INSPECTION REPORT

EON RoCa3

Capelle aan den IJssel, the Netherlands

Major Inspection
Turbine S/N: 296470

February / March 2008

Service order number: A72.1679.012

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Thomassen Turbine Systems

AnsaldoEnergia
A Finmeccanica Company

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INTRODUCTION

The gas turbine was stopped on Saturday the 16th of February 2008 for a planned "Major Inspection."
During this inspection the following capital parts were replaced:

- Fuel nozzles primary (new)
- Fuel nozzles secondary (new)
- Liners (refurbished, extender kit)
- Crossfire tubes (refurbished)
- Transition pieces and bullhorns (refurbished, extender kit)
- 1st stage nozzle (refurbished)
- 1st stage buckets (refurbished)
- 1st stage shrouds (refurbished)
- 2nd stage nozzle segments (refurbished with brush seal)
- 2nd stage shrouds (refurbished without honeycomb)
- Radial bearing #1 (new)
- Radial bearing #2 (new)

Meanwhile, the following work was carried out:

- Replacement of lubricating oil filters, hydraulic filters, hydraulic filters for servo valves.
- Renewal of flex seals of exhaust casing.
- Alignment check GT ⇔ Generator.
- Alignment check Accessory Gearbox ⇔ GT.
- Renewal and modification of exhaust thermocouples.
- Inspection of bleed valves.
- Disassembly of lower half of inner barrel for high pressure brush seal replacement.
- Machining of casing slots for EGV's and S17 blades (by client).

The slow-roll was started on Saturday the 29th of March and subsequently fired up on Tuesday the 1st of April.
The emissions and the dynamic pressures were measured at base load the day after, in order to find the optimum position of the splitter valve.
After the measuring instruments were removed on Thursday the 3rd of April, the machine went into full commercial operation.

NAMEPLATE INFORMATION

Turbine:	MS9001E
Rating:	130790 kW (Gas) @ 5 degrees C
Serial Number:	296470
Fired hours	95472,6
Fired starts	329
Starting Motor:	E – motor Holec Ridderkerk
Rating:	1420 kW @ 10kV
Type:	1K 162 HB -02
Serial Number:	1 – 6130 – 1 / B1
Acc. Gearbox:	BHS - Voith
Type:	A 919
Serial Number:	516 373
Generator:	ABB
Rating:	168750 kVA @ 3000 rpm
Type:	WY 21Z - 092 LLT
Serial Number:	215 650

DAILY ACTIVITIES

Manpower:
During nearly the whole time of the overhaul, the basic Voith/DIW crew consisted of 10 technicians in dayshift, 8 technicians in nightshift, sometimes supplemented by 2 electricians in dayshift.
A crew of Wagenborg/Nedlift was present during the 1st week of the overhaul for disassembly of inlet ducting, ventilation ducting and rooftop and during the last week of the job for re-assembly of it.

Monday, 18th of Feb. 2008:

Dayshift
Before the actual work started around 10.00, there was a safety induction.

- Preparations for the actual work, like installation of scaffolding, floorplates and removal of sidewall panels.
- Disassembly of flexible gas lines. (bottom half)
- Disassembly of secondary fuel nozzles. (bottom half)
- Disassembly of combustion chamber covers. (bottom half)
- Removal of internal wall between load coupling and generator.
- Removal of cooling water tubes for flamedetector cooling.
- Disassembly of accessory coupling cover.
- Wagenborg/Nedlift activities on the rooftop.

Nightshift

- Disassembly of the 7 combustion chambers in bottom half with flow sleeves, liners and crossfire tubes.
- Disassembly of accessory coupling.
- Installation of alignment fixture at accessory gearbox flange.
- Punch marks were made in the 7 disassembled flow sleeves for marking of the position of the 13 mm holes for the dynamic measuring probes.
- An attempt was made to loosen the bolts of the load coupling at the generator side with the special hydraulic tool at a pressure of 1200 bar. This didn't succeed.

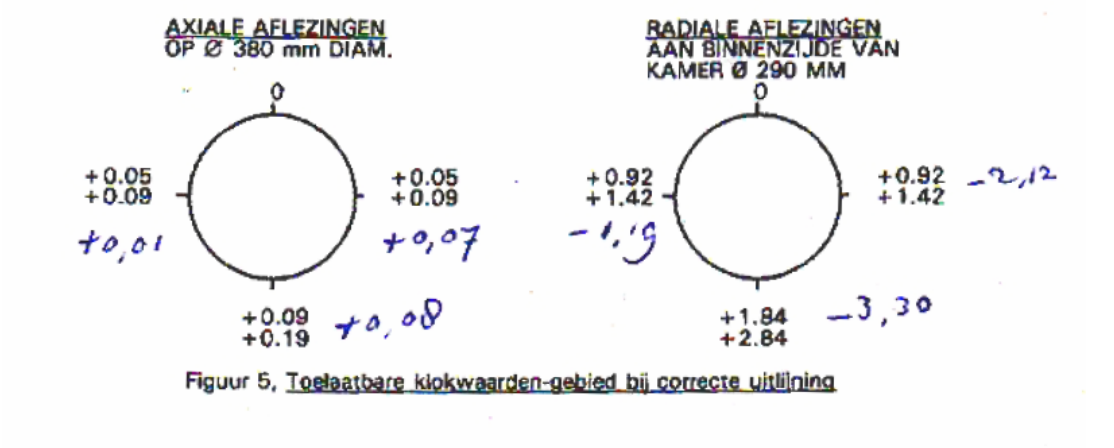
Tuesday, 19th of Feb. 2008:

Dayshift

- Scaffolding platforms were being built at either side of the compressor splitline.
- The dowel pins and bolts of the upper half of the turbine casing were removed and every other bolt was loosened.
- Disassembly of remaining flexible gas lines.
- Disassembly of remaining secondary fuel nozzles and covers.
- Installation of temporary turbine support underneath bellmouth.
-
- Wagenborg/Nedlift activities on the rooftop.

