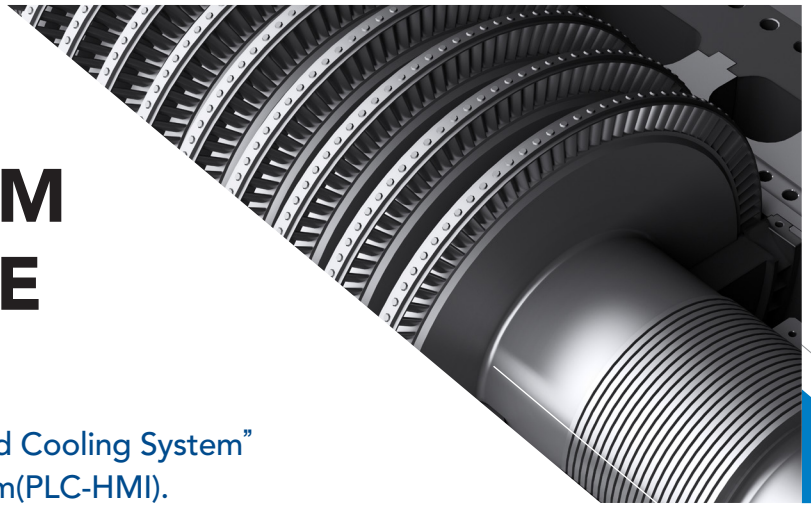
FORCED COOLING SYSTEM FOR HIP TURBINE



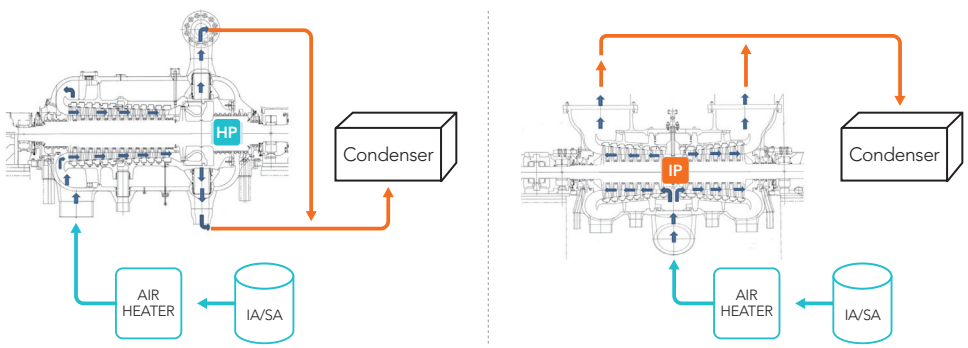
PTS(Power Tech Solution) provides “Forced Cooling System” and Services with automatic control system(PLC-HMI).

We offer so many benefits to our customers. Our highly efficient forced cooling system provides a powerful tool to improve **power plant availability and quickly normalize power plant** in case of emergency turbine work.
This forced cooling system can shorten the cooling time by about **4 to 6 days** compared to natural cooling.

