |
| 13 | 55 | 1,000 |
| 14 | 57 | 0,973 |
| 15 | 59 | 0,948 |
| 16 | 61 | 0,923 |
| 17 | 63 | 0,899 |
| 18 | 64 | 0,876 |
| 19 | 66 | 0,855 |
| 20 | 68 | 0,833 |
| 21 | 70 | 0,814 |
| 22 | 72 | 0,794 |
| 23 | 73 | 0,776 |
| 24 | 75 | 0,758 |
| 25 | 77 | 0,741 |

*Debit of filtrate multiplied by Correction Factor.