Nightshift

- Disassembly of remaining liners and crossfire tubes.
- Disassembly of the remaining flow sleeves, except the ones of chamber #13 and #14, which couldn't be removed yet, because of obstructing piping.
- The transition pieces were partially removed.
- The alignment was measured between accessory gearbox and gasturbine. (see actual written readings below)



Figuur 5, Toelaatbare klokwaarden-gebied bij correcte uitlijning

- The alignment fixture was removed again.
- A lot of bolts were removed out of piping flanges. The piping itself could not be lifted out yet, because the roof was still closed.
- A start was made with unbolting the combustion wrapper, but the Hytorc failed shortly after using it.

Wednesday, 20th of Feb. 2008:

Dayshift

- Another Hytorc was brought from Rheden.
- Scaffolding was built inside the inlet plenum for the inspection of the IGV's.
- Wagenborg/Nedlift was still working on the rooftop, so the crane could still not be used inside the acoustical package.
- Unbolting of casings was ongoing. This was done at every other bolt, because the temporary supports could not be installed yet.
- The IGV's were forced to a 90 degree angle for the measurement of the IGV clearances.
- Wagenborg/Nedlift activities on the rooftop.
- Cleaning of combustion chambers.

Nightshift

- All bolts were removed out of the load coupling flange at generator side.
- Cooling and sealing air piping was lifted from the machine.
- Measuring of x1 and x2 clearances of IGV's.
- Disassembly of the last 2 flow sleeves.

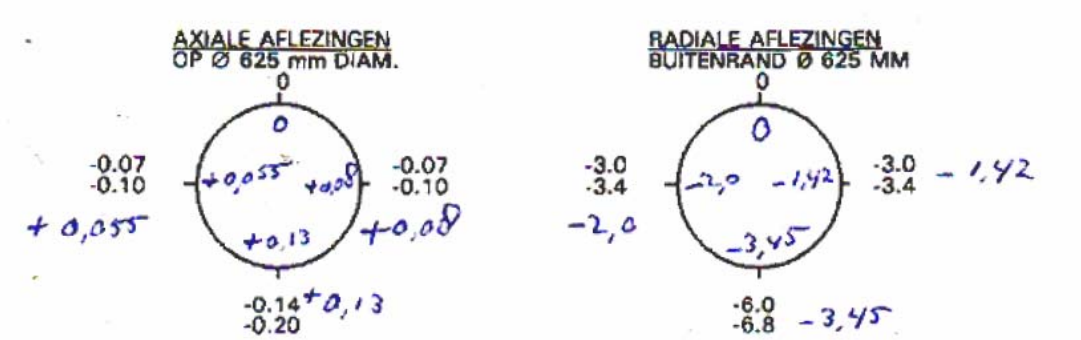
Thursday, 21st of Feb. 2008:

Dayshift

- Disassembly of remaining big bore piping on the machine.
- Preparations for measurements of the rotor position.
- The accessory coupling was temporary installed, because the rotor turning device had to be attached to it.
- Disassembly of bolts out of combustion wrapper flanges.
- The rotor position was measured at the 1st stage compressor blades with feeler gauges.
- Wagenborg/Nedlift finished its disassembly activities.

Nightshift

- The rotor position was measured. (see inspection forms)
- The alignment was measured between gasturbine and generator. The axial measurements were done with measuring wedges and are the averages of 4 measurements. (see written readings below)



Figuur 3, Toelaatbare klokwaarden-gebied bij correcte uitlijning
(Doorzakking hoofdkoppeling is in meetwaarden verwerkt)

- Disassembly of the remaining piping.
- Disassembly of bolts out of the vertical splitlines of wrapper / CDC ,wrapper / turbine casing, compressor after casing / CDC and compressor forward casing / inlet bellmouth.

Friday, 22nd of Feb. 2008:

Dayshift

- The disassembled liners were inspected.
- The special tools for the disassembly of bearing #3 were installed.
- All remaining wrapper bolts were removed.
- All x1 and x2 clearances were measured of the IGV's, while forcing the IGV's each to the outward position. The inner bushing clearance was measured and it was noticed that IGV #38 had an excessive bushing clearance of 1,37mm. In cooperation with the client it was decided to remove the air inlet bellmouth in order to disassemble the "L" segments with the inner bushings as far as possible to the bottom of the machine.

Measuring of inner bushing clearances of IGV's

- All turbine support jacks were installed and jacked onto the casings.

Nightshift

- The wrapper was lifted from the machine.
- The compressor forward and after casing were lifted from the machine.
- The last 5 transition pieces were removed.
- Unbolting of air inlet bellmouth.

Saturday, 23rd of Feb. 2008:

Dayshift (50% manpower)
Scaffolding was built upon request for the disassembly of the rear wall of the air inlet plenum. The platforms were approved for usage at around 11.00.

- Removal of bolts and dowel pins from horizontal joints of the turbine casing.
- removal of bolts and dowel pins from horizontal and vertical joints of compressor discharge casing (CDC).
- Unbolting of inlet bellmouth.
- Holes were drilled in the horizontal flange of the after wall of the air inlet plenum for the fixation of lifting eyes.

Nightshift (50% manpower)

- The upper part of the after wall of of the air inlet plenum was removed.
- The upper part of the inlet cone was removed.
- The last bolts were removed out of the flanges of the CDC.
- The manhole was removed for access inside the exhaust diffusor.

Sunday, 24th of Feb. 2008:
No activities.

Monday, 25th of Feb. 2008:

Dayshift

- Disassembly of last bolts of turbine casing.
- Disassembly of after wall of air inlet plenum.
- Disassembly of upper half of inlet bellmouth.
- Disasembly of lower half of rub ring.
- Removal of “L” segments for inner bushings of IGV’s in lower half.
- Disassembly of upper half of CDC (compressor discharge casing).
- Inspection of disassembled crossfire tubes and crossfire tube retainers.

Nightshift

- The CDC was brought to the other turbine hall and turned onto its after flange.
- Disassembly of upper half of the turbine casing.
- Disassembly of upper half of inner barrel.
- The insulation packs of bearing #2 were disassembled.
- The IGV’s were partially removed out of the bottom half.
- The splitline bolts of the 1st stage nozzle were disassembled.