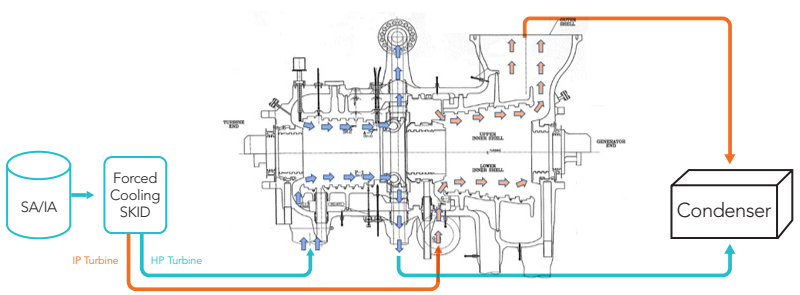
Forced Cooling SKID 3D Model

Forced Cooling System Air Flow Diagram

Forced Cooling Air Path for HP&IP Turbine

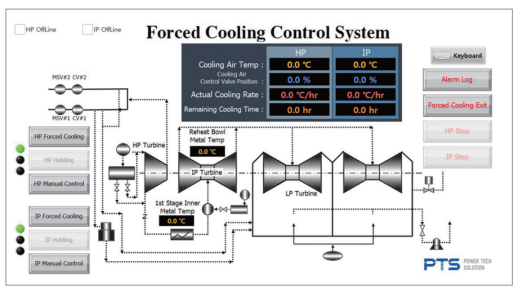


HP&IP Combined Turbine



AUTOMATIC CONTROL SYSTEM

"Forced Cooling System" and
Services with automatic control system(PLC-HMI)

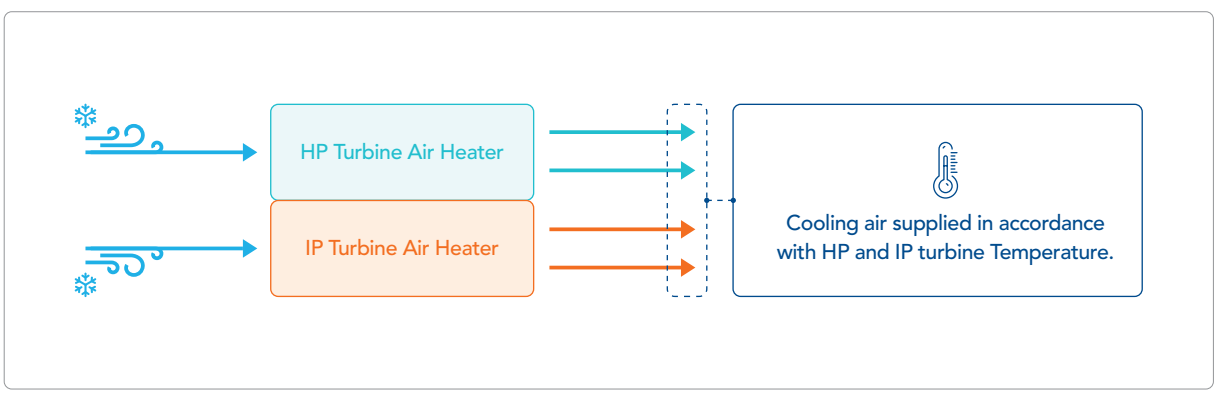


Air Heater Design

Cooling Air Flow

- **HP Turbine:** HP Exhaust(Low Temperature) → HP Inlet (High Temperature)
- **IP Turbine:** IP Inlet (High Temperature) → IP Exhaust (Low Temperature)
  - The cooling airflow can be changed by the turbine manufacturer's design.
    The forced cooling SKIDs have been developed 8 Models according to the capacity of turbine and manufacturer.

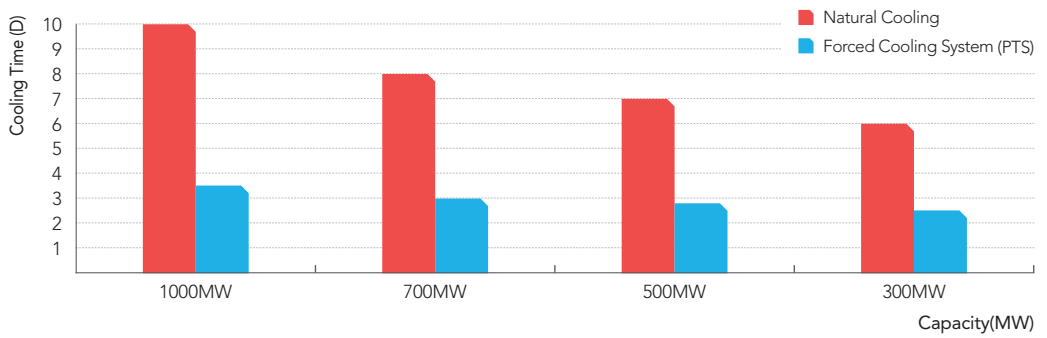
According to the cooling air inlet metal temperature, the cooling air temperature should change as the temperature drops.



