Introduction

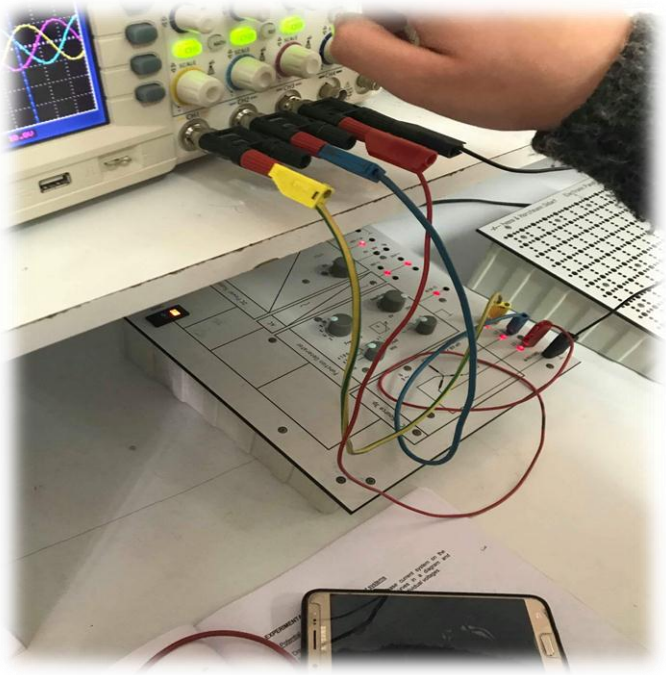
What people in life (not workers or in factories) do deal with is the single phase systems of sources but in the life of industry we use Polyphase systems which the kind of systems used in heavy works and especially in Motors because they produce a magnetic field that rotates in a specified direction .

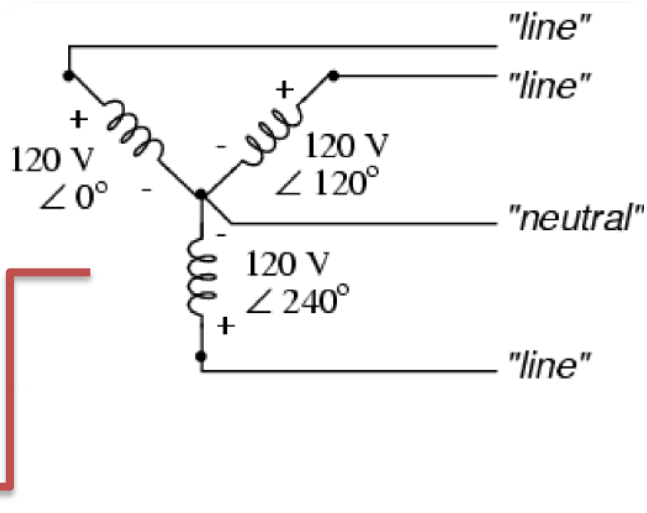
In this experiment we are going to know two types of three phase systems : Y and delta , and determine the relationship between current and voltage in y and delta load lines , and constructing a balanced and unbalanced load systems and see their effect.

Procedures

❖ Part one:

1. **This circuit represent the 3 phase y.**





2. We measured the angle of phase shift

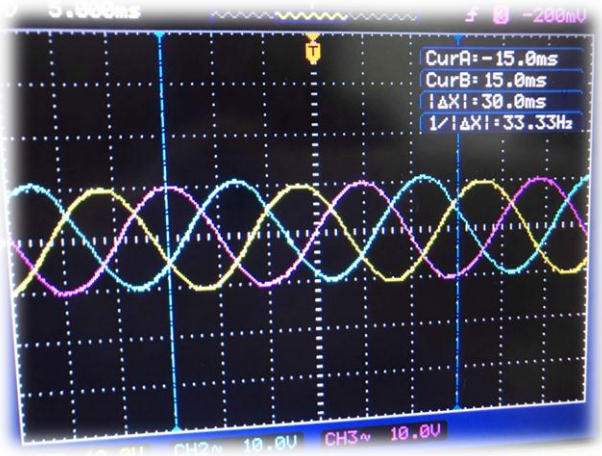
- We found that :

- Its negative seq.
- ϕ12=123.15(see the attached explanation)
- ϕ13= 123.15
- ϕ23= 123.15

☒ Remember that:

