

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT
EE-462 ELECTRICAL MACHINES

Term: 012

Experiment # 2
PARALLEL OPERATION OF POLY PHASE ALTERNATORS

☞☞ PURPOSE

To study the conditions necessary to connect two three-phase alternators in parallel.

☞☞ APPARATUS USED

- SA-100-3 Three-Phase Alternators (2)
- DC Motors Type HD-34 (2)
- HT-100 Tachometer (1)
- RLC-100 Load Bank (1)
- 0 to 250 Volt AC Voltmeters (2)
- 0 to 1.0 Amp AC Ammeters (2)
- 0 to 300 Watt AC Wattmeters (300 V-2a) (4)
- 0 to 125 Volt DC Power Supplies (2)
- 400 Volt Pilot Lights (3)
- 115 Volt DC Power Supplies (2)

☞☞ PROCEDURE

1. Couple the three-phase alternators to the DC motors and make the connections as shown in figure 1. Adjust the alternators' rheostat to their maximum resistance (fully clockwise position). Adjust the motors' rheostats to their minimum resistance (counter clockwise) position. The alternators' overload switches should be in the "Off" position.
2. Let the instructor check your machines and meters' connection. Start one of the motors and adjust its speed to 1800 RPM by adjusting the DC supply voltage. Adjust the output of its alternator (henceforth referred to as alternator#1) to 208 Volts AC. Switch on its overload switch and apply a 0.25 Amps resistive load. Maintain the 208 Volt-60 Hz output by the adjustment of the excitation and the speed.
3. Start the second motor and adjust its speed to approximately 1800 RPM. Adjust the output of alternator#2 to approximately 208 Volts AC. The phasing lamps will now be flashing on and off together. If they flash alternately, the phase rotation of one of the alternators is incorrect and any two of the stator leads of Alt.#2 should be swapped. With the lamps flashing together, adjust the speed of Alt.#2 until the flashing has stopped and the lamps are dark (Dark-Lamp Method). If the output voltages of the two alternators are equal, Alt.#2 may be paralleled with the bus, (Alt.#1 and the load) by switching on its overload switch. Alternator#2 is now floating on the line.
4. Increase the speed of Alt.#2 so that it carries half of the load. Adjust the field of Alt. #2 so that its

output has a unity power factor (i.e. $\text{Volts} \times \text{Amps} \times 1.73 = \text{Watts}$).

5. Reduce the speed of Alt.#1 until it is floating on the line and open its overload switch. Reduce the load to zero and shut off both motors.

SUGGESTIONS FOR CONCLUSION

Discuss the conditions necessary to parallel and divide load between two polyphase alternators.

QUESTIONS

1. With the alternators paralleled, What would happen if one of the prime movers was shut off?
2. Can a Synchroscope be used to check the phase sequence?
3. What other methods can be used to check the phase sequence?

Figure 1. Parallel operation of polyphase alternators
DC MOTOR