Tuesday, 26th of Feb. 2008:

Dayshift

- The remaining IGV's were removed from the bottom half.
- The upper half and lower half of the 1st stage nozzle were disassembled.
- The upper half of the nozzle support ring was disasembled.
- The bearing cap of bearing #3 was removed.

Removal of bearing cap of bearing #3

- The nozzle segments were partially removed out of the upper half of the turbine casing.

Nightshift

- All 2nd and 3rd stage nozzle segments were removed from the upper half of the turbine casing.
- All 1st and 2nd stage shrouds were removed from the upper half of the turbine casing.
- The turbine and compressor clearances were measured.
- The IGV's were removed from the upper half of the bellmouth.
- The rotor bump check was done to determine the axial float of the rotor before opening of the thrust bearings. The float was 0,46mm.

Wednesday, 27th of Feb. 2008:

Dayshift

- The upper half of tilting pad bearing #3 was removed.
- Disassembly of nozzle segments and shrouds from bottom half.
- Cleaning of removed IGV's.

Nightshift

- The old "chemloy" bushings were removed out of the "L" segments.
- The IGV's were cleaned and inspected.
- All outer bushings of the IGV's were removed from the upper half of the bellmouth.
- Disassembly of nozzle segments and shrouds from bottom half.

Thursday, 28th of Feb. 2008:

Dayshift

- The rotor was temporary supported at bearing #3 with a securable hydraulic jack and the bottom half of tilting pad bearing #3 was removed.
- All outer bushings of the IGV's were removed from the lower half
- Disassembly of nozzle segments and shrouds from bottom half.
- The compressor rotor blades were inspected for excessive blade rock. All the blades were within lmits.
- EON checked the IGV's with dye penetrant. Only some of the IGV's were checked.
- The lower half of bearing #3 was removed and inspected. This was done visual and ultrasonic. No abnormalities or excessive wear were observed, so the lower half was re-installed after cleaning.

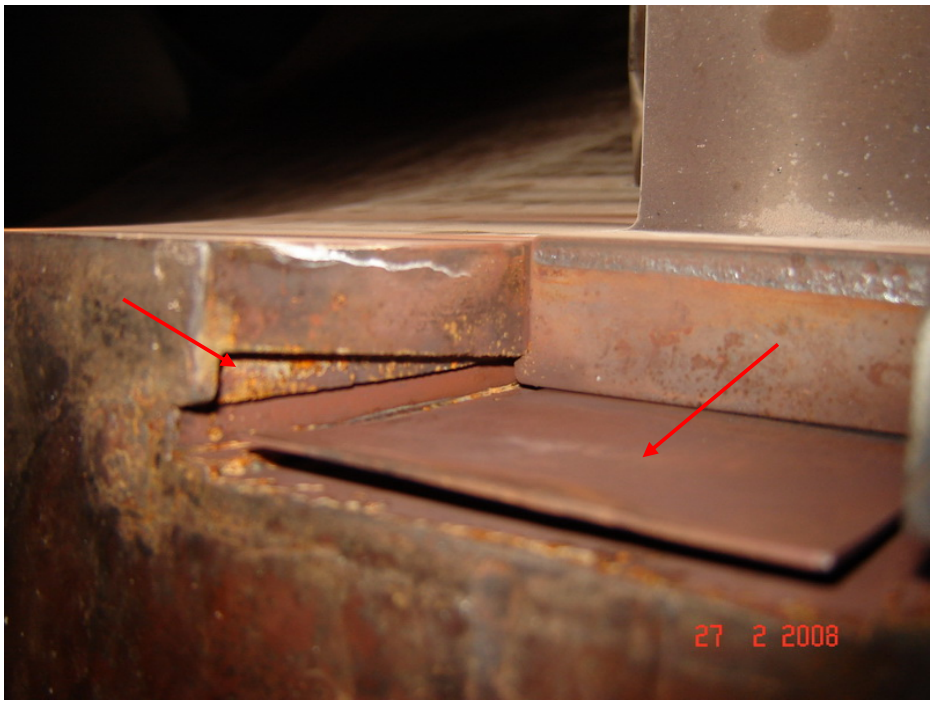
Nightshift

- Disassembly of nozzle segments and shrouds from bottom half.
- Disassembly of 1st stage buckets.
- Cleaning activities.

Friday, 29th of Feb. 2008:

Dayshift

- Disassembly of nozzle segments and shrouds from bottom half.
- Disassembly of S17 blades and EGVs from bottom half. It was noticed that the slots in the casing for the EGV's were heavily damaged and had some kind of saw teeth pattern (see photograph). This was an old problem that had worsened over the years and had temporary been solved by installing radial shims to put inward pressure on the EGV's



Damage slot for EGV's and formerly installed shim plate

- The top half of tilting pad bearing #3 was installed. The rotor was lifted and moved 1,20 mm inside the bearing.
- Cleaning and inspection of IGV's.
- The oil drain of bearing #2 was loosened, because of loose bolts and lockplates underneath bearing #2 inside the wrapper.

Nightshift

- Disassembly of all 1st stage buckets and seal pins.
- Unlocking of twistlocks of 3rd stage buckets.
- Drilling, tapping and putting of helicoils in boltholes.
- Assembly of all "chemloy" bushings inside "L" segments.
- Assembly of all outer bushings of IGV's in upper half.

Saturday, 1st of March 2008:

Dayshift (50% manpower)

- Bearing #3 was lifted again inside the bearing to check for vertical clearance together with the client. The measured clearance was 1,14mm.
- Assembly of IGV's in upper half of bellmouth.
- Unlocking of twistlocks of 3rd stage buckets.

Nightshift (50% manpower)

- The 3rd stage buckets were disassembled from the rotor, to have access for the repair of the flex seals inside the exhaust casing.
- Cleaning activities.

Sunday, 2nd of March 2008:

No activities.

