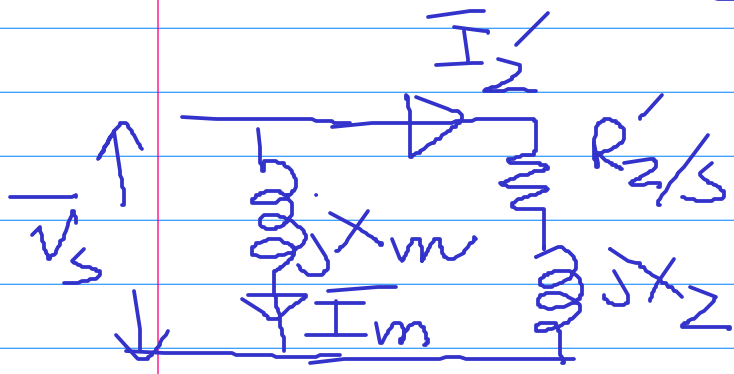
Applications: Pump (high power) / 50% speed variation

Slip Power Recovery Drives (ω_{syn})



$P_g = I_2'^2 R_2'/s$

$= $ Air-gap Power

$= P_{mLoss} + P_{mech}$

$= I_2'^2 R_2' + I_2'^2 R_2'(1-s)/s$

$T_e = 3 \dfrac{I_2'^2 R_2'(1-s)/s}{\omega_{syn}(1-s)} = 3 \dfrac{I_2'^2 R_2'/s}{s\,\omega_{syn}}$ ✓

$= 3 \dfrac{V_s^2}{\left(R_2'/s\right)^2 + (X_2')^2} \times \dfrac{R_2'/s}{\omega_{syn}}$ ✓

$\dfrac{R_2'}{s} \Rightarrow$ const $\Rightarrow T_e$ is const

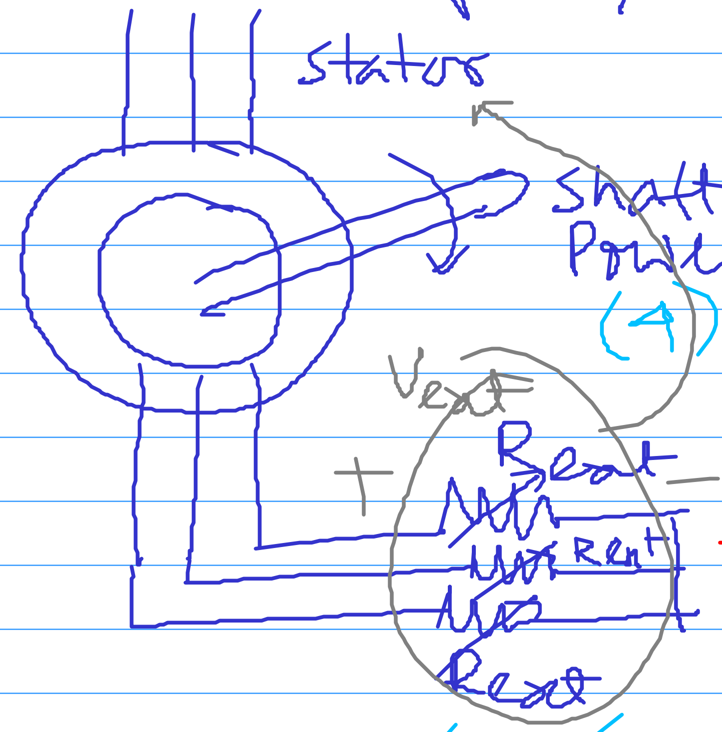
$\Rightarrow I_2'$ is const

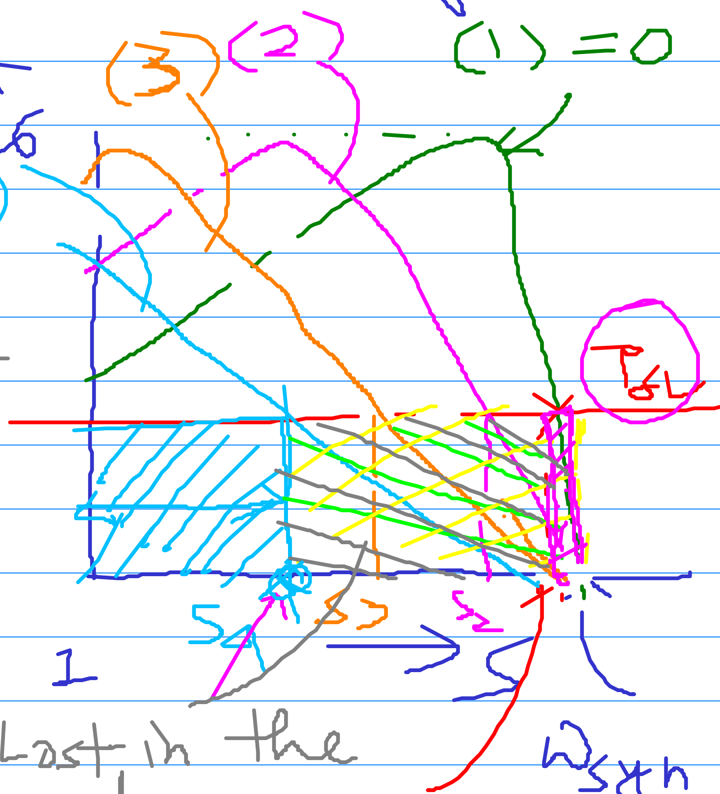
$s_{fl} \rightarrow I_{2fl}' \rightarrow$ 3%, 4%

$I_2'^2 R_2' \rightarrow 5\,P_g$

Squirrel Cage M/C → Wound Rotor IM

slip Ring I/M





$R_{Total} = R_2 + R_{ext}$ 1

$S_{FL} \Rightarrow R_{ext} = 0$
$= .03$

$S_2 \Rightarrow R_{ext2}$

$S_3 \Rightarrow R_{ext3}$

$S_4 \Rightarrow R_{ext4} = .5$

$$\frac{R_2}{S_{FL}} = \frac{R_{ext2} + R_2}{S_2} = \ldots = \frac{R_{Total}}{S} = \text{const}$$

SP_g = slip Power → Returned back to

$(S - S_{FL}) P_g \Rightarrow$ Actual slip Power to be recovered the supply

$(1 - S) P_g$ = Mechanical Power

N_r = No. of turns of the rotor coil

N_s = No. of turns of the stator coil