Q1: A local factory has 0.8 PF and consumes 750 kVA. The factory needs to add 150 kW electric boiler for a new production line.

1. How boiler installation will affect PF value.
2. Knowing that the factory electric system is 3-phase 380V, calculate the current in Amperes after boiler installation.
3. After installing the boiler. Calculate required capacitor in kVAR to improve PF to 0.92.
4. Calculate current in Amperes after capacitor bank installation.
5. What is the main effect of current value changing (b & d)? Is it positive or negative effect?
6. Knowing that you pay 10$/kW/month, calculate estimated savings between before boiler installation and after capacitor bank installation.

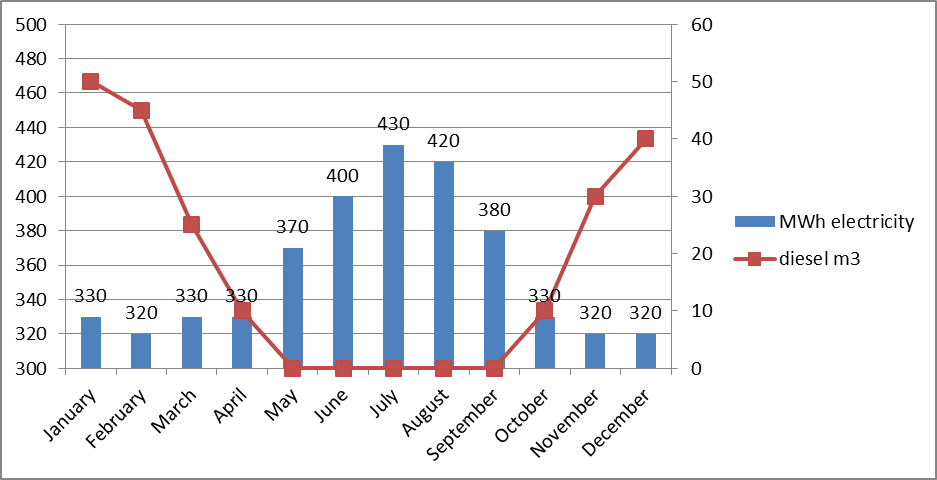
Q2: oil #2 boiler has the following operational data: annual fuel consumption equals to 420 m3 of oil, O2% equals 8%, and stack to ambient air temperature difference equals to 350 oC. Assume oil#2 calorific value is 36MJ/liter, and it costs 5Nis/L.

After executing an energy audit, O2% value was reduced to 5%, and stack to ambient air temperature difference to 250oC.

1. Calculate annual energy saved.
2. Calculate annual cost saved.
3. If steam distribution system thermal energy loss equals to 320,000 MJ/year, calculate boiler net efficiency.
4. If system auxiliary controller (pumps, valves, monitors…etc.) consumes 12MWh electricity per year. Calculate system gross efficiency.

Q3: For the following building annual energy load.

1. What general notes do you have about local weather?
2. How much energy do you think this building consume for summer cooling?



Q4: After understanding IAQ main factors and its consequences. What do you think the main obstacles/limitations of implementing such principles in Palestine? What solutions do you propose?