Forced-air Cooling System

Forced-air cooling system for industrial steam turbines

GE offers an innovative forced-air cooling system for GE and non-GE turbines, able to improve availability of the unit by reducing the outage duration.

Availability and Flexibility Improvement

Based on a broad experience on Industrial Steam Turbines (ISTs), GE offers a standardized solution for controlled/accelerated unit cool-down, widely applicable to all GE and non-GE fleets and able to achieve cool-down time reduction up to 50%, compared to natural cooling. This solution allows increased availability and flexible outage execution, fulfilling the requirements of modern power generation or industrial plants and helping to ensure the overall unit profitability.

Background

From an operator’s point of view, the time it takes from live steam valves closure to the moment when disassembly activities commence, should be as short as possible. However, the current experience on ISTs shows that the cool-down of the turbine can take up to 3 days.

The common practice of reducing live steam temperature before closing the live steam valves is not always feasible or practical on ISTs because of either unplanned trip events, boiler collector systems, specific industrial processes or outdated boiler technology.

Solution

In order to achieve an accelerated cooling down time improving the unit profitability, GE has developed a mobile and scalable hardware which provides cooling air from the external environment.

Blower skid

The blower skid is assembled on a mobile support which allows to use a single system to provide forced cooling air to different turbines in the plant, if desired. A fan, driven by an electric motor conveys the cooling air, after filtering, into a duct (Fig. 1). The interfaces between skid and turbine inlet are customized by means of flexible hose and flanges.
Analysis
3D FE thermal and structural assessments have been carried out for the steam turbine (Fig. 3) to verify:
- Cool down time
- Avoidance of rotor and blade rubbing
- Mechanical integrity and low cycle fatigue (LCF)

Benefits
- Improvement of overall unit profitability
- Reduced outage duration
  Up to 50% reduction of cool-down time compared to natural cooling.
- Fully mobile solution
  The complete system is assembled on a mobile support which can be lifted at a single point, carried with a fork lift or even pushed on wheels. As a result, one device could be used on different ISTs in the plant.
- Scalable to volumetric cooling flow requirements

Applicability
The forced-air cooling system can be applied to nearly all the medium and large size ISTs, both GE and non-GE technology.