Fuel Oil Viscosity at Temperature (ASTM D341)

Kinematic viscosity of fuel oil at any temperature from two known points by the ASTM D341 (Walther) chart equation, and the heating temperature for a target viscosity.

Method: ASTM D341 Viscosity–Temperature Charts for Liquid Petroleum Products (classic Walther form with the constant 0.7)

Input parameters

Unit system: SI

Parameter	Value	Unit
Temperature of the first known point	50.000	°C
Viscosity at the first point	180.00	cSt
Temperature of the second known point	100.00	°C
Viscosity at the second point	30.000	cSt
Temperature wanted	120.00	°C
Target viscosity (atomising or pumping) From the burner maker; pressure-jet burners often need lower viscosity than rotary-cup or steam-atomised burners.	15.000	cSt

Calculated results

Parameter	Value	Unit
Viscosity at the temperature wanted	18.276	cSt
Oil temperature for the target viscosity	129.13	°C
Viscosity-temperature slope (D341)	2.8997	

Notes for this case

- A temperature lies outside the two known points: the result is extrapolated. Check it is above the pour point and well below the flash point.

Formula and method

$$\log\log(\nu+0.7) = A - B\log T \quad (\nu \text{ in cSt},\ T \text{ in K})$$

$$B = \frac{Z_1 - Z_2}{\log T_2 - \log T_1}, \quad Z_i = \log\log(\nu_i + 0.7) \qquad \nu_3 = 10^{10^{A - B\log T_3}} - 0.7 \qquad T_t = 10^{(A - Z_t)/B}$$

Variables

$T_1\$, \$T_2$	temperatures of the known points	K
$\nu_1\$, \$\nu_2$	viscosities at the known points	m²/s (cSt in the equation)
T_3	temperature wanted	K
ν_t	target viscosity	m²/s
ν_3	viscosity at T_3	m²/s
T_t	temperature for the target viscosity	K
B	slope of the D341 line	–
A	intercept of the D341 line	–
Z	$\log\log(\nu+0.7)$	–

Method and standards

The Walther equation of ASTM D341 through two measured points. Logarithms are base 10.

Assumptions and limits

- Simple D341 form, good above about 2 cSt; newer editions add terms for very thin oils.
- Outside the two known temperatures the result is extrapolated (a warning appears); check against the pour point and the flash point.

References

• ASTM D341 Viscosity–Temperature Charts for Liquid Petroleum Products (classic Walther form with the constant 0.7)

Report details

Report reference	FCC-YP2C-2P86 (the same inputs always give the same reference)
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Release checks	3 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/boilers-power-plant/fuel-ash-handling/fuel-oil-viscosity-temperature

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Reopens the calculator with the inputs of this report.