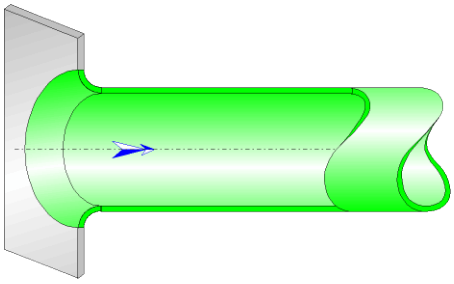
Flush-mounted rounded entrance
Circular Cross-Section
(CRANE)



Model description:

This model of component calculates the minor head loss (pressure drop) generated by the flow in a flush-mounted rounded entrance of piping.

The head loss by friction in the piping is not taken into account in this component.

Model formulation:

Hydraulic diameter (m):

$$D_h = D$$

Pipe cross-sectional area (m^2):

$$A = \pi \cdot \frac{D^2}{4}$$

Mean velocity in pipe (m/s):

$$v = \frac{q}{A}$$

Mass flow rate (kg/s):

$$G = q \cdot \rho$$

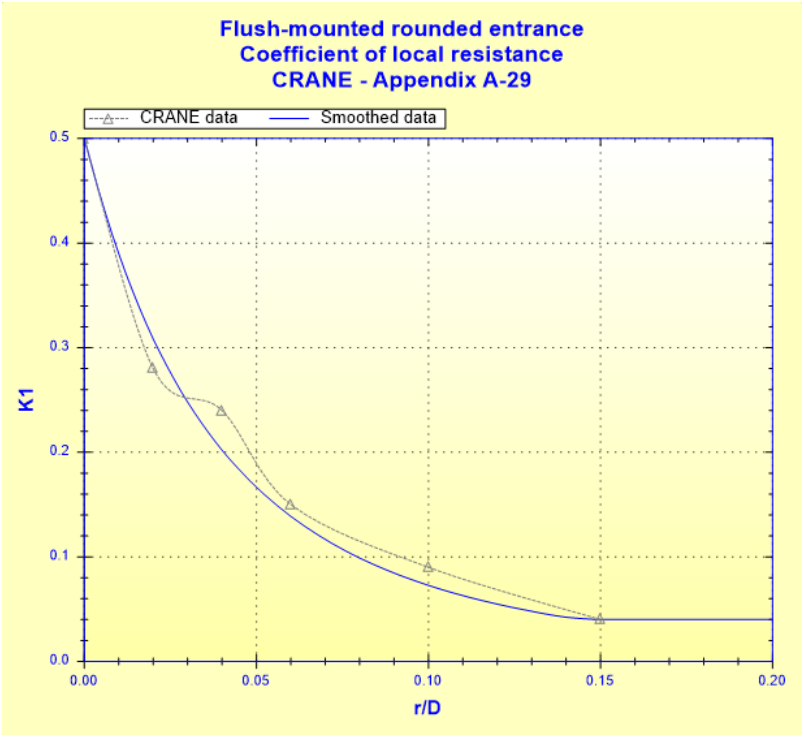
Reynolds number in pipe:

$$Re = \frac{v \cdot D}{\nu}$$

Local resistance coefficient ($Re \geq 10^4$):

- $r/D \leq 0.15$

$$K_1 = f\left(\frac{r}{D}\right)$$ ([1] Appendix A-29)



- r/D > 0.15

$$K_1 = 0.04$$ ([1] Appendix A-29)

Total pressure loss coefficient (based on mean velocity in pipe):

$$K = K_1$$

Total pressure loss (Pa):

$$\Delta P = K \cdot \frac{\rho \cdot v^2}{2}$$

Total head loss of fluid (m):

$$\Delta H = K \cdot \frac{v^2}{2 \cdot g}$$

Hydraulic power loss (W):

$$Wh = \Delta P \cdot q$$

Symbols, Definitions, SI Units:

