Liquid Jet Pump (Eductor): Flow Ratio, Head Ratio and Efficiency

Flow ratio, head ratio and efficiency of a liquid jet pump or eductor from motive, suction and discharge heads and the motive and entrained flows.

Method: Jet pump head and flow ratios and efficiency η = MN (definitions; Karassik et al., Pump Handbook)

Input parameters

Unit system: SI

Parameter	Value	Unit
Motive flow	10.000	m³/h
Suction (entrained) flow	8.0000	m³/h
Motive head at the nozzle	60.000	m
Suction head	-2.0000	m
Discharge head	10.000	m

Calculated results

Parameter	Value	Unit
Flow ratio Q_s/Q_m	0.80000	
Head ratio (H_d − H_s)/(H_m − H_d)	0.24000	
Efficiency M·N	19.200	%
Discharge flow	18.000	m³/h

Notes for this case

- Same fluid for motive and suction. Jet pumps are simple and robust but rarely exceed 30–35 % efficiency.

Formula and method

$$M = \frac{Q_s}{Q_m}, \quad N = \frac{H_d - H_s}{H_m - H_d}, \quad \eta = MN$$

Variables

Q_m	Motive flow	m³/s
Q_s	Suction (entrained) flow	m³/s
H_m	Motive head at the nozzle	m
H_s	Suction head	m
H_d	Discharge head	m
M	Flow ratio Q_s/Q_m	-
N	Head ratio (H_d − H_s)/(H_m − H_d)	-
η	Efficiency M·N	-
Q_d	Discharge flow	m³/s

Method and standards

Energy balance definitions.

Assumptions and limits

- Same liquid; steady.
- H_m, H_s and H_d are total heads (pressure plus velocity head) at the motive inlet, suction and discharge connections, on one common datum.
- Efficiencies above 35 %, and above 100 %, are flagged.

References

• Jet pump head and flow ratios and efficiency η = MN (definitions; Karassik et al., Pump Handbook)

Report details

Report reference	FCC-VWT3-TYQ4 (the same inputs always give the same reference)
Generated	17 November 2026, 19:45 UTC
Calculator	Liquid Jet Pump (Eductor): Flow Ratio, Head Ratio and Efficiency
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/mechanical/pumps/eductor-jet-pump

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.