POWERTEK

SIDI KRIR GENERATING COMPANY
شركة سيدى كرير لتوليد الكهرباء
(subsidiary of Powertek Energy Sdn. Bhd.)
17 El Ahram Street, Wing A, 8th Floor, Roxi, Heliopolis, Cairo, Egypt
tel +20 2 2414 3640 **fax** +20 2 2414 2986
Issued capital: L.E. 142,402,880
Commercial reg.: 34248 Investment Cairo

Certificate of Completion

Sidi Krir Generating Company "SKGC" (2 x 360 Mw) certifies that ***PESCO for Projects, Contracting and Industry SAE*** has successfully accomplished and completed the following activities through the agreement for the Supply of Technical Manpower for unit 4 Steam Turbine & Generator Major Overhaul carried out by PESCO's professional manpower during SKGC's Unit 4 Major Overhaul from October to December 2020.

and through PESCO's professional manpower during SKGC's Unit 4 Major Overhaul activities:

1. **HIP and LP Turbines Overhaul Work scope:**

1.1. Checks before disassembly of HP/IP and LP Casings

1.1.1. Checks after disassembly of HP/IP and LP casings:

a) Check correct mating of outer and inner casing joint faces.

b) Check radial and axial clearances of steam path and glands.

c) Check diaphragm steps and key clearances.

d) Check position and cantering of diaphragms, diaphragm-carriers and exhaust diffusers.

e) Check for diaphragm deformation in areas subjected to high temperatures (> 420oC).

f) Check the results of Visual inspection, Ultrasonic testing, MPI testing and Dye Penetrant testing, as required, for evidence of scratching, separation/adhesion, cracking etc and advise SK rep.

1.1.2 Checks on HP/IP and LP Rotors (After removal of the rotor from cylinder):

a) Visually inspect rotor from coupling to coupling

b) Check rotor run out.

c) Clean and NDE rotor from coupling to coupling and review the results with actions.

1.1.3 Checks on HP/IP and LP Rotors (During reassembly):

a) All steam path and gland seal clearances, and rotor/casing cantering shall be measured and recorded at casing's reassembly.

b) Check and record bolt-tightening torques during reassembly.

2. **Couplings:**

a) Perform dimensional and visual check of the bores of the coupling bolt holes.

b) Perform dimensional check of coupling bolts.

c) Check rotor alignment during rebuild (also parallelism and concentricity).

d) Check rotor-jacking system with rotors coupled and uncoupled.

e) Check bolt tightening when re-coupling the rotors.

1.2. Bearings and Turning Gear:

1.3. Journal Bearing No 1,2,3 and 4:

a) Check clearance at journal bearings.

b) Check clearances at location of oil baffles.

c) Record condition of the surfaces of journal bearings.

d) Check tightness of keeps at reassembly.

3. **Thrust Bearing:**

a) Check the clearance at the thrust bearing (Float).
b) Inspect the surfaces of the pads. (Ultrasonic Testing and Dye Penetrant Testing).
c) Perform dimensional checks of adjusting shims of the thrust bearing at thrust collar.
d) Check clearances at thrust bearing oil baffles.
e) Perform visual and geometric inspection of thrust bearing collars.
f) Perform geometric inspection of elastic rings (pad support rings).

3.1. Components Mounted inside Pedestals:

a) Check air gaps of over speed and governor speed measurement generators.
b) Check the turning gear.
c) Check the control equipment.
d) Check the shaft line axial displacement pickup.
e) Check the vibration pickups.
f) Check the temperature pickups before reassembly.
g) Check the condition of cables.

3.2 HIP Turbine Valves and Servomotors:

3.2.1 Servomotor - HIP Lower and Upper Stop Valves and Governing Valves (10 Servomotors):

a) Record the functional clearances.
b) Check the straightness of the servomotor spindle.
c) Check the characteristics of the springs.
a) Replace all servomotor seals.
d) Function check after reassembly.

3.2.2 HIP 50% Of Admission Valves (HIP Stop valves) (HIP control valves):

b) Check the total displacement of the steam valve moving parts after removal of the servomotors (stop and governing valves).
c) Check functional clearances of the moving parts.
d) Check the straightness of the valve spindles.
e) Check the pilot valve travel. (stop valves only)
f) Perform visual inspection of stop valve sealing (check for traces of erosion).
g) Check the valve seat attachment systems in their chests.
h) Perform visual and magnetic particle inspection of valve casings in the transition and blend radii within the vicinity of the chest bowl and the drains.
i) Check the sealing surfaces of the covers and lap if required.

