Oil Hydrogenation: Hydrogen per Iodine Value Drop

Hydrogen to lower the iodine value of an oil by a given amount (1 mol H_2 per mol I_2), its normal volume, and the hydrogen per tonne of oil.

Method: Definitions and mass and energy balances: iodine value = g I_2 per 100 g oil; one H_2 saturates the double bond that adds one I_2

Input parameters

Unit system: SI

Parameter	Value	Unit
Oil	20,000	kg
Iodine value before	130.00	
Iodine value after	75.000	
Hydrogen losses (purge, dissolved)	5.0000	%

Calculated results

Parameter	Value	Unit
Hydrogen	91.742	kg
Hydrogen volume at 0 °C, 1 atm	1,020.0	m^3
Hydrogen per tonne of oil	4.5871	kg/t

Notes for this case

- One unit of iodine value needs about 0.08 kg of hydrogen (0.88 Nm^3) per tonne of oil.

Formula and method

$$n = \frac{M(IV_1 - IV_2)}{100\, M_{I_2}}, \quad m_{H_2} = nM_{H_2}(1 + x)$$

Variables

M	Oil	kg
IV_1	Iodine value before	-
IV_2	Iodine value after	-
x	Hydrogen losses (purge, dissolved)	-
m_{H_2}	Hydrogen	kg
V_{H_2}	Hydrogen volume at 0 °C, 1 atm	m^3
m_{H_2}/M	Hydrogen per tonne of oil	kg/kg

Method and standards

Iodine value stoichiometry.

Assumptions and limits

- Ideal gas at 0 °C, 1 atm for volume.

References

- Definitions and mass and energy balances: iodine value = g I_2 per 100 g oil; one H_2 saturates the double bond that adds one I_2

Report details

Report reference	FCC-8QGP-9Y6J (the same inputs always give the same reference)
Generated	17 November 2026, 19:50 UTC
Calculator	Oil Hydrogenation: Hydrogen per Iodine Value Drop
Method last reviewed	13 November 2026
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/textile-rice-oil/oil-hydrogenation-hydrogen

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Reopens the calculator with the inputs of this report.