Motor Starting Calculator Equations

$kV = motor\ operating\ voltage$
$HP = rated\ motor\ horsepower$
$\eta = motor\ efficiency$
$PF_r = running\ power\ factor$
$PF_s = starting\ power\ factor$
$MVA_r = running\ MVA$
$P_r = running\ real\ power$
$Q_r = running\ reactive\ power$
$I_r = running\ current$
$kvahp = starting\ kVA\ per\ horsepower\ ratio$
$MVA_s = starting\ MVA$
$P_s = starting\ real\ power$
$Q_s = starting\ reactive\ power$
$I_s = starting\ current$
$sr = starting\ to\ running\ current\ ratio$
$MVA_{sc} = short\ circuit\ MVA\ at\ point\ of\ interest$
$V_{dip} = voltage\ dip\ at\ point\ of\ interest$

$$MVA_r = \frac{745.7 * HP}{\eta PF_r * 10^6}$$
$$P_r = MVA_r PF_r$$
$$Q_r = \sqrt{{MVA_r}^2 - {P_r}^2}$$
$$I_r = \frac{MVA_r}{\sqrt{3}kV}$$

Method 1:

$$MVA_s = \frac{kvahp * HP}{1000\eta}$$
$$P_s = MVA_s PF_s$$
$$Q_s = \sqrt{{MVA_s}^2 - {P_s}^2}$$

Method 2:

$$I_s = sr * I_r$$
$$MVA_s = \sqrt{3}kVI_s$$
$$P_s = MVA_s PF_s$$
$$Q_s = \sqrt{{MVA_s}^2 - {P_s}^2}$$

V_{dip} Estimate:

$$V_{dip} \approx 1 - \frac{MVA_{sc}}{MVA_{sc} + MVA_s}$$

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Questions or Comments …

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