Monday, 3rd of March 2008:

Dayshift

- Visual inspection of flexible gas lines. Inspection inside by means of borescope.
- Fabrication of plywood tools for removal of bottom half of inner barrel.

Fabrication of plywood tools for removal of bottom half of inner barrel

- Disassembly of flex seals from exhaust casing.
- Cleaning of IGV's and bellmouth.
- Repair of oil drain bearing #2.

Nightshift

- Disassembly of flex seals from exhaust casing.
- Assembly of IGV's in upper half of bellmouth.
- Fabrication and assembly of disassembly tools for removal of lower half of inner barrel. The barrel had t be turned around the shaft.
- Cleaning activities.

Tuesday, 4th of March 2008:

Dayshift

- The lower half of the inner barrel was disassembled for the inspection and removal of the high pressure brush seal.

Removal of lower half of inner barrel

- The bearing cap of bearing #1 was disassembled.
- Visual inspection of flexible gas lines. Inspection inside by means of borescope.
- The "L" segments were installed in the lower half.
- Cleaning activities.

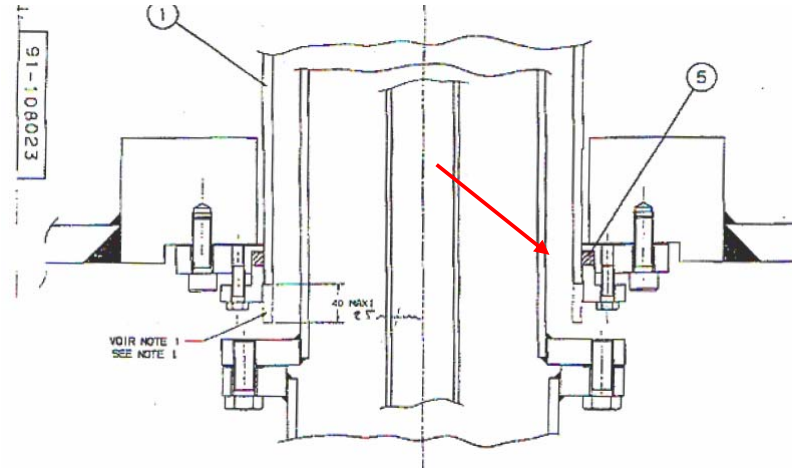
Nightshift

- The vertical clearances were measured of the rotor inside the bearings. Bearing #1 => 0,61 mm and bearing #2 => 0,98 mm.
- The bearing clamp of bearing #2 was disassembled.
- The upper half of bearing #2 was removed.
- The upper half of radial bearing #1 was removed.
- Cleaning activities.

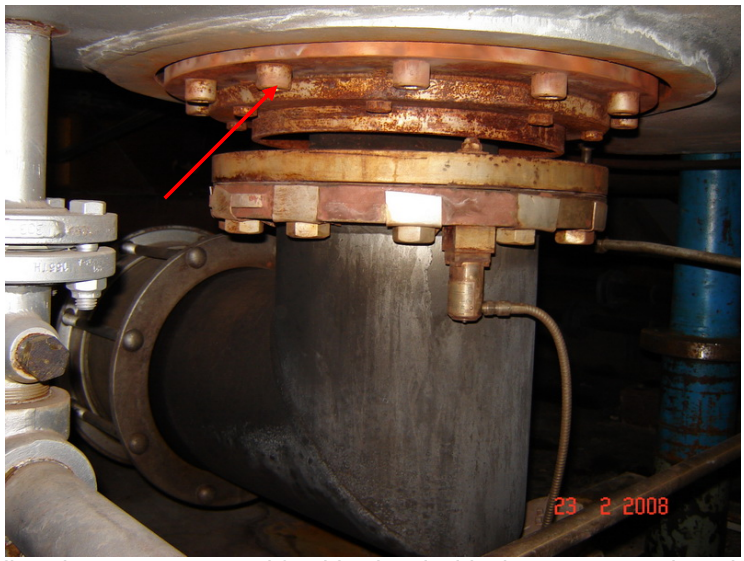
Wednesday, 5th of March 2008:

Dayshift

- The remaining EGV's and S17 blades were removed out of the lower half.
- Repair of oil drain bearing #2. There was no gland seal, where the drain pipe of bearing #2 was passing through the bottom of the wrapper. New bolts, lockplates and gaskets were installed as well as a gland seal, made of packing rope. (see picture below)



Packing rope was installed at position 5



All gaskets were renewed for this pipe, inside the wrapper and outside

- Visual inspection of flexible gas lines. Inspection inside by means of borescope.
- The flex seals for the exhaust casing arrived on site around 16.00
- The labyrinth clearances were measured at bearing #1 and #2.

- Cleaning activities.

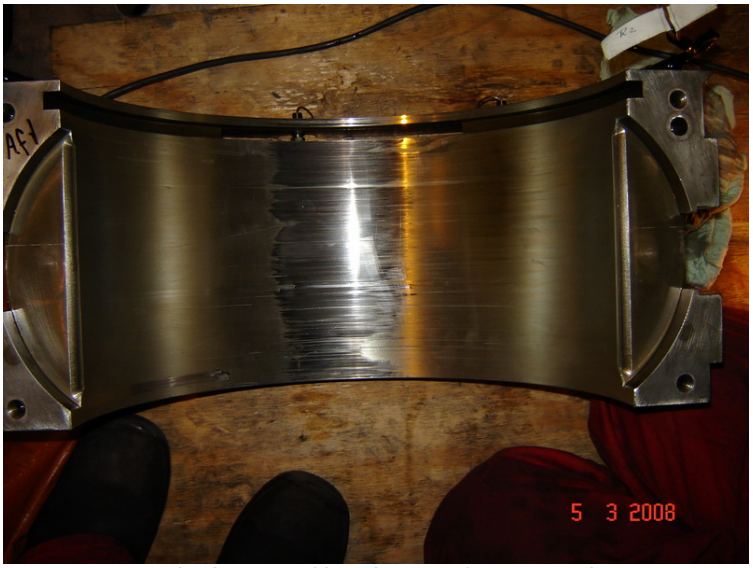
Nightshift

- The thrust shim for the flex plates of the exhaust casing was grinded off.
- Disassembly of S17 and EGV's from upper half.
- Drilling out sheared off bolts in casing.
- Assembly of refurbished 1st stage shrouds in upper half.
- Cleaning activities.

