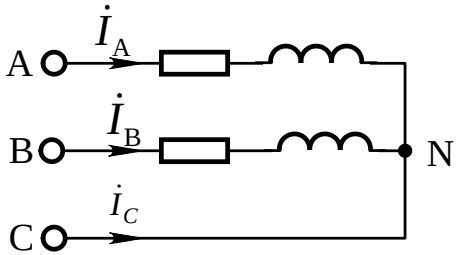
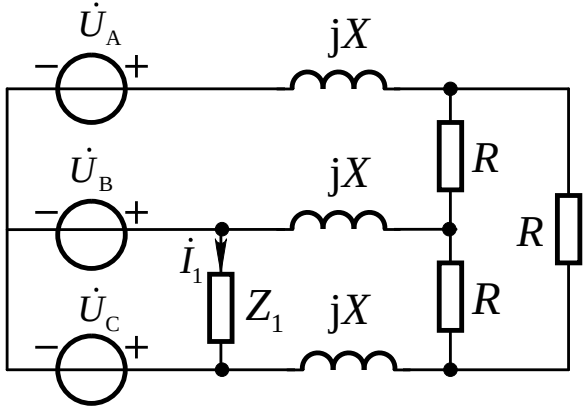
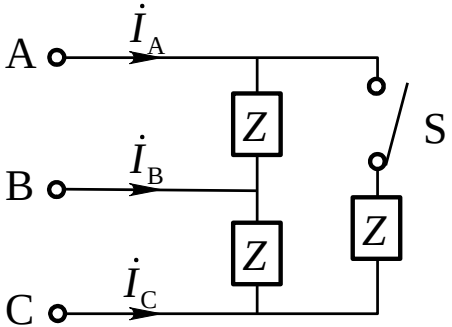
不对称三相电路

产生不对称的原因





负 载 不 对 称



发生断路、短路等故障

利用不对称三相电路的特性而工作的某些电气设备或仪器等等……

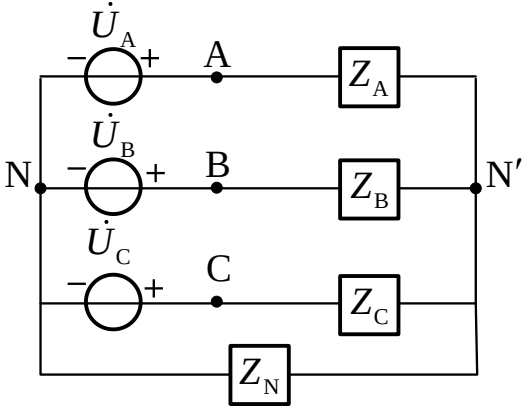
不对称三相电路

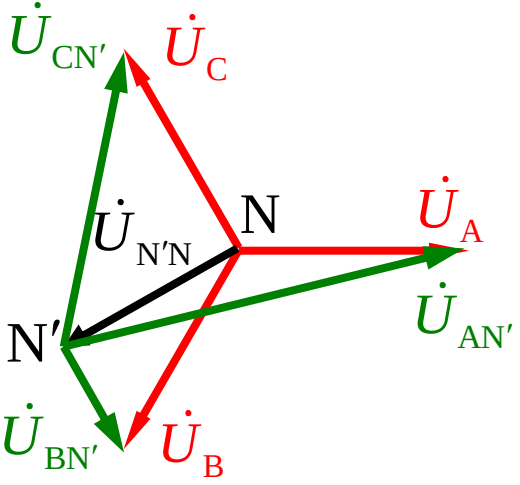
电源对称负载不对称

$$\left(\frac{1}{Z_A}+\frac{1}{Z_B}+\frac{1}{Z_C}+\frac{1}{Z_N}\right)\dot{U}_{N'N}=\frac{\dot{U}_A}{Z_A}+\frac{\dot{U}_B}{Z_B}+\frac{\dot{U}_C}{Z_C}$$

$$\dot{U}_{N'N}=\frac{\dot{U}_A/Z_A+\dot{U}_B/Z_B+\dot{U}_C/Z_C}{1/Z_A+1/Z_B+1/Z_C+1/Z_N}$$

$$\Longrightarrow \quad \dot{U}_{N'N}\neq 0 \quad \Rightarrow \quad \left.\begin{aligned}\dot{U}_{AN'}&=\dot{U}_A-\dot{U}_{N'N}\\ \dot{U}_{BN'}&=\dot{U}_B-\dot{U}_{N'N}\\ \dot{U}_{CN'}&=\dot{U}_C-\dot{U}_{N'N}\end{aligned}\right\}$$

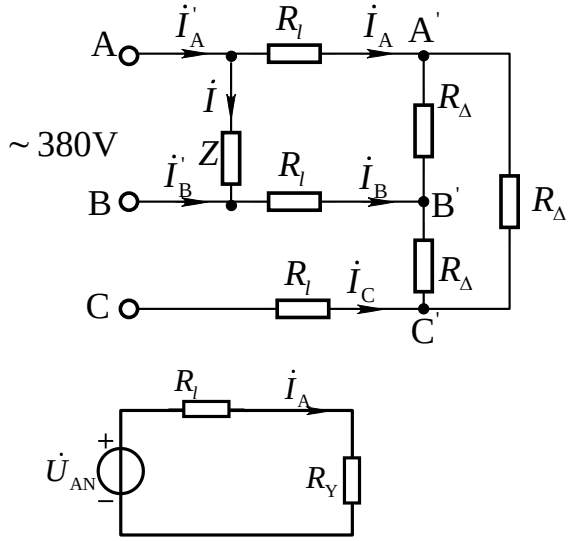




为负载不对称时也保持负载相电压对称,以使其正常工作，减少中性点位移，就应减小中线阻抗Z_N。低压电网广泛采用三相四线制。

不对称三相电路　例题

例1 图示对称三相电路线电压 $U_l = 380\text{V}$，线路电阻 $R_l = 10\Omega$，负载电阻 $R_\Delta = 90\Omega$，附加一单相阻抗 $Z = 10\angle 30^\circ\,\Omega$，求电源侧各端线电流。



解：单相计算 $\dot{U}_{AN} = 220\angle 0^\circ\text{V}$　　$\dot{U}_{AB} = 380\angle 30^\circ\text{V}$

$$R_Y = R_\Delta/3 = 30\Omega \qquad \dot{I}_A = \frac{\dot{U}_{AN}}{R_l + R_Y} = \frac{220\angle 0^\circ\text{V}}{(10+30)\Omega} = 5.5\angle 0^\circ\text{A}$$

$$\dot{I}_B = 5.5\angle -120^\circ\text{A}\,,\ \dot{I}_C = 5.5\angle 120^\circ\text{A}$$

单相阻抗电流

$$\dot{I} = \frac{\dot{U}_{AB}}{Z} = \frac{380\angle 30^\circ\text{V}}{10\angle 30^\circ\,\Omega} = 38\angle 0^\circ\text{A}$$

不对称A、 B端线电流

$$\dot{I}'_A = \dot{I}_A + \dot{I} = 5.5\angle 0^\circ + 38\angle 0^\circ = 43.5\angle 0^\circ\text{A}$$

$$\dot{I}'_B = \dot{I}_B - \dot{I} = (5.5\angle 120^\circ - 38\angle 0^\circ)\text{A} \approx 41.03\angle -173.3^\circ\text{A}$$