360 ⇨ 3.8

theta ⇨ 1.3



3. We measure line to line and line voltage.

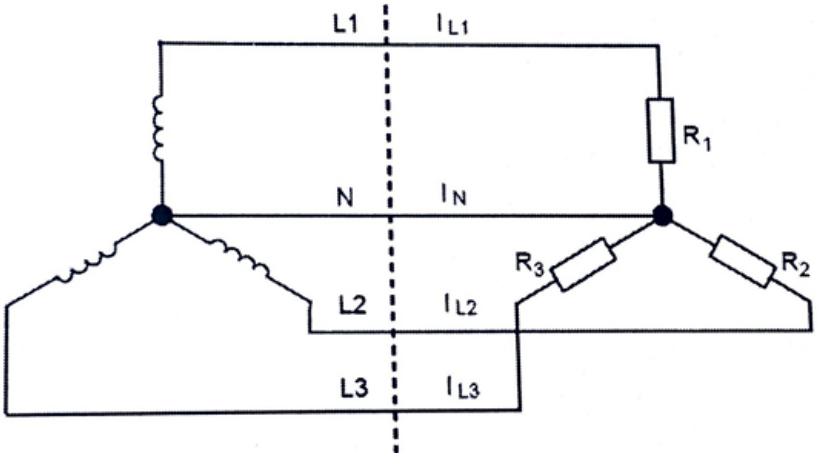
VL1	7.1	VL1L2	12
VL2	7.1	Vl2L3	12
Vl3	7.1	VL1L3	12

Notice that:

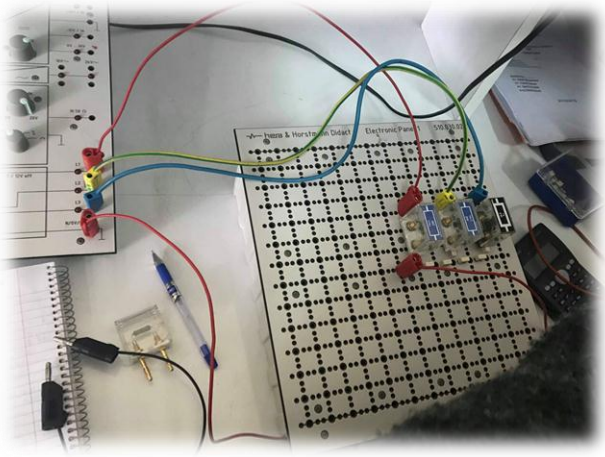
- $VL=\sqrt{3}\ V\phi$
- Peak value of phase voltage=$\sqrt{2}$ *12=16.97v
- Peak value of conductor voltage

  = $\sqrt{2}$ *7 = 10.04 volt.

❖ **Part Two** star connected source star connect load



1. **We connect the circuit like this when R1, R2, R3 =1k Ω then we measured the conductor current ,Neutral current, conductor and phase voltage.**

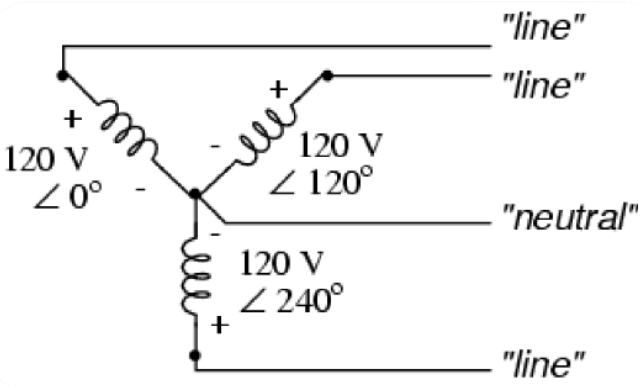


2. **We replace the resistances by 1k Ω,680Ω 330Ω(unbalanced load), then we measure the required values.**

Star Circuit		Load	
		Balanced	Unbalanced
Conductor current IL IN Iϕ (mA)	IL1	7.05	7
	IL2	7.1	10
	IL3	7.04	20.6
	IN	0.04	12
Conductor voltage VL (volt)	VL1-L2	12.3	12.3
	VL2-L3	12.3	12.2
	VL3-L1	12.1	12.03
Phase voltages Vϕ (volt)	VL1-N	7.02	6.8
	VL2-N	7.1	7.1
	VL3-N	7	7
Power	PR1	49.49mw	47.6mw
	PR2	50.41mw	71mw
	PR3	49.28mw	144.2mw
	Tot power $P_T=P_{R1}+P_{R2}+P_{R3}$	149.18 mw	262.8 mw