Thursday,6th of March 2008:

Dayshift

- The lower half of bearing #1 was removed for inspection. The rotor was lifted by crane and supported by the slipring. The client was advised to replace the bearing or repair the babbitt. EON inspected the bearing with dye penetrant and by means of ultrasonic testing. No replacement bearing was available on a short notice, so the lower half was re-installed to be able to rotate the shaft.



The bottom of bearing #1 after removal

- The S17 blades and EGV's from the upper half were cleaned and inspected.
- The new flex plates were installed inside the exhaust casing.
- Ongoing work on bearing #2 drain.
- The new brush seals for bearing #2 were inspected. They were both for the same direction of rotation, so one set was not suitable, as they have to be mirror view.
- The packing gasket of the outer crossfire tubes in the upper half were renewed.
- Cleaning activities.

Nightshift

- Assembly of 2nd stage shrouds in upper casing.
- Assembly of 2nd stage nozzle segments in upper casing.
- Assembly of 3rd stage nozzle segments in upper casing.
- The thrust shim for the flex seals of the exhaust casing was installed.
- Bearing #1 was measured.
- Cleaning activities.

Friday, 7th of March 2008:

Dayshift

- Final assembly of drain line of bearing #2.
- Final assembly of flex seals in exhaust casing.
- Cleaning activities.

Nightshift

- Bearing #1 was re-installed, because the decision was taken that it would not be repaired. Instead a new bearing would be brought from another EON plant in Germany. The bearing had to be temporary installed in order to be able to turn the rotor.
- Assembly of 1st stage shrouds in lower half.
- Assembly of 2nd stage shrouds in lower half (partially).
- The old seal pins were glued inside the 3rd stage buckets and the serial numbers were checked against the weight chart of 2004.

Saturday, 8th of March 2008:

Dayshift (50% manpower)

- Assembly of 2nd stage shrouds.
- Assembly of bearing cap of bearing #3. Before final bolting, the clearance between cap and bearing was measured with lead wire. A 0,50 mm shim was placed underneath the bearing cap. The clearance between cap and bearing was measured => Forward: 0,56 mm / After: 0,56 mm.
- The refurbished 2nd stage nozzle segments with new diaphragm brush seals were partially installed.
- The old twistlocks of the 2nd stage buckets (not removed) were inspected. They had not been nicely staked during 2004 overhaul. None of the twistlocks had moved or damaged further.
- The welder B. Stienezen of TTS finished the installation of the flex seals inside the exhaust casing. He re-assembled the piece of half pipe, which had been removed to be able to disassemble the flex plates.


Welding of the disassembled piece and detail of the installed new flex seal

Nightshift (50% manpower)

- Final assembly of 2nd stage nozzle segments in lower half.
- Disassembly of tools for bearing cover #3.
- The refurbished 1st stage buckets were installed according to weight chart and with new seal pins and lock pins.
- Cleaning activities.

Sunday, 9th of March 2008:

No activities.

Monday, 10th of March 2008:

Dayshift

- The bolts of the bearing cap of bearing #3 were tightened to torque and secured.
- Assembly of 3rd stage buckets.
- New thermocouples were glued in the new bearing #2 with araldite.
- Cleaning activities.

Nightshift

- The refurbished 1st stage nozzle ring was built together on the ground and the out of ellepticity of the nozzle was measured.
- Final assembly of 3rd stage buckets. The twistlocks were not staked yet.
- The 13 mm holes for the dynamic pressure sensors were drilled in the refurbished flow sleeves. The flow sleeves had been brought to the Elbar workshop for the replacement of the liner stops.

A newly drilled holes for the dynamic pressure probe

Tuesday, 11th of March 2008:

Dayshift

- Renewal of various filter elements (lubricating oil / hydraulic oil / hydr. servo filters). Cleaning of porostone instrument air filters.
- The refurbished transition pieces were fitted on the nozzle ring to check the sizes. Some of the floating seals of the picture frame had to be shortened a little in order to fit.
- The bullhorns were fitted onto the refurbished transition pieces. Some of the bullhorns were not fitting. Therefore some material was lightly grinded off from the hard metal facing of the bullhorns.

Fitting of transition pieces on the nozzle

Detail of a lightly grinded hard metal facing

- Assembly of 3rd stage shrouds in lower half (partially).
- The 4 bleed valves were visually inspected and functionally tested with air pressure.
- The lower 2 bleed valves were re-installed with new spiral wound gaskets. Because the studbolts were a little too long for the selflocking part of the nuts, they were secured with Loctite studlock.
- Cleaning activities.

The client decided that they would machine the slots for the EGV's themselves on site, because the didn't want to wait for a time consuming proposal from TTS.

Nightshift

- Assembly of 3rd stage shrouds and nozzles in the lower half.
- About 50% of the twistlocks of the 3rd stage buckets were staked. A special tool was made for this staking, after the first attempts with a chisel were not very successful.

Special twistlock staking tool

- The refurbished transition pieces were made to fit on the refurbished nozzle.
- The 1st stage nozzle halves were disengaged again.

