PW AVANCED POWER ELECTRONIC

PW N^{r}5
Static reactive power compensators

Objective :

The primary objectives of static reactive power compensators, such as Static VAR Compensators (SVCs), include:

1. **Voltage regulation:** They help maintain stable voltage levels in power systems by compensating for reactive power imbalances. This is crucial for preventing voltage fluctuations and ensuring consistent power supply quality.
2. **Power factor correction :** SVCs adjust the power factor by controlling reactive power, which improves system efficiency and reduces energy losses. A better power factor means more efficient use of active power.
3. **System stability enhancement :** By providing or absorbing reactive power, SVCs enhance system stability, reduce power losses, and prevent over-voltages. This helps in maintaining grid stability during load variations.
4. **Load balancing:** SVCs can balance three-phase loads, reducing equipment overload and additional losses associated with asymmetric loads.
5. **Improvement of power quality :** They mitigate issues like voltage sags and flicker, ensuring smoother operation of electrical systems.

Handing:

1- Study of the different types of compensation and compare them with respect to the stability of the voltage at the terminals of the load impedance.
2- Study of the reduction of power losses.
3- Improvement of the power factor cos φ.

Parallel compensation:

1 Assembly: Carry out the following assembly, taking a resistive-inductive load:

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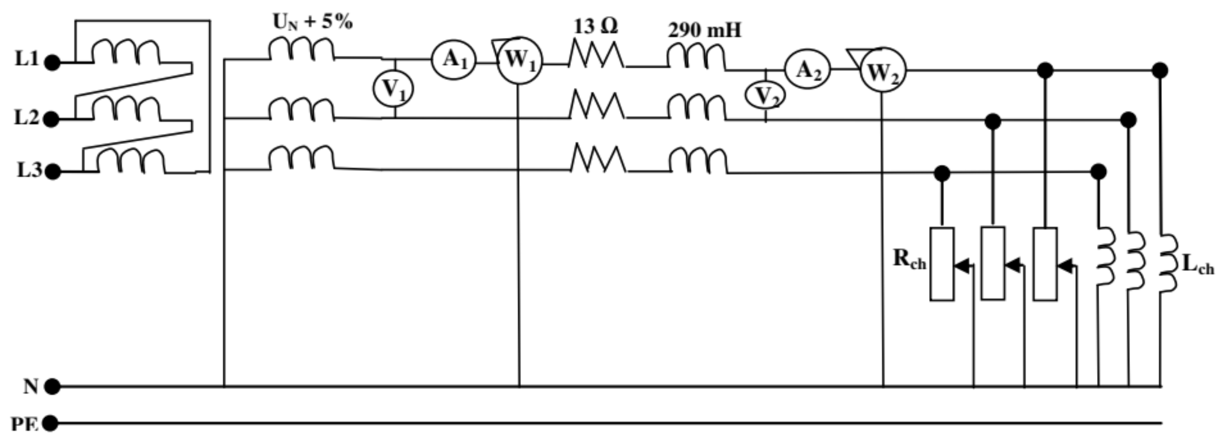

Operating mode

1. In order to demonstrate the main role of this type of compensation, it is sufficient to study the line without operating capacities.
2. Set the inductive load to Lch = 2.4 H
3. Vary the resistive load by 100%, 80%, 60% and 40%
4. Measure the parameters: voltage U1, current I1, active power P1 and reactive power Q1 at the beginning of the line as well as voltage U2, current I2, active power P2 and reactive power Q2 and $\cos\varphi_2$ at the end of the line;
5. Change the value of the load inductance to Lch = 1.2 H and repeat the same measurements
6. Transfer the measurements to the table below:

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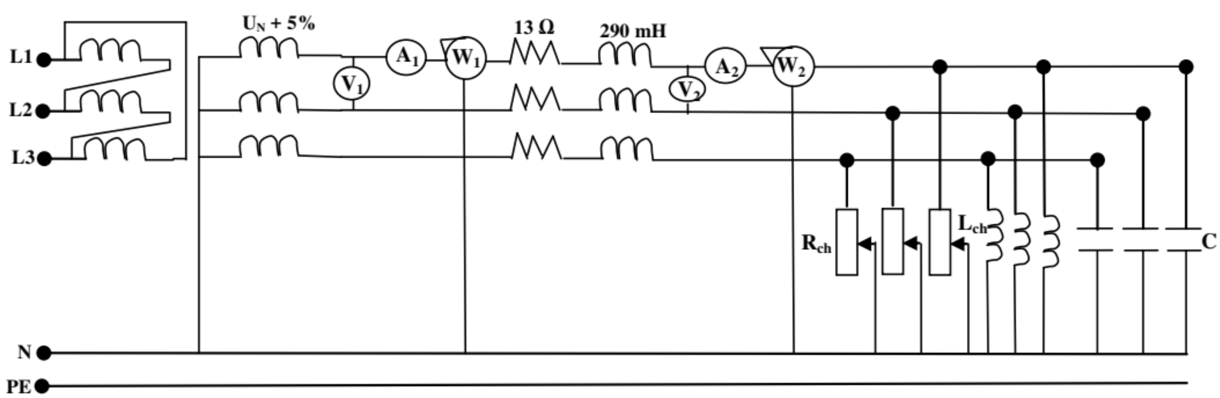
L_{ch} (H)	R_{ch} (%)	U_1(V)	I_1(A)	P_1(W)	Q_1 (VAR)	U_2(V)	I_2(A)	P_2(W)	Q_2 (VAR)	$\cos\varphi_2$	$\Delta P = P_1 - P_2$	$\Delta Q = Q_1 - Q_2$
2,4	100											
	80											
	60											
	40											
1,2	100											
	80											
	60											
	40											

7. Connect the compensation capacitors in parallel



8. For Lch = 2.4 H take C = 4µF and for Lch = 1.2 H take C = 8µF; enter the measurements in the table below:

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C(µF)	L_{ch} (H)	R_{ch} (%)	U_1(V)	I_1(A)	P_1 (W)	Q_1 VAR	U_2(V)	I_2(A)	P_2 (W)	Q_2 VAR	$\cos\varphi_2$	$\Delta P = P_1 - P_2$	$\Delta Q = Q_1 - Q_2$
4	2,4	100											
		80											
		60											
		40											
8	1,2	100											
		80											
		60											
		40											

9. Compare the results of the load voltage measurements U2 before and after compensation for the same load?
10. What do you notice about the value of the load factor cosφ2?
11. How do the active and reactive power losses vary before and after compensation for the same load?