

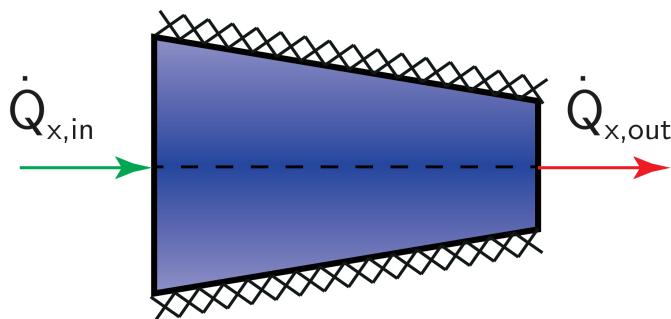
EB - Cond. - Body 2

Set up the energy balance for the truncated cone to determine its temperature T_w . Assume steady-state heat transfer without source/sink inside.

To determine the temperature T_w at the interface between the solid and fluid domains, a global energy balance around the entire solid must be established.

1 Setting up the balance:

A constant heat flux is imposed on the left side of the solid, while on the right side, heat is lost due to convection. No heat is lost through the top and bottom surfaces due to adiabatic conditions.



Hence, the steady-state energy balance around the solid reads:

$$\dot{Q}_{x,in} - \dot{Q}_{x,out} = 0.$$

2 Defining the elements within the balance:

The rate of heat entering from the imposed flux is calculated as:

$$\dot{Q}_{x,in} = 4\dot{q}''\pi R^2,$$

and the rate of heat loss from the right side is calculated from Newton's law of cooling:

$$\dot{Q}_{x,out} = \alpha\pi R^2 (T_w - T_\infty).$$