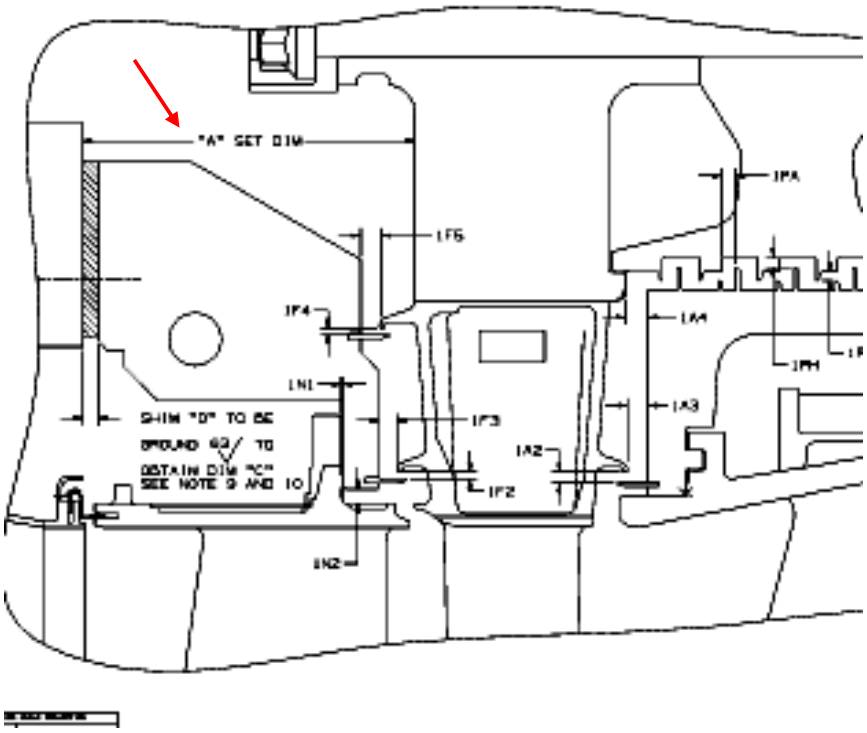
Wednesday, 12th of March 2008:

Dayshift

- A new "E" seal between nozzle retaining ring and 1st stage shrouds was glued in the lower half.
- The lower half of the 1st stage nozzle ring was installed.
- The remaining twistlocks of the 3rd stage buckets were staked.
- Renewal of oil filters.

Nightshift

- The rotor float was measured several times and was at average 0,60 mm.
- The “A” measure was measured for the rotor position according to the new method and was 258,60 mm. (see below)



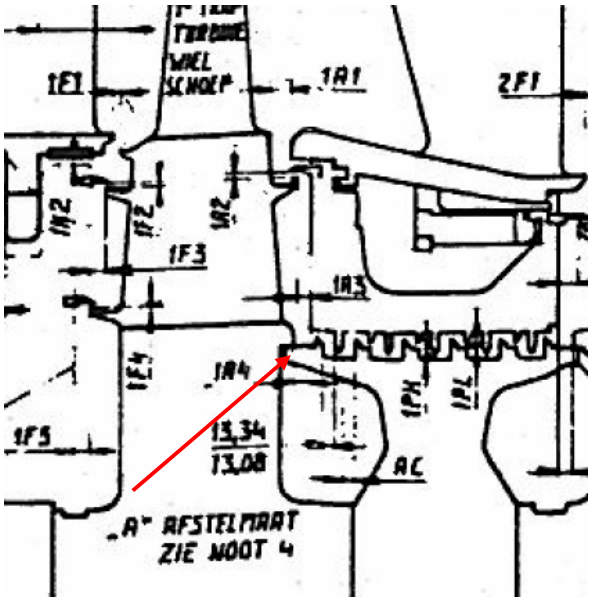
The “A” set dimension according to the new method (tolerances: 260,15 mm – 260,66 mm)

- The upper half of the 1st stage nozzle ring was fitted.
- The Nozzle ring was centred in the machine. The height was OK with the old shims, taking the ellepticity into account.
- The turbine closing clearances were measured.

Thursday, 13th of March 2008:

Dayshift

- The rotor position "A" set dimension was also measured according to the old method and compared with the values in the clearance diagram. The measured value was 13,70 mm. (see below)



The "A" set value according to the old method (tolerances 13,08 mm – 13,34 mm)

- It was discussed with the client and TTS engineering whether or not the twistlocks of the 3rd stage should be renewed, because of bad staking. The decision was taken the day after to remove the 3rd stage buckets again and re-install new twistlocks.
- The axial position of the rotor was discussed and in cooperation with P. Remy of EON the decision was taken not to change the thrust shims and leave the rotr position as found.
- The rub ring was installed in the lower half.
- The upper half of the bellmouth was temporary installed.
- The new bearing #1 and brush seal for bearing #2 arrived around 16.00 on site.
- Renewal of oil filters.
- Cleaning activities.

Nightshift

- The transition pieces were installed in the lower half.
- The IGV rack was set to the 90 degree open position and a start was made with the installation of the new IGV gearwheels.
- Cleaning activities.

Friday, 14th of March 2008:

Dayshift

- Assembly of new IGV gearwheels
- The bottom half of new Bearing #2 was turned around the rotor underneath the journal.

The special bridge piece for supporting the rotor at bearing #2 was too weak. The crane was also used for extra support.

- Cleaning activities.
- The opening force was checked of all 6 implosion doors inside the air intake filter house. The opening forces were between 139 kgf. and 160 kgf.

Nightshift

- Assembly of new IGV gearwheels.
- The 3rd stage nozzle segments and shrouds were removed again from the lower half in order to replace the twistlocks.

Saturday, 15th of March 2008:

Dayshift (50% manpower)

- The twistlocks were unlocked and the 3rd stage buckets were moved out again.
- Assembly of new IGV gearwheels.
- Cleaning activities.

Nightshift (50% manpower)

- The 3rd stage buckets and twistlocks were removed from the rotor.
- Cleaning of rotor disc at 3rd stage bucket slots.
- Assembly of IGV gearwheels.
- Disassembly of bellmouth upper half.

Sunday, 16th of March 2008:

No activities.

Monday, 17th of March 2008:

Dayshift

- The clearance was measured between the bearing strap of bearing #2 and the bearing, by means of lead wire. With 0,50 mm shim underneath the strap, the lead wire measure was 0,60 mm.
- The bottom half of bearing #1 was removed.
- In the new bearing there were no holes for the thermocouple wire, so these had to be drilled in the workshop.

Drilling of hole in the new bearing for the thermocouple wire

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- The staking grooves in the 3rd stage rotor disc was blended and checked by dye penetrant.
- The client was installing the EGV's in the upper casing, after machining the slots.
- Cleaning activities.