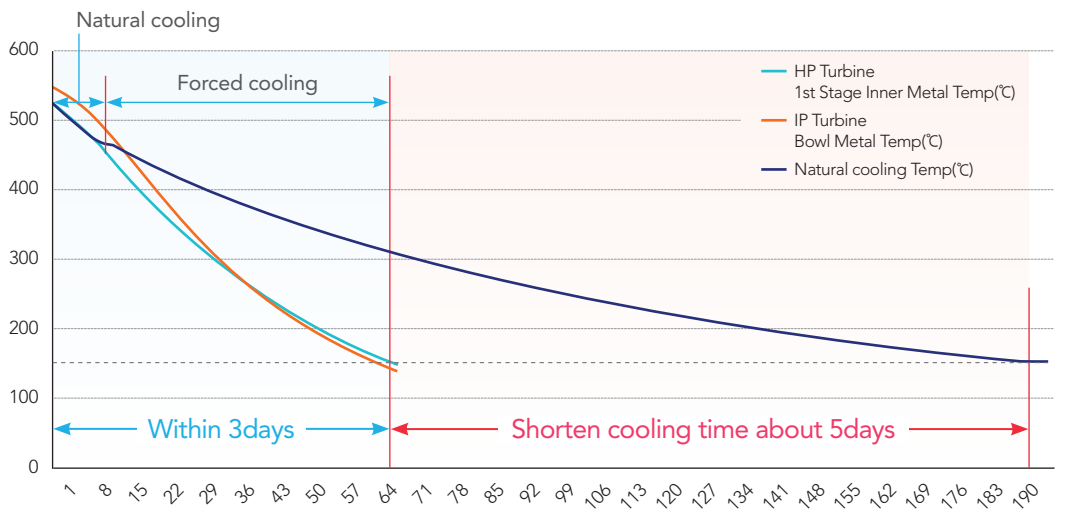
The steam turbine forced cooling system has been developed by PTS and significantly reduces the cooling time compared to the natural cooling time and other existing forced cooling system.

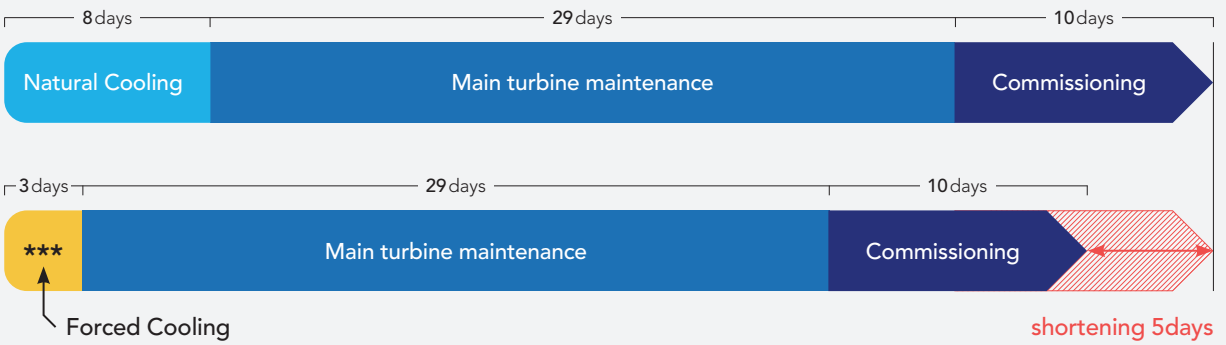
Our highly efficient forced cooling system dramatically reduces the cooling time by 4~6days in case of power plants without any forced cooling system.

