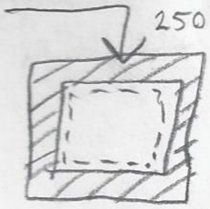
b)



$\hat{V}_0 = 183720 \ \frac{cm^3}{g} \times \left(\frac{1\ m}{100 cm}\right)^3 \times \frac{1000\ g}{kg} = 183.72 \ \frac{m^3}{kg}$

$\hat{U}_0 = 2552.3 \ kJ/kg$

$M_0 = \frac{1\ m^3}{183.72\ m^3/kg} = 5.443 \times 10^{-3}\ kg$

$\frac{dM}{dt} = \dot{m}_{in}(t) \quad \int_{m_0}^{m_f} dM = \int_0^t \dot{m}_{in}(t)\,dt \quad M - M_0 = \int_0^t \dot{m}_{in}(t)\,dt$

$M(t)\frac{d\hat{U}}{dt} = \Sigma \dot{m}_{in}\left[\hat{H}_{in} + \cancel{gh}^{0} + \cancel{\tfrac{1}{2}V^2}^{0}\right] - \Sigma \cancel{M_{out}\left[\hat{H}_{out} + gh + \tfrac{1}{2}V^2\right]}^{0} + \cancel{\dot{Q}}^{0} + \cancel{\dot{W}_s}^{0}$

$M - M_0 = \int_0^t \dot{m}_{in}(t)\,dt \qquad M = M_0 + \int_0^t \dot{m}_{in}(t)\,dt$

$M(t)\frac{d\hat{U}}{dt} = \dot{m}_{in}\hat{H}_{in}$

$\left(M_0 + \int_0^t \dot{m}_{in}(t)\,dt\right)\frac{d\hat{U}}{dt} = \dot{m}_{in}\hat{H}_{in}$

$\left(M_0 + \int_0^t \dot{m}_{in}(t)\,dt\right)\int_{\hat{U}_0}^{\hat{U}} d\hat{U} = \left(\int_0^t \dot{m}_{in}(t)\,dt\right)\hat{H}_{in}$

$\left(M_0 + \int_0^t \dot{m}_{in}(t)\,dt\right)(\hat{U} - \hat{U}_0) = \hat{H}_{in}\int_0^t \dot{m}_{in}(t)\,dt$