FCCM CONVERTER: DIFFERENCE EQUATION

$$i_v[n] = i_v[n-1] + \left(\frac{i_c[n] - i_v[n-1]}{(m_c + m_{cmp})\cancel{T_s}}\right)(m_c + m_d)\cancel{T_s} - T_s m_d$$

Substitute $\alpha = \dfrac{m_c + m_d}{m_c + m_{cmp}}$

$$i_v[n] = i_v[n-1] - i_v[n-1]\alpha + \alpha i_c[n] - T_s m_d$$

$$\boxed{i_v[n] = (1-\alpha) i_v[n-1] + \alpha i_c[n] - T_s m_d}$$ $i_v[n]$

STEADY STATE QUANTITIES:

$$i_\infty = \frac{\alpha i_c - T_s m_d}{\alpha} = i_c - \frac{T_s m_d}{\alpha}$$

$$i_\infty = i_c - \left(\frac{T_s}{L}\right)\left(\frac{V_c + L\, m_{cmp}}{\frac{V_c}{V_d} + 1}\right)$$

STEADY-STATE VALLEY CURRENT i_∞

$$\Delta i = \frac{m_c m_d}{m_c + m_d} T_s = \frac{V_c V_d}{V_c + V_d} \cdot \frac{T_s}{L}$$

STEADY-STATE RIPPLE CURRENT Δi

$$i_{pk} = i_\infty + \Delta i$$

STEADY-STATE PEAK CURRENT i_{pk}

$$\langle i_c \rangle = \frac{L}{2V_c T_s}\left(i_{pk}^2 - i_\infty^2\right)$$

$$\langle i_d \rangle = \frac{L}{2V_c T_s}\left(i_{pk}^2 + i_\infty^2\right)$$

STEADY STATE AVERAGE CURRENTS $\langle i_c \rangle$ $\langle i_d \rangle$