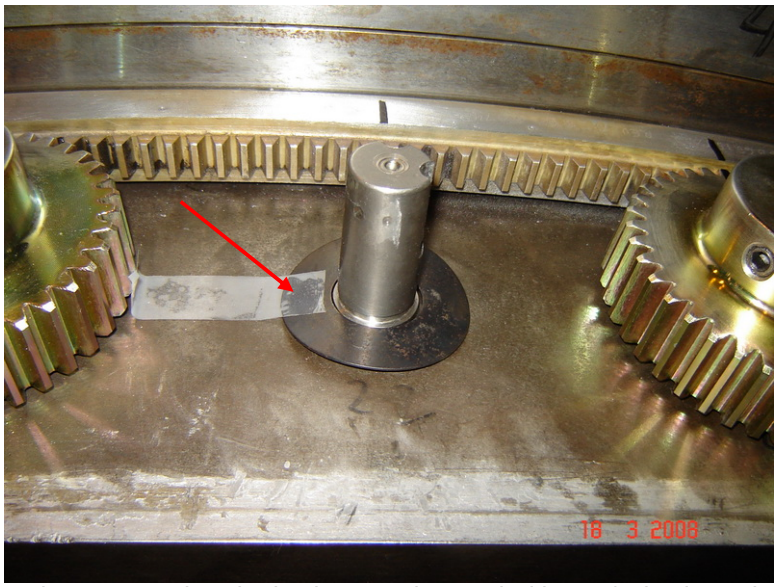
Nightshift

- The vertical bearing clearance was measured of bearing #2 and was 0,72 mm.
- The 3rd stage buckets were assembled to the rotor again with new twistlocks.
- Bearing #2 was fully assembled.

Tuesday, 18th of March 2008:

Dayshift

- The twistlocks of the 3rd stage buckets were partially staked.
- EON was installing the EGV's in the lower casing.
- Bearing #1 was installed with the old active thrust bearing and new thermocouples.
- It was noticed that the IGV's were not fully spring loaded to the outside against the thrust washer. After investigation it turned out that according to a GE TIL 1132-2Rev1 of 2004, the cup springs had to be installed with the cups facing inward. This was in contradiction with the formerly used GE TIL 1132-2, where the cup had to be fitted facing outward.



These cup springs had to be turned around with cup facing inward

Nightshift

- The lead wire check was done on bearing #1 with a 0,50 mm shim. The measured value of the wire was 0,62 mm.
- The old inactive thrust bearing was installed with new thermocouples.
- Bearing #1 was fully assembled.
- The cup spring of the IGV's were turned around in the upper half.
- All twistlocks were staked of the 3rd stage buckets.
- Cleaning activities.

Wednesday, 19th of March 2008:

Dayshift

- The cup springs of the IGV's were turned around in the bottom half.
- The staking of the twistlocks of the 3rd stage was inspected and approved.
- The 3rd stage shrouds and nozzle segments were re-installed in the lower half.
- The bolts of bearing cap #1 were tightened to torque.
- EON was still working on the installation of the S17 blades and EGV's in the lower half (this was finished around 15.00).

Nightshift

- Assembly of bellmouth upper half.
- Assembly of compressor forward and after casing upper half.
- Assembly of gear rack of IGV's and installation of angle indicator.
- Assembly of operating link between hydraulic cylinder and rack.
- The inlet cone was fitted on the front side of the bellmouth.
- It was noticed by borescope that one shim of the S1 stator blades was protruding into the flow path in the bottom half of the compressor.

This shim was protruding into the flow path.

Thursday, 20th of March 2008:

Dayshift

- The after wall of the inlet plenum was installed.
- All bolts of bellmouth and compressor casings were tightened to torque.
- The tool for the installation of the lower half of the inner barrel was built up.
- The shim n the bottom half of the compressor, which was protruding into the flow path got 2 tack welds to secure it (se picture).

two tack welds were made to secure the protruding shim

- The lower half of the inner barrel was installed without the high pressure brush seal. After consulting TTS engineering it was decided to secure the brush seal segments only in the upper half and not in the lower half.

Nightshift

- The “E” seal was installed in the turbine upper casing.
- The upper half of the turbine casing was installed.
- The dowel pins and bolts were installed for fixation of the lower half of the inner barrel.
- The expansion joint around the bellmouth was bolted up.

Friday, 21st of March 2008:

Dayshift

- The upper after wall of the inlet plenum was installed.
- The new high pressure brush seals were installed inside the upper and lower half of the inner barrel. In the lower half the segments were not locked any more, to make it easier to change them out next time.
- assembly of upper half of inner barrel.
- All installed bolts of the turbine casing were tightened to torque.
- The CDC was turned in the horizontal position and brought to the turbine area.
- The fuel nozzles arrived around 19.00 from TTS, where they had been brought for flow testing.

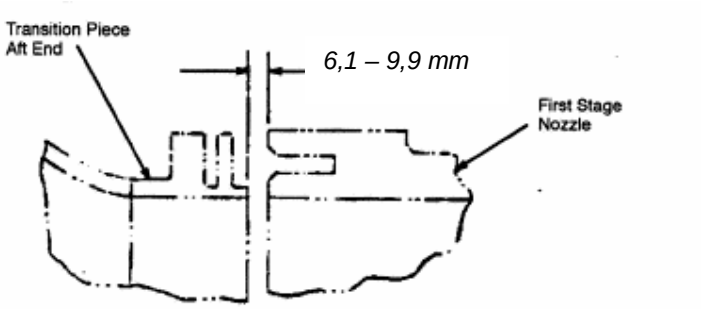
Nightshift

- The counter bore plugs in the boltholes of the inner barrel were fitted and secured.
- The upper half of the CDC was installed.

