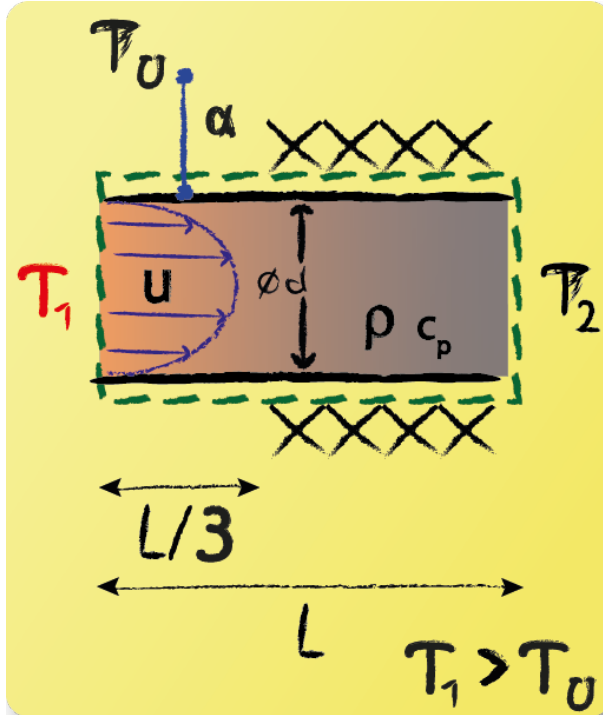


Energy Balance: Task 16



Choose an equation that is suitable to calculate temperature T_1 at the pipe's inlet.

1



Since $2/3$ of the pipe section's length are isolated/adiabatic temperature within the fluid does not change from there on. An energy balance of the entire section therefore is equivalent to one that contains only the first $1/3$. The differential equation describing the temperature profile is obtained by the energy balance of an infinitesimal slice of pipe in x -direction and in more detail is described in **Task 12**. For the purpose of this task the convective heat flux is expressed via the logarithmic temperature difference, yielding the energy balance:

$$0 = u \frac{\pi d^2}{4} \rho c_p (T_1 - T_2) + \frac{1}{3} \alpha \pi d L \frac{T_1 - T_2}{\ln\left(\frac{T_1 - T_u}{T_2 - T_u}\right)}$$