Governing Equations

$$\frac{dn_{ox,v}}{dt} + \frac{dn_{ox,l}}{dt} = -C_d N_{inj} A_{inj} \sqrt{\frac{2(P_T - P_{losses} - P_C)}{(MW)_{ox} \overline{V}_{ox,l}}}$$

$$-\overline{V}_{ox,l} P^*_{ox} \frac{dn_{ox,l}}{dt} + \left[[V_T - n_{ox,l} \overline{V}_{ox,l}] \frac{dP^*_{ox}}{dT} - n_{ox,l} P^*_{ox} \frac{d\overline{V}_{ox,l}}{dT} \right] \frac{dT_T}{dt} = R_u \left[n_{ox,v} \frac{dT_T}{dt} + T_T \frac{n_{ox,v}}{dt} \right]$$

$$[m_T c_{P_T} + n_{ox,l} \overline{C}_{P_{ox,l}} + n_{ox,v} \overline{C}_{V_{ox,v}} + n_{sp,v} \overline{C}_{V_{sp,v}}] \frac{dT_T}{dt} = \frac{dn_{ox,v}}{dt} [R_u T_T - \Delta \overline{H}_{ox,v}] + \frac{dn_{ox,l}}{dt} [P_T \overline{V}_{ox,l}]$$

The unknowns are $\dot{n}_{ox,l}$, $\dot{n}_{ox,v}$ and $\dot{T}_T$
And so we proceed to solve the equations to isolate each of the unknowns: