

# Tight Schedule, Early Delivery

**IMAN SIGIT**  
**SULZER TURBO-**  
**MACHINERY SERVICES**

Power generation companies are often held to a higher reliability standard because of the enormous consequences of delays or failures to provide electricity to the public. When undertaking maintenance and repair activities for utilities, Sulzer Hickham Indonesia is fully in tune with the requirements and needs of these customers, including extensive pre-shut-down contingency planning.

▶ In June 2003, PT Sulzer Hickham Indonesia (PTSHI), a company of Sulzer Turbomachinery Services, received an order to repair three large Japanese-designed steam turbine rotors from a national utility power plant. The single high-pressure (HP) rotor has a tip diameter of 1750 mm (69"), an overall length of 9250 mm (364") and weighs 34 tons. The other two rotors are identical, double-flow low-pressure (LP) rotors, with tip diameters of 3450 mm (136"), overall lengths of 8450 mm (333"), weighing 56 tons each. All the rotors operate at 3000 rpm. The complete unit has operated since 1996. The damage was discovered during a previous

outage, but electrical supply constraints prevented repairs from being performed at that time.

The rotors, generating a combined 600 MW, had suffered a lube-oil-system-related problem and resulting secondary damage. In both of the LP rotors, rotating stages 3 and 4 were severely damaged, as were the bearing journals, oil seal areas, and labyrinth seals. On the HP rotor, only the labyrinth seals were damaged.

## **Extensive Repair after Long Planning**

To meet the customers' required 35-day turn-around, this work had to be planned, prepared, and carried out with great care and effi-



**1** Besides extensive planning and skilled people, large machine tools like this 63-ton lathe are necessary for performing high-quality repairs on big rotors.

ciency. The planning for this service outage began more than one year before the actual outage period. Contingency planning was required to try to account for unknown and unseen damage that might be found during the outage period. Furthermore, PTSHI had to plan to receive the 78-ton generator rotor as well. Coordination planning involved the OEM, the local utility, and PTSHI engineers and technicians. Preparatory activities included the pre-positioning of spare parts and a large portable horizontal boring machine that might be required. Shop team activities were scheduled in extreme detail.

The following work scope was developed, in order to repair these rotors on an emergency 24-hour working basis:

- ▶ Clean, non-destructive test, and measure mechanical run-out for each rotor
- ▶ Hardness test and surface roughness test all bearing journal surfaces on each rotor
- ▶ Replace all labyrinth seal strips on each rotor
- ▶ Remove the minimum material necessary to clean up damaged rotor journals and oil seal areas, by turning on the lathe
- ▶ Replace the blading in stages 3 and 4 of each LP rotor

### Special Lifting and Handling Tools

The mechanical run-out measurements and machining of the rotors was performed in a horizontal lathe that has a 3500 mm swing over the bed plates, a total bed length of 12,500 mm and can accommodate up to 63 tons maximum rotor weight between centers (Fig. 1). PTSHI's special-design lifting and handling tooling gave the customer the additional security of knowing that all the massive rotors could be handled in a safe and efficient manner.

The work scope called for the 3rd- and 4th-stage rotor blades on each of the LP rotors to be machined off, in order to save time. The blade root areas of these rotors were then machined using special fixtures and tooling installed on the large lathe. Following completion of the removal of the labyrinth seal strips and other machining work, each rotor was removed from the large lathe and placed on a pair of electrically driven roller-stands, where the critical re-blading work and installation of the new labyrinth seal strips was performed (Fig. 2). Each rotor was then in turn re-installed in the large lathe, where the new labyrinth seal strips and blade shrouds were machined to size. Final dimensional inspections and

non-destructive testing were performed to certify that required quality standards were met for all work undertaken.

The work was completed five days ahead of schedule. The rotors were returned to the power plant and are back on-line, ensuring trouble-free operation to a highly satisfied customer, who is now talking to PTSHI regarding other repair projects. ◀



**2** Re-blading work on a 56-ton low-pressure steam turbine rotor.

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