Sheet N1 · Numerical validation

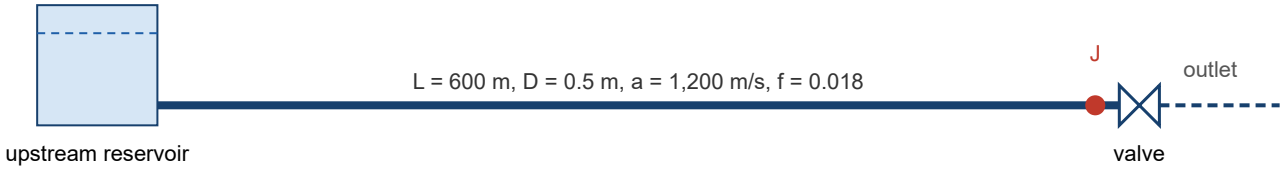
Valve closure at the end of a pipe (Wylie & Streeter, example 3-1)

Source : E. B. Wylie, V. L. Streeter, Fluid Transients, McGraw-Hill, 1978, example 3-1

1. The question

Does CBELIER reproduce, instant by instant, the head at the valve computed in the reference textbook of the field?

2. The case

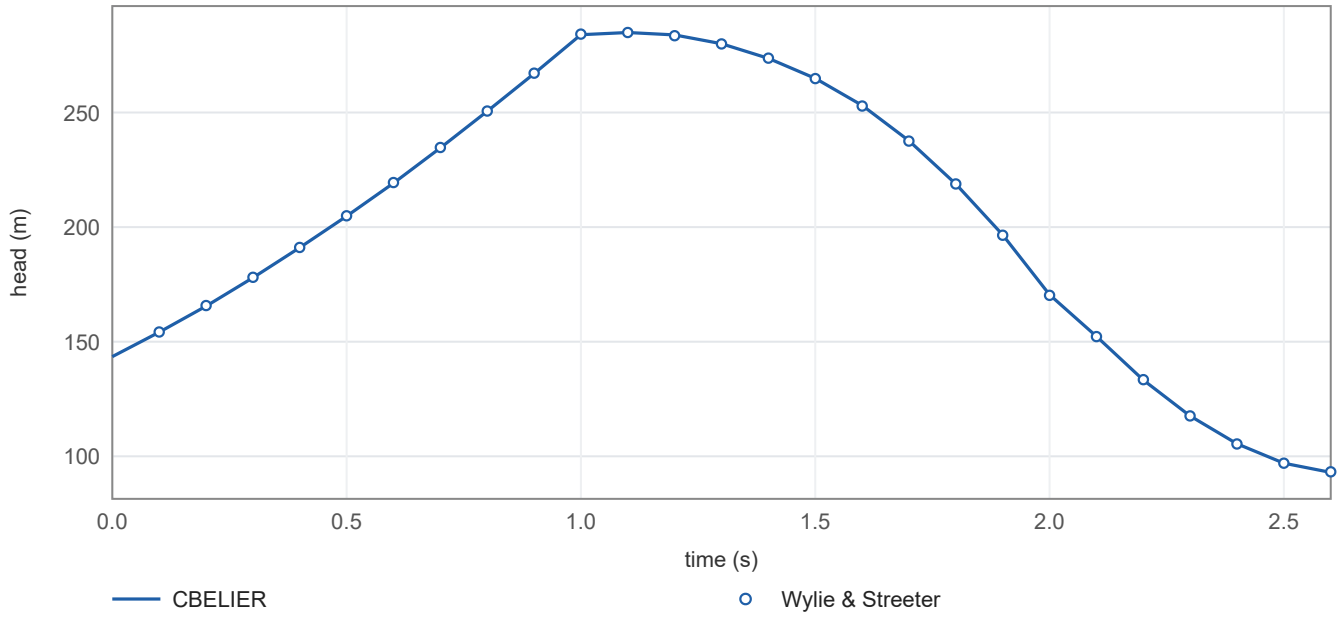


A reservoir at 150 m feeds a 600 m pipe closed by a valve following τ = (1 – t/2.1)^1.5. The book gives the head at the valve every 0.1 s. CBELIER uses the same mesh (5 reaches, 0.1 s step).

3. Data and status

Data	Value	Status
Upstream reservoir	150 m	PUBLISHED
Pipe: L, D, a	600 m; 0.5 m; 1,200 m/s	PUBLISHED
Friction factor f	0.018	PUBLISHED
Initial flow	0.477 m³/s	PUBLISHED
Closure law τ = (1 – t/2.1)^1.5	—	PUBLISHED
Roughness giving f = 0.018 at nominal flow	0.31 mm	DERIVED

4. Results



Head at the valve: CBELIER (line) and book values (circles).

5. Differences

Indicator	CBELIER	Reference	Difference
Initial head at the valve	143.49 m	143.49 m	−0.00 m
Maximum head at the valve	284.92 m	284.87 m	0.0 %
Maximum difference over the 26 instants	0.32 m	—	0.11 % of peak

The book curve is reproduced within 0.3 m for a 285 m peak. The residual difference comes from friction: CBELIER recomputes it at every step, the book keeps it constant.

6. Limitations and assumptions

- Numerical validation: the reference is a computation, not a measurement.
- The book values are read from a printed table.