PTC INQ. #06-15

TECHNICAL INQUIRY
PTC 6 – 2004

Subject: PTC 6-2004, Generator Output And Turbine Inlet Steam Flow Guarantee

Background: A contract to supply a turbine generator required the supplier to guarantee the following performance at the design (contract) steam cycle. The steam turbine operates in a reheat-regenerative cycle.

A. Generator Output at MGR, kW: 800,000
B. Steam Flow to Main Stop Valve at MGR, kg/hr: 2,290,000
C. Net Turbine Heat Rate at MGR, kcal/kWh: 1,782

Question #1: Regarding the Code guidelines for performance guarantee of Net Turbine Heat Rate, are there any guidelines in ASME PTC 6 to determine Generator Output (Item A) and Steam Flow to Main Stop Valve (Item B) and compare test results to the guaranteed values?

Answer #1: The three performance items listed above are all related to each other. For a steam turbine in a reheat-regenerative cycle, the ASME PTC 6 Code addresses, in detail, the cases in which heat rate is guaranteed at a specified electrical output. The Code also provides guidance for determining the maximum output capability at a specified opening of the steam admission valves (e.g. at valves wide open) with the corresponding steam flow capacity.

Question #2 For Item A, Generator Output at MGR, is it technically appropriate if we request a turbine generator supplier to guarantee this output (800,000 kW) at a fixed turbine inlet steam flow of 2,290,000 kg/hr. Are there any guidelines in ASME PTC 6 to determine the generator output (at MGR) at a fixed turbine inlet steam flow of 2,290,000 kg/hr in case the steam turbine operates in a reheat-regenerative cycle?

Answer #2: A turbine can also be specified to attain a stated electrical output at a stated throttle flow but in ASME Codes this is recommended for automatic extraction steam turbines or steam turbines operating in combined cycle.
In the case of a reheat-regenerative cycle, PTC 6 does not provide explicit guidance on how to determine the corrected test generator output at a fixed inlet steam flow. An example of a calculation for an automatic extraction steam turbine, however, is shown in Section 10 of ASME PTC 6A. ASME PTC 6.2 for steam turbines operating in combined cycle recommends the use of kilowatt output at a fixed set of reference conditions to determine overall performance of the steam turbine instead of heat rate. This is called Output Performance in ASME PTC 6.2, para 3.1.