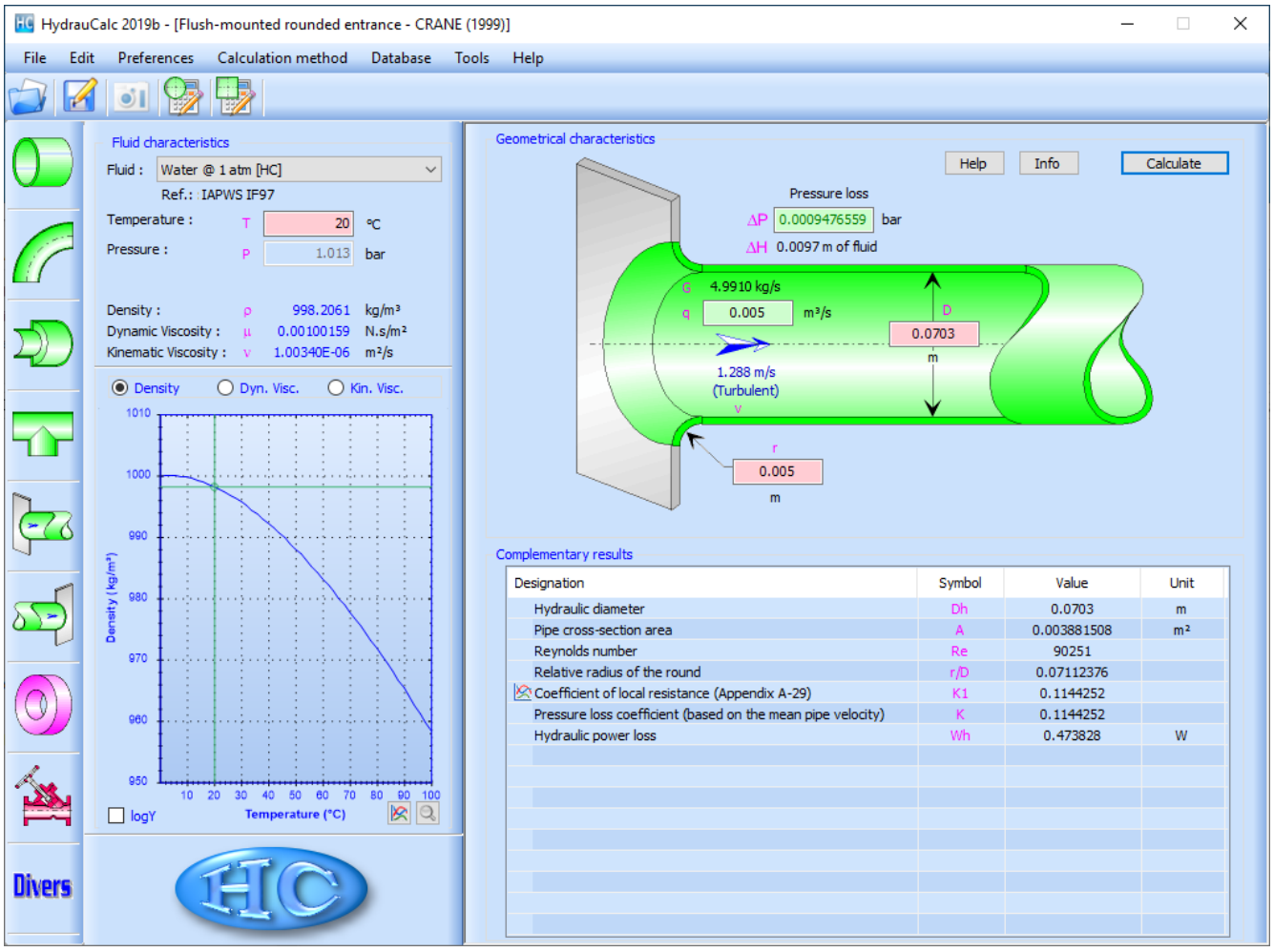
D_h	Hydraulic diameter (m)
D	Pipe diameter (m)
A	Pipe cross-sectional area (m^2)
q	Volume flow rate (m^3/s)
v	Mean velocity in pipe (m/s)
G	Mass flow rate (kg/s)

Re	Reynolds number in pipe ()
r	Radius of the round (m)
K_1	Local resistance coefficient ()
K	Total pressure loss coefficient (based on mean velocity in pipe) ()
ΔP	Total pressure loss (Pa)
ΔH	Total head loss of fluid (m)
Wh	Hydraulic power loss (W)
ρ	Fluid density (kg/m^3)
ν	Fluid kinematic viscosity (m^2/s)
g	Gravitational acceleration (m/s^2)

Validity range:

- turbulent flow regime in pipe ($Re \geq 10^4$)

Example of application:



References:

[1] CRANE - Flow of Fluids Through Valves, Fitting and Pipe - Technical Paper No. 410 - Edition 1999