Notes and Questions

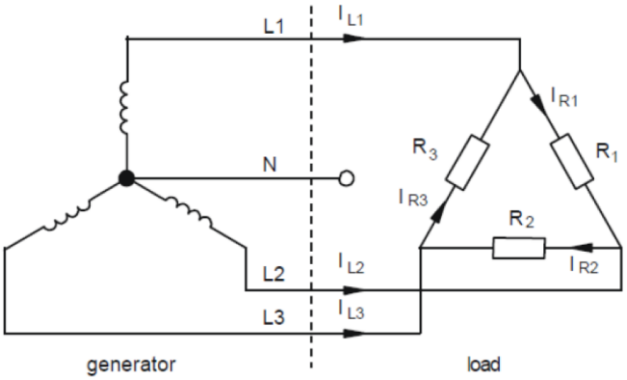
1. **We notice that VL and Vϕ didn't change when we changed the values of resistance because we didn't change the source, as the change of resistance affect the value of current.**
2. **IL=Iϕ**
3. **When we the load is balance, the current value of Neutral almost equal zero, so we can ignore the NL connecting with the source.**
   (the sum of three equal values and consist angle of 120 with any two line equal zero).

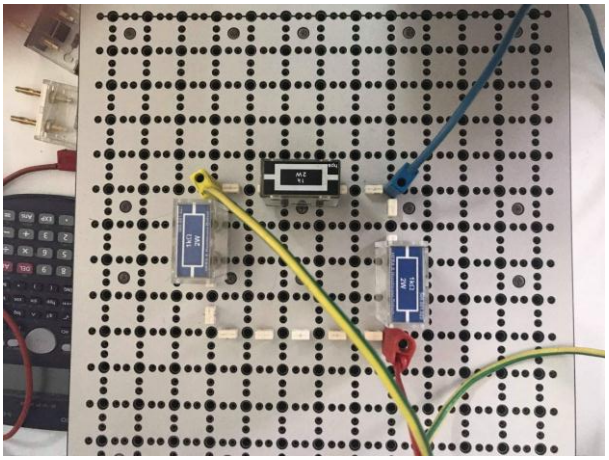


4. **But it not the same in the unbalanced load, there is a current passes in neutral line when the load is unbalanced , because the neutral current is equal to the sum of 12 mA such that the three currents must be the same to be there is no current throw neutral line , in an unbalanced situation the 3 currents is not the same , so there is a current pass throw neutral line . (the sum of the current must be zero, the sum in unbalanced situation is not zero).**

❖ Part three star connected source delta connected load

1. Connect the circuit as shown.
2. Firstly, we connect balanced load(1kΩ) and measured the required values)
3. Secondly, we change the values of the resistance





Delta Circuit		Load	
		Balanced	Unbalanced
Conductor current IL (mA)	IL1	20.7	42.2
	IL2	20	25
	IL3	20.6	46
Phase current	IR1	12	11.7
	IR2	11.8	17.4
	IR3	12	34.9
Phase voltages Vϕ (volt)=VL	VL1-N	12	12
	VL2-N	12	12
	VL3-N	11.95	11.7
Power	PR1	144 mw	140.4 mw
	PR2	141.6 mw	208.8 mw
	PR3	143.4 mw	408.33 mw
	Tot power $P_T=P_{R1}+P_{R2}+P_{R3}$	429 mw	757.53 mw

Questions

1. From our measured results, we can derive a relation between the conductor current (IL) and the phase current (Iɵ) such that: IL=√3Iɵ.
2. Vϕ=VL
3. The algebraic sum of line currents equal zero in either balance and unbalance load(to ensurs KVL law).
4. No, We could see that the phase voltages equal conductor voltages and they are the same in each balanced and unbalanced load because the change of a resistor value just do change the conductor current that go through it as above in the table. But the supplied voltage across it remains the same.

❖ Conclusion

After finished our experiment we conclude that the angle shift between the individual voltages is 120 degree and we see this in oscilloscope . and we verify the equation VL=(3)^1/2 VΦ for star connection .

And we conclude that in star 3-phase connection the current of each phase line is equals to another phases in balance situation , and different in unbalanced situation . and we can see the same to the phases voltages in balance and unbalanced situations in delta connection (the voltages is different In star connection) . and we verify the equation IL=(3)^1/2 IΦ for delta connection .