

## **ABSTRACT**

The last decades of the century have witnessed great acceleration in energy crisis. The electricity sector in Iraq has suffered from the poor maintenance for the most parts of the power plants. Steam turbines power plants are one of the oldest technologies still in general production for most of electric energy in Iraq. This research produces one of the best solutions to the energy crises and to the old steam power plants by the benefits of using of combined power plants (re-powering of steam plants). A computer program was written in MathCAD software to study the performance of one steam turbine unit at south Baghdad thermal power plant at design and off design conditions. The performance of the chosen steam unit was studied by closing two feed water heaters and putting up the unit as a part of the combined cycle. A gas turbine unit has been selected to suit the steam turbine plant conditions and full analysis of this turbine was performed. Those above two units are considered to be the elements of combined cycle. Then the performance of the considered combined cycle power plant was studied with and without supplementary firing. It was found that it is necessary to close two feed water heaters in order to combine the two cycles. The results reveal that:

Closing two heaters of south Baghdad power plant raises the power by about (8.67%) while the thermal efficiency decreases about (2.4%). This research shows the importance of (Re-powering) method to deal with the energy crisis caused by old steam turbines.

The power output increases to (194.25 MW) with combined cycle plant, and the thermal efficiency increases to (48.23%). When this power is produced from a steam unit, there will be an increase in fuel consumption by (14.99%) and a decrease in efficiency by (7.23%), while production of this power from a gas unit will increase the fuel consumption by (23.29%) and decrease the efficiency by (11.23%) as compared with the suggested combined plant.