3.2.3. HIP and LP Turbine Auxiliaries:

a) Lube oil system pumps, filters and lube oil tank inspection plus oil flushing.
b) Control fluid system pumps, filters and oil tank inspection plus oil flushing.

4. **Generator Overhaul Work Scope:**

4.1 **Stator Water Circuit Draining Then Place Under Vacuum**

a) Removal of braids and neutral bar.
b) Water system draining and vacuum test.
c) Water circuit preservation

4.2 **Generator Mechanical Dismantling**

d) Blind flanges installation on Water and oil circuit Check rotor run out.
e) Disconnection and removal of excitation system.
f) Disassembly of brushed holder.
g) Rotor probe dismantling

4.3 **LP / Generator Shaft Coupling:**

h) Perform dimensional and visual check of the bores of the coupling bolt holes.
i) Perform dimensional check of coupling bolts.
j) Check rotor alignment during rebuild (also parallelism and concentricity).
k) Check rotor-jacking system with rotors coupled and uncoupled.
l) Check bolt tightening when re-coupling the rotors.

4.4 **Generator Rotor Drawing Out:**

a) End shield top half disassembly TS/GS with oil deflectors
b) Bearing 5 & 6 top halves remove
c) Seal oil ring and inner oil deflector top halves remove
d) Removal of H2 Coolers
e) Installing of the rotor lifting device and float the rotor
f) Disassembly of the all-lower parts (bearings, seal oil ring, oil deflectors)"
g) Preparation of rotor removal (installing of the special tools, wire, post, chain block,)"
h) Removal of Rotor
i) Disassembling of H2 Coolers
j) Cleaning of Cooler Tube & Pressure Test

5 **Rotor Works**

a) Rear and Front End Strip down
b) Retaining rings inspection

5.1 **Rotor Gasket Replacement**

a) Replace stalk-bolts seals
b) Remove rotor main lead wedges for NDT
c) Replace rotor bore plug seal
d) Inspect coils and blocks
e) Inspect cooling slots
f) Perform leak test on rotor bore
g) Inspect rotor sub-slots

5.2 **Rotor NDT Test**

a) NDT coil retaining rings
b) Fans
c) Bearings

5.3 **Generator and Rotor electrical tests:**

5.4 **Generator stator radial and lateral wedges removal and reinstatement.**

5.5 **Assembling of Generator:**

a) Install lower stator end shield and lower for rotor insertion (TS/CS)
b) Installation of sling device at CS
c) Installations of inner end baffles / tighten
d) Install fan nozzle
e) Preparation of rotor insertion (installing of the special tools, wire, post, chain block,)
f) Insertion of Rotor
g) Assembling bottom end shield TS/CS with bottom half of bearings 5&6 and support rotor on lifting device
h) Assemble of fan blades CS/TS
i) Assembling of upper stator end shield and cover
j) Assembling of hydrogen seals CS/TS
k) Apply end shield sealant (grooves to be cleaned)
l) Bearing 5&6 top half and oil labyrinth install (install final parts of end shields)
m) Reassembly of Exciter

5.6 **Generator Bearings:**

5.7 **Journal Bearing No. 5 and 6:**

a) Check clearance at journal bearings.

b) Check clearances at location of oil baffles.

c) Check tightness of keeps at reassembly.

d) Check the results of Visual inspection, Ultrasonic testing and Dye Penetrant testing of the bearing white metal, as required, for evidence of scratching, separation/adhesion, cracking etc.

e) Check loading pattern.

It is worth noting that PESCO personnel strictly followed the SKGC's plan for Major Overhaul (Shutdown & Start-Up) activities as well as Health and Safety procedures and instructions of the power plant and completing the outage with zero LTA.

"This Certificate has been issued upon PESCO request without any obligation to the Company."

Best Regards

Ahmed Farouk

Edra Head of O & M

Mohamed Zaghloul

General Manager

Sidi Krir
GENERATING COMPANY
شركة سيدى كرير لتوليد الكهرباء
بطاقة ضريبية رقم: ٢٠٥-١٣٦-٥٣٢ ضرائب الاستثمار
سجل تجارى رقم : ٣٤٢٤٨