Expected Cooling Time

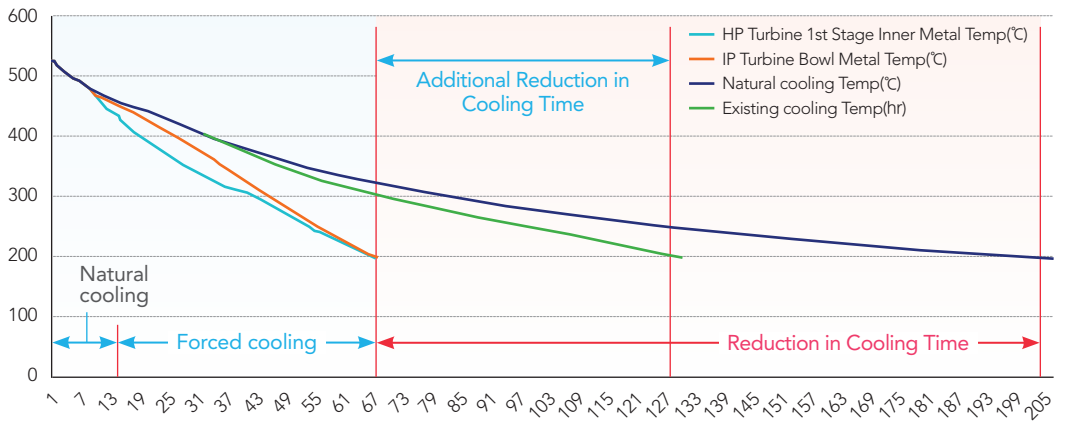


Expected Cooling Curve for HIP Turbine(700MW)

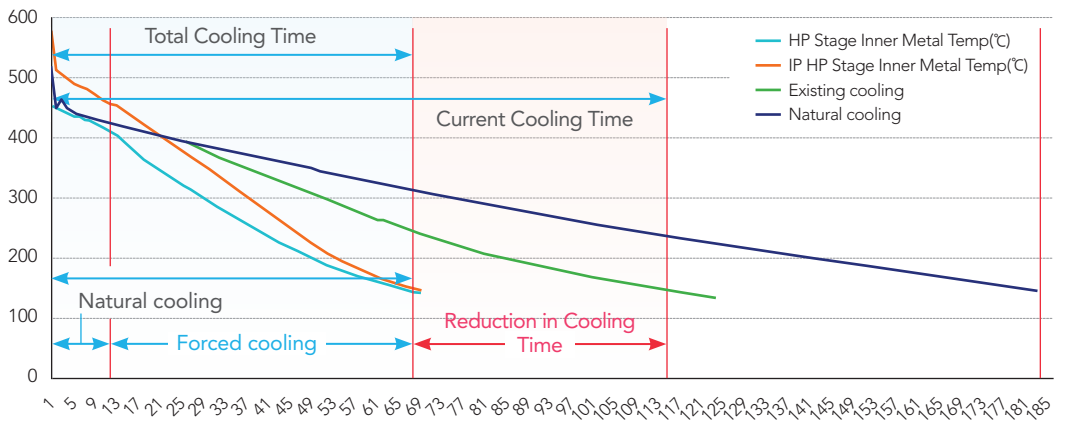




Shin-Boryeong Unit 1 Steam Turbine Cooling Curve



Boryeong Thurmal Power Plant Unit 8 Steam Turbine Cooling Curve



Expected Benefit

- Improving Power Plant Availability
- Saving Aux. Power Consumption
- Fast Recover Emergency Repair

Main Turbine cooling time directly affects overhaul schedule because this is critical path. Improving the availability of power plant can maximize customer profit. The profit may vary with SMP and fuel price.

500MW Class	700MW Class	1,000MW Class
about 500,000USD/day (2,000,000USD/times)	about 700,000USD/day (3,500,000USD/times)	about 1,000,000USD/day (6,000,000USD/times)

Forced Cooling SKID

Forced Cooling SKID

Automatic Control System

MOU FOR TECHNICAL ASSISTANCE AGREEMENT
(PTS - KOMIPO Institue of Technology)

MOU ON Technical Assistance Agreement TPT-PTS

Forced Cooling System Test-Bed Agreement
PTS - Shin-boryeong Power Plant