# Evaporation Rate from a Liquid Pool and Ventilation Dilution

Evaporation rate of a volatile liquid from an open pool or tank by the mass-transfer method, and the vapour concentration with dilution ventilation.

**Method:** Crowl and Louvar; Chemical Process Safety: Fundamentals with Applications; ...

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Molar mass of the liquid | 92.140 | kg/kmol |
| Vapour pressure at the liquid temperature | 3.7597 | kPa |
| Liquid temperature | 25.000 | °C |
| Pool or liquid surface area | 1.8240 | m² |
| Ventilation rate | 3,000.0 | ft³/min |
| Non-ideal mixing factor (0.1–0.5) | 0.10000 | |
| Ambient pressure | 101.33 | kPa |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Gas-phase mass transfer coefficient | 0.004816 | m/s |
| Evaporation rate | 4.4192 | kg/h |
| Vapour concentration in the room (ppm by volume) | 2,302.1 | |

**Notes for this case**

- Still air over the pool, liquid at a uniform temperature, low vapour pressure against ambient. The non-ideal mixing factor k is 0.1–0.5 (0.1 for poor mixing). Wind raises the evaporation rate.
- A screening estimate for training and early design, not a hazard or risk study.

## Formula and method

$$K = K_0 \left(\frac{M_0}{M}\right)^{1/3},\ K_0 = 0.83\ \text{cm/s},\ M_0 = 18,\quad Q_m = \frac{MKAP^{sat}}{R_g T_L},\quad C_{ppm} = \frac{Q_m R_g T}{k Q_v P M} \times 10^6$$

### Variables

| | | |
|---|---|---|
| $M$ | Molar mass of the liquid | kg/kmol |
| $P^{sat}$ | Vapour pressure at the liquid temperature | Pa |
| $T_L$ | Liquid temperature | K |
| $A$ | Pool or liquid surface area | m² |
| $Q_v$ | Ventilation rate | m³/s |
| $k$ | Non-ideal mixing factor (0.1–0.5) | - |
| $P$ | Ambient pressure | Pa |
| $K$ | Gas-phase mass transfer coefficient | m/s |
| $Q_m$ | Evaporation rate | kg/s |
| $C_{ppm}$ | Vapour concentration in the room (ppm by volume) | - |

### Method and standards

Mass transfer from the liquid surface into still air, with dilution ventilation.

### Assumptions and limits

- Low vapour pressure; still air.

### References


- Crowl and Louvar
- Chemical Process Safety: Fundamentals with Applications
- 2nd ed. (Prentice Hall, 2002)
- ch. 3
- eqs. 3-12 to 3-18
- Example 3-8


## Report details

| | |
|---|---|
| Report reference | FCC-8R76-PFGR (the same inputs always give the same reference) |
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| Calculator | Evaporation Rate from a Liquid Pool and Ventilation Dilution |
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| Software release | FireCAD Calc, release of 17 November 2026 |
| Release checks | 2 reference cases of this calculator, computed independently, are checked on every release |

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

### This calculator online

https://calc.firecad.com/chemical/process-safety/pool-evaporation-rate

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.