Eskom Rotek Industries	NITRIDING SERVICES SCOPE OF WORK	Turbo Gen Services

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1. PURPOSE

The purpose of this document is to define the services needed from a contractor for provision of a reliable, comprehensive and cost-effective **NITRIDING** service to ERI – TGS, Matla and Rosherville Works.

2. CONTEXT FOR NITRIDING SERVICES CONTRACT

According to DIN EN 10052:1994-01, nitriding is defined as the thermo-chemical treatment of a work piece in order to enrich the surface layer with nitrogen. Carbo-nitriding involves enriching the surface layer with nitrogen and carbon. There are three main processes for nitriding. These processes are **gas nitriding, salt bath nitriding, and plasma nitriding.** Note that the contractor should be able to perform all 3 types as could be required at different times.

Matla Works and Rosherville manufactures and refurbishes small, medium and large size turbine components for Eskom Power stations. Matla nor Rosherville works do not possess the capabilities, skill and facilities of nitrinding components. Some of these components include, studs and nuts, bushes, Rotor shafts but not limited to where the expertise of niteriding is required to harden the surface of a steel components for the purpose of **increasing the wear resistance** of a component. The penetration requirement will be depend on the application requested at the time, in cases where deeper surface penetration is required the scope of work will stipulate Liquid nitriding over the gas nitriding...etc

The company should focus on Nitriding services. The service provider should have facilities and equipment that should accommodate components, but not be limited to:

1. Must be able to accommodate diametrical components of Inside and outside diameters up to +700mm.
2. Must be able to accommodate components ranging from a height and length of 150mm to 4m respectively.
3. To machine surface finish required for final machined product is N6
4. Due to size of some of the components, the company must have the facilities to execute the scope both in-situ (Eskom Power Stations and Rotek Workshops), and at their own workshop facilities.
5. The company should be able to supply the correct certification required for our demanding clients.
    a. The contractor should be ISO 9001 certified

EXPECTED MATERIAL LIST

CARBON STEELS	ALLOY MATERIALS	OTHER MATERIALS	STAINLESS STEELS
EN8 (080M40)	21CrMoV 5-7 (1.7709); 13CrMo44(1.7335)	INCONEl	S/S 431
EN9 (070M55)	24CrMo5 (1.7258); 40CrMoV4 – 7	CAST IRON	S/S 410
43A MILD STEEL	15/16Mo3 (1.5415)	ALUMINIUM	S/S 420
EN1A BRIGHT	X35CrMo17 (1.4122); X22CrMoV12 – 1 (1.4923)	BRASS	S/S 316
EN19"T" (709M40)	10CrMo 9 – 10 (1.7380)	AL BROZEN	S/S 304
EN24"T" (817M40)	X20Cr13 (1.4021)	PB1 BRONZE	
EN36B	CX12CrMoS17	LPB1 BRONZE	
EN19, EN 24 ANNEALED	X39CrMo17 – 1; DUREHETE 1055		

3. SCOPE OF WORK

The correct nitriding procedures, specifications, qualifications and inspections need to be carried out. This will require that all staff performing the tasks to be fully qualified and certified in their specific fields for the purpose of nitriding steel(s). Nondestructive testing (NDT) of the finished product and all components will also be required. The final coated product must be a very low rate distortion, tight dimensions, with good surface finishes and low tolerances.

The machining specifications are as follows, but not limited to

- N6 or 0.8 µm Ra surface finish
- ± 0.01 tolerance

The list below shows the variety of components (but not limited to) that require nitriding.

- Cylindrical sleeves/bushes, shafts, hollow shafts, Spindles
- Eccentric Keys
- Volute sleeves
- Valve Seats and modules
- MOP Bearings
- ESV Inserts
- HP Stub Shafts
- Anti-Rotating plates
- Studs and nuts

NB: All material and components for nitriding will be supplied by Works engineering, unless otherwise stated.

It is imperative that whenever an item is sent for nitriding that item will be accompanied with an approved detailed scope of work from either Matla or Rosherville Works engineering department. If the contractor for whatever reason is to receive an unapproved scope from Works engineering, the contractor is to ignore such scope and only execute as per approved scope of work. The scope of work will at least include the following points:

1. Detailed drawing(s) that clearly indicates the area or location where nitriding should be done
2. Signed off memo detailing the work to be carried out. The scope will also indicate the following:
    a. The area on the component to be nitride required
    b. The parent material of the component
    c. Inspection of component before nitriding (pictures to be taken and any noticeable defects recorded and to be reported immediately)
    d. Dimensional inspection and sizes to be recorded before nitriding
    e. Inspection(s) required post nitriding such as NDT and hardness test results, and penetration test.
3. The required surface finish post machining of nitride area
4. Dimensional inspection of the component as indicated on the scope supplied

The following items need to be sent to Works engineering before nitriding commences:

1. Detail Quality control plan (QCP) of the work to be carried out
    a. Approval of the QCP document will give technical go ahead of the scope to be carried out
2. An as received inspection report of the component, immediately upon receipt (pictures indicating any noticeable defects on the components)
    a. A dispatch inspection of each component will be conducted by Eskom Rotek Industries. Note that this inspection report can be compared upon request with the as received inspection conducted by the subcontractor.

NB: An external audit to be conducted by an Eskom Rotek representative will be done before any contract or work is awarded. The audit will determine the capacity and capabilities of the awarded contractor are sufficient to satisfy the requirement discussed above.

REFURBISHMENT AND NITRIDING OF BUSHES

Taking the **example** of **HP Guide insert bushes** which are Level 1 components as per Eskom procedure document No. **240-94068830**. The scope will be as follows:

1. Receive components from site
2. Conduct as received inspection and report any defects found
    a. **Perform surface hardness test before nitriding and share results**.
3. Using provided scope and drawing(s). Compile a PQP/QCP and send to Matla Works engineer for approval
4. Remove any rust or corroded areas before nitride is applied
    a. Ensure a smooth clean surface on area to be nitride
5. Nitride indicated area as indicated on supplied scope of work
6. Perform NDT on component post nitriding.
7. Perform dimensional inspection.
8. Perform **surface hardness testing after nitriding**.
9. Dispatch to site

4. REPORTING

Reporting shall be on weekly basis. Where immediate action is required by Works engineering personnel the Works engineer and/or technician must be informed immediately. All contact information will be provided.

5. SUPPORTING DOCUMENTS

NB: The following documentation must be returned for the purpose of technical evaluation:

a) As received Inspection report
b) Final inspection report
c) NDT Report
d) Hardness test results
e) Material certificate

6. DOCUMENT SUPPORTED BY:

Name	Position	Signature	Date
Phathutshedzo Nemakhavhani	Welding Engineer (Rosherville)		
Phillip Litheko	Matla Works Technician		
Sive Madikida	Matla Works Mechanical Manager		