$$\frac{\partial \rho}{\partial \theta} = \left[\frac{60}{2\pi N}\right]\frac{1}{V}\left[\sum \dot{m}_{in} - \sum \dot{m}_{out}\right] - \frac{\rho}{A}\frac{\partial A}{\partial \theta}$$

$$\frac{\partial Y_i}{\partial \theta} = \frac{1}{M}\left[\frac{60}{2\pi N}\right]\left[(\bar{\omega} MW_i)V + \sum Y_{i,in}\dot{m}_{in} - \sum Y_{i,out}\dot{m}_{out}\right] - \frac{\partial M}{\partial \theta}\cdot\frac{Y_i}{M}$$

$$\frac{\partial T}{\partial \theta} = \frac{1}{MC_{v_{mix}}}\left[\frac{60}{2\pi N}\right]\left[\sum \dot{m}_{in}h_{in} - \sum \dot{m}_{out}h_{out}\right] - \left[\frac{\rho}{MC_{v_{mix}}}\frac{\partial V}{\partial \theta}\right] - \left[\frac{U_{mix}}{MC_{v_{mix}}}\frac{\partial M}{\partial \theta}\right] - \left(\sum \frac{\partial Y_i}{\partial \theta}\left[\frac{\bar{U}_i}{MW_i}\right]\right)\frac{1}{C_v}$$