

Title: Nalfleet 2000 Product Dosage Guidance

Date: 2nd Nov 23

NALFLEET 2000™ cooling water treatment combines film forming corrosion inhibitors with a scale suppressant in liquid form for ease of application. NALFLEET 2000™ will protect ferrous metals, copper and copper alloys and all other metals including aluminium components. NALFLEET 2000™ is soluble in water in all proportions and does not contain chromates.

The Nalfleet 2000 Product Dosage guidance is segregated into 3 parts:

Part A: Control Guideline and dosage

Part B: Working examples of dosage estimation

Part C: General Application Notes

Part A: Control Guideline and dosage

Nitrite Control limits for Nalfleet 2000: 700 - 1,500 ppm nitrite (as NO₂), **recommended routine maintenance nitrite residual** = 840 ppm (as NO₂)

The nitrite (as NO₂) control guideline and dosage for Nalfleet 2000 as below

1. **Minimum** = 700 ppm and required dosage of Nalfleet 2000 = 22 L/m³
2. **Maximum** = 1,500 ppm and required dosage of Nalfleet 2000 = 48 L/m³
3. **Recommended (routine maintenance)** = 840 ppm, and required dosage of Nalfleet 2000 = 27 L/m³

Note:

- To increase nitrite residual by 100 ppm, required dosage of **Nalfleet 2000** = 3L/m³ of distilled or technical water
- Above mentioned product dosage is an estimation only, system required dosage may varies due to water quality, system demand, and other variations.

Part B: Working examples of dosage estimation:

- **New cooling system (e.g. Nitrite residual = 0) :** Recommended dosage is 27 L/m³, 840 ppm Nitrite.
- **Existing operating cooling water system (e.g. some nitrite residual presence but below recommended guideline):** Assuming system measured nitrite residual at 700 ppm and to increase nitrite residual to 840 ppm, required nitrite = 140 ppm = 4.2L of Nalfleet 2000 is needed.

Part C: General Application Notes

1. The engine manufacturer's recommendations for water quality should always be complied with.
2. Chloride levels should always be as low as possible. Most engine manufacturers recommend a maximum of 50 ppm chlorides.
3. For this reason, Wilhelmsen Ships Service recommends the use of distilled water as make-up.

Appendix 1: Nalfleet 2000 Dosage Guidance (as Nitrite) and (as Sodium Nitrite)

Note: Corrosion inhibitor is normally measured as nitrite, some original equipment manufacturers (OEMs) or vessels might opt for nitrite as Sodium nitrite. Hence, to convert Nitrite to Sodium Nitrite conversion factor of 1.5 is applied (e.g. 1 ppm of NO₂ = 1.5 ppm as NaNO₂).

Below is the dosage guidance in both Nitrite and Sodium Nitrite.

Table 1: Min, max and recommended nitrite and required Nalfleet 2000 product dosage

Product	Nitrite (as NO ₂)	Target Nitrite (as NO ₂)	Product Dosage (L/m ³)
Nalfleet 2000	Min	700	22
	Max	1,500	48
	Recommended	840	27
	100 ppm	100	3

Graph 1: Nalfleet 2000 Product Dosage Chart.

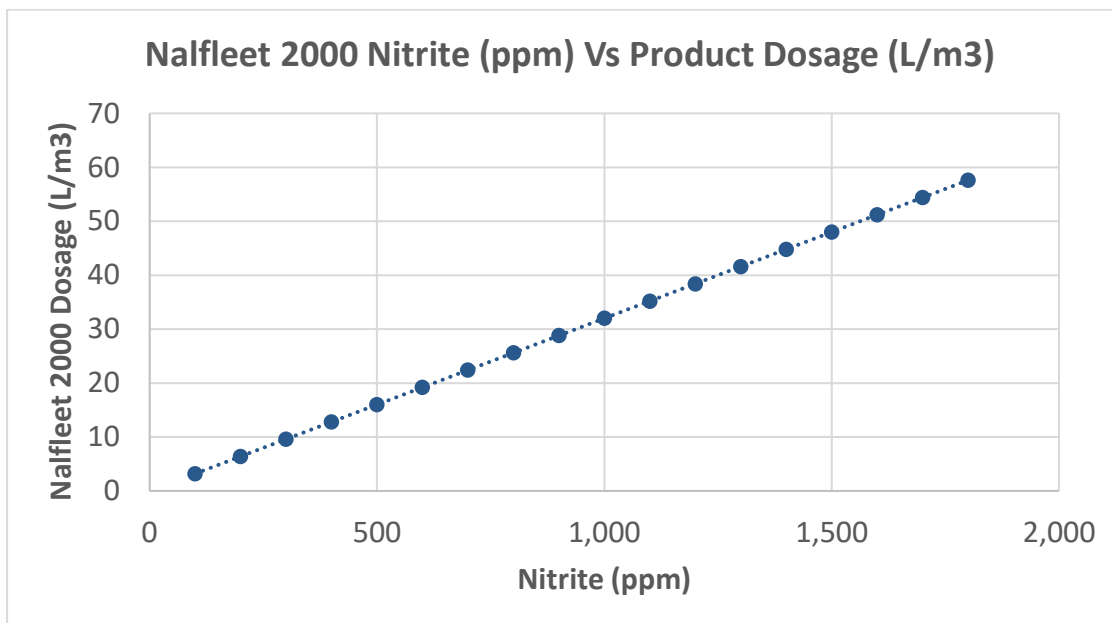


Table 3: Min, max and recommended Sodium Nitrite and required Nalfleet 2000 product dosage

Product	Sodium Nitrite (as NaNO ₂)	Target Sodium Nitrite (as NaNO ₂)	Product Dosage (L/m ³)
Nalfleet 2000	Min	1,050	22
	Max	2,250	48
	Recommended	1,260	27
	150 ppm	150	3

Graph 2: Nalfleet 2000 Product Dosage Chart.