Saturday, 22nd March 2008:

Dayshift (50% manpower)

- All bolts of the CDC were tightened to torque.
- The remaining transition pieces were installed, except for the ones of chamber #14 and #1. These ones had to be fitted after the vent pipe of bearing #2 was fitted and secured. The clearance between the 1st stage nozzle and picture frames of the transition pieces were checked with a "go no go" feeler. All picture frame clearances were between the tolerances of 6,1 mm – 9,9 mm.



- All temporary turbine support jacks were removed from underneath the casings.

Nightshift (50% manpower)

- Assembly of wrapper upper half.
- Assembly of vent pipe of bearing #2.
- Cleaning activities.

Sunday, 23rd of March 2008:

No activities.

Monday, 24th of March 2008:

No activities, because of Eastern.

Tuesday, 25th of March 2008:

Dayshift

- All bolts of the wrapper were tightened to torque. Of one bolthole in the CDC <=> wrapper flange, the helicoil had moved out. For this bolt hole a new helicoil was installed from the inside.
- The vent pipe of bearing #2 was tightened and secured.
- The 2 transition pieces #14 and #1 were assembled and secured.
- Wagenborg/Nedlift started its activities for assembly of the roof.

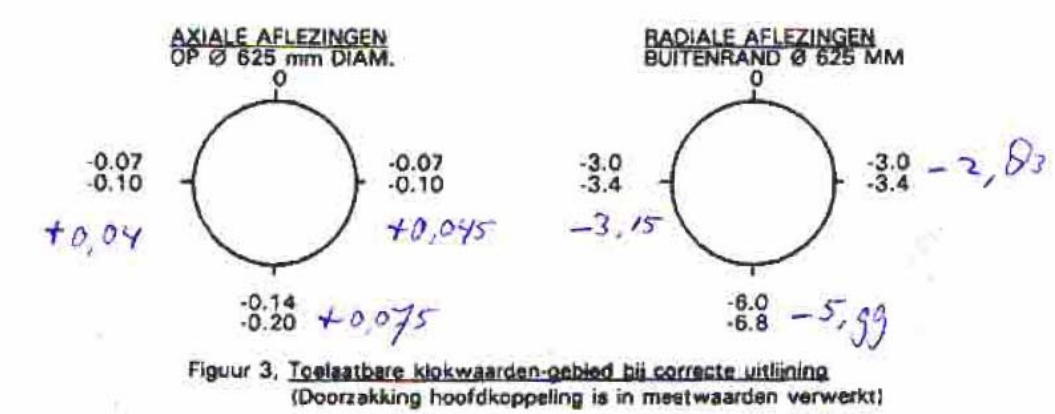
Nightshift

- A final inspection was performed inside the wrapper, to check the lockplates and to remove the tape from the opening holes.
- The combustion chambers were re-installed with outer crossfire tubes.
- The flow sleeves were installed, except for the #3 and #4.
- The big bore piping was partially lifted on top of the machine.

Wednesday, 26th of March 2008:

Dayshift

- Assembly of liners and crossfire tubes.
- The alignment was checked between gasturbine and generator. The results were discussed with P. Remy of EON. EON decided not to perform a re-alignment, although the slope of the turbine shaft was not in the correct angle (see written results below). This was based upon the fact that there were no vibration problems or bearing problems with GT bearing #3 and generator bearings.



Figuur 3, Toelaatbare klokwaarden-gebied bij correcte uitlijning
(Doorzakking hoofdkoppeling is in meetwaarden verwerkt)

- The gear backlash of the IGV's was brought within the proper values. The gearwheels were greased with silicone grease and the protection cover was fitted.
- Activities of Wagenborg/Nedlift on the rooftop.

Nightshift

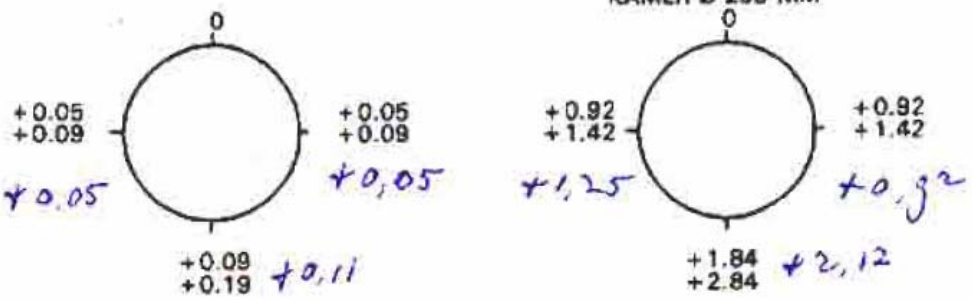
- The lifting beam was re-installed inside the package.
- Installation of the 2 upper bleed valve assemblies.
- The combustion chamber covers were fitted, except 2 pieces.
- The accessory coupling was removed.
- All measuring probes were fitted for the dynamic pressure testing.
- Activities of Wagenborg/Nedlift on the rooftop.

Thursday, 27th of March 2008:

Dayshift

- The last 2 combustion covers were fitted.
- Assembly of secondary fuel nozzles.
- The alignment fixture was fitted on the accessory gearbox flange and the alignment between accessory gearbox and gasturbine was measured. The measured values were within limits, so no corrective action was needed (see written results below).

H. Met uitlijngereedschap gemonteerd op de hulptandwielkast moeten de volgende metingen op de turbine-as worden verkregen, zie figuur 5.



Figuur 5. Toelaatbare klokwaarden-gebied bij correcte uitlijning

- The load coupling flange was closed at the generator side. The coupling bolts were tightened according to the instructions with the hydraulic tools.
- Installation of piping and flexible gas lines.
- The inside of the exhaust diffuser was inspected and the cover was finally installed.
- Activities of Wagenborg/Nedlift on the rooftop.

Nightshift

- The accessory coupling was installed permanently. The free length between the gearbox and GT flanges was checked. This length was 1968 mm, which gives the coupling the correct pre-stretch of 12,5 mm.
- Installation of piping and flexible gas lines.
- Activities of Wagenborg/Nedlift on the rooftop.

Friday, 28th of March 2008:

Dayshift

- The concentricity of the generator/load coupling flange was inspected. The measured result of 0,02 mm