Governing Equations

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

$$-\overline{V}_{ox,l} P_{cr,ox} \dot{n}_{ox,l} + \left(\left(V_T - n_{ox,l}\overline{V}_{ox,l}\right) \left(\frac{P_{cr,ox}}{dT}\right) - n_{ox,l} P_{cr,ox} \left(\frac{\overline{V}_{ox,l}}{dT}\right) \right) \dot{T}_T = R_u \left(n_{ox,v}\dot{T}_T + T_T \dot{n}_{ox,v} \right)$$

$$(m_T c_{P_T} + n_{ox,l}\overline{C}_{P_{ox,l}} + n_{ox,v}\overline{C}_{V_{ox,v}} + n_{sp,v}\overline{C}_{V_{sp,v}})\dot{T}_T = \dot{n}_{ox,v}(R_u T_T - \Delta\overline{H}_{ox,v}) + \dot{n}_{ox,l}(P_T \overline{V}_{ox,l})$$

$$\dot{r}(t) = a \left(\frac{\dot{n}_{ox,l}(MW)_{ox}}{\pi (R_p(t)^2)} \right)^n$$

Linealizando por serie de Taylor:

$$\dot{r}(t) = a \left(\frac{\dot{n}_{ox,l}(t - t_{step})(MW)_{ox}}{\pi (R_p(t)^2)} \right)^n + na \left(\frac{\dot{n}_{ox,l}(t - t_{step})(MW)_{ox}}{\pi (R_p(t)^2)} \right)^n (\dot{n}_{ox,l}(t) - \dot{n}_{ox,l}(t - t_{step}))$$

The unknowns are $\dot{n}_{ox,l}$, $\dot{n}_{ox,v}$ and $\dot{T}_T$