**Calculation from selected core parameters**

• Total core heat output

• Total heat output in fuel pellets (assumed 94.5% of the total core heat output)

• Nominal system pressure

• Total core mass flow rate

• Effective fuel cooling mass flow rate (= total mass flow rate minus bypass flow)(normal cond.)

• Number of fuel assemblies

• Active fuel height

• Lattice pitch

• Number of fuel rods per assembly

• Outside fuel rod diameter

• Clad thickness

• Fuel pellet diameter

• Number of spacers, their locations, and their local pressure loss coefficients (local loss coefficient of 0.8 each)

• Spacer uniformly distributed distance

• Clad and channel wall roughness

• Flow rate for one assembly

**Pressure Drop Axial Distribution**

Calculation of pressure drop in single-phase flows, including:

* + Friction pressure losses
  + Local losses from the spacer grids
  + Elevation pressure drop.
  1. Where, friction coefficient for pipes:
  + Laminar flow ():
  + Turbulent flow (Blasius formula, ):
  + Turbulent flow in commercial rough tubes (Colebrook formula replaced by Colebrook formula can be replaced with the Haaland formula)

Chart

Description automatically generated

Figure : Axial pressure drop distribution for EPR .

**Coolant Enthalpy Axial Distribution in Heated Channel**

Chart, waterfall chart

Description automatically generatedThe enthalpy distribution of coolant is described by the following differential equation:

Integration yields,

Chart, line chart

Description automatically generated

Figure : Axial coolant enthalpy distribution for EPR

**Coolant Temperature Axial Distribution in Heated Channel**

Assuming constant specific heat, the enthalpy increase can be expressed in terms of the temperature increase as follows:

Using and assuming a constant channel cross section area and heat flux distribution, the coolant temperature can be found as,

Where, by definition bulk liquid temperature,

Chart, line chart

Description automatically generated

Figure : Axial coolant temperature distribution for EPR (Outlet temp. is nearly equal to and inlet temp. is nearly equal to ).

**And with that, I'll wrap things up.**

**Thanks!**