

Increasing Power Plant Efficiency with 15 % and decreasing the consumption of the natural gas with 25% in Summer Season by Modification of Cooling tower System

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Abstract

Power station plant (combined cycle) consist of Gas turbine GT9 (32 MW h), Gas Turbine GT8C (52MW h) and Steam Turbine (36 MW h) which supply the Companies (Sidpec , Gasco, Alex. Fiber& EPC) by electrical power and process steam

The Cooling System Contains No.7 Cells Cooling Tower To Feed Cold Water To Process Plant (PVC , VCM , CL2 And Utility Plants) which required minimum cooling water inlet temperature (Max. 27 °C) And the heat duty equal 56 M Kcal / h And The steam turbine condenser of the power plant require inlet water temperature (Max. 35 °C) and heat duty equal 78 M Kcal / h so the steam turbine output power 36 MW h .

There Are a Problem In Cooling Water System specially in summer season when the steam turbine operation with the process plants, Because The Return Cooling Water Temperature increased due to increasing air wet bulb temperature and due to heat load of steam turbine condenser, So to keep the process plants in operation 100 % load capacity, then we must stop the steam turbine consequently the power losses shall be 36 MW h (7 months) stop every year

EPC solved this problem By separation No. 2 Cells film type filling from the total No. 7 Cells to be in continuous operation with the power station plant, So the steam turbine power generation reached to 31.3 MW h . And The No.5 cells to be in operation with the process plants. Then the cooling water outlet temperature of the No. 5 Cells shall reach to the minimum value due to cooling tower max. Approach 2 °C and the VCM plant shall be loaded with 100% Capacity.

The Results Due To Operation Steam Turbine in summer

1. Increase the power plant efficiency From 29.4 % To 44.5 % (58% Excess from total power of gas turbines GT8C,GT9) and available net output power reached to 106 MW at maximum ambient temperature 41 °C (required power 85 MW)
2. Decrease The flue gases temperature outlet from power plant from 515 °C to 160 °C
3. Decrease the consumption of the natural gas (N.G) which is using in gas turbines By 45.5 million Nm³ (350 m³ / MW Equivalent ٤٠ million L.E / year)

