Federal Reference Method 5 Equations

$$D_{n(est)} = \sqrt{\frac{K_5 Q_m P_m}{T_m C_p (1 - B_{ws})}} \sqrt{\frac{T_s M_s}{P_s \Delta P_{avg}}}$$

D_n Selected

$$M_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(\%N_2 + \%CO)$$

$$C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta P_{std}}{\Delta P}}$$

$$P_s = P_{bar} + \frac{P_g}{13.6}$$

$$\Delta H = \left\{ 846.72 \, D_n^4 \Delta H_@ C_p^2 (1 - B_{ws})^2 \frac{M_d}{M_s} \frac{T_m}{T_s} \frac{P_s}{P_m} \right\} \Delta P$$

$$\Delta H_@ = \left(\frac{0.75\Theta}{V_{cr(std)}} \right)^2 \Delta H \left(\frac{V_{m(std)}}{V_m} \right)$$

$$P_m = P_{bar} + \frac{\Delta H}{13.6}$$

$$pmr = Q_{std} C_s$$

$$Q_{std} = 3600(1 - B_{ws}) V_s A_s \left[\left\{ \frac{T_{std} P_s}{T_{s(avg)} P_{std}} \right\} \right]$$

$$M_s = M_d(1 - B_{ws}) + 18.0 B_{ws}$$

$$V_s = K_p C_p \left[\frac{\sum_{i=1}^{n} \sqrt{\Delta P_i}}{n} \right] \sqrt{\frac{T_{s(abavg)}}{P_s M_s}}$$

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

$$\gamma = \frac{V_{cr(std)}}{V_{m(std)}}$$

$$V_{wc(std)} = \frac{(V_f - V_i) \rho_w R T_{std}}{P_{std} M_w}$$

$$V_{cr(std)} = K' \frac{P_{bar} \Theta}{\sqrt{T_{amb}}}$$

$$V_{m(std)} = V_m \gamma \frac{T_{std} \left(P_{bar} + \frac{\Delta H}{13.6} \right)}{T_m P_{std}}$$

$$V_{wsg(std)} = \frac{(W_f - W_i) R T_{std}}{P_{std} M_w K_2}$$

$$V_{m(std)} = K_1 V_m \frac{\left(P_{bar} + \frac{\Delta H}{13.6} \right)}{T_m}$$

Federal Reference Method 5 Equations

$$D_{n(est)} = \sqrt{\frac{K_5 Q_m P_m}{T_m C_p (1 - B_{ws})} \sqrt{\frac{T_s M_s}{P_s \Delta P_{avg}}}}$$

$$M_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(\%N_2 + \%CO)$$

RM 3 Eq. 3-1

$$pmr = Q_{std} C_s$$

$$Q_{std} = 3600(1 - B_{ws}) V_s A_s \left[\left\{\frac{T_{std} P_s}{T_{s(avg)} P_{std}}\right\}\right]$$

RM 2 Eq. 2-8

$$V_s = K_p C_p \left[\frac{\sum_{i=1}^{n} \sqrt{\Delta P}_i}{n}\right] \sqrt{\frac{T_{s(abavg)}}{P_s M_s}}$$

RM 2 Eq. 2-7

$$P_s = P_{bar} + \frac{P_g}{13.6}$$

$$P_m = P_{bar} + \frac{\Delta H}{13.6}$$

$$M_s = M_d(1 - B_{ws}) + 18.0 B_{ws}$$

RM 2 Eq. 2-6

$$C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta P_{std}}{\Delta P}}$$

RM 2 Eq.2-3

Federal Reference Method 5 Equations

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

RM 4 Eq. 4-4

$$V_{wc(std)} = \frac{(V_f - V_i)\rho_w R T_{std}}{P_{std} M_w}$$

RM 5 Eq. 5-2

$$V_{wsg(std)} = \frac{(W_f - W_i) R T_{std}}{P_{std} M_w K_2}$$

RM 4Eq. 4-2

$$\mathrm{V_{m(std)}} = \mathrm{V_m}\gamma \frac{T_{std}\left(\mathrm{P_{bar}} + \frac{\Delta \mathrm{H}}{13.6}\right)}{T_m P_{std}}$$

RM 5 Eq. 5-1

$$\mathrm{V_{m(std)}} = K_1 V_m \frac{\left(\mathrm{P_{bar}} + \frac{\Delta \mathrm{H}}{13.6}\right)}{T_m}$$

RM 5 Eq. 5-1

$$V_{cr(std)} = K' \frac{P_{bar}\Theta}{\sqrt{T_{amb}}}$$

RM 5 Eq. 5-12

$$\gamma = \frac{V_{cr(std)}}{V_{m(std)}}$$

RM 5 Eq. 5-14

$$\Delta H_{@} = \left(\frac{0.75\Theta}{V_{cr(std)}}\right)^2 \Delta H \left(\frac{V_{m(std)}}{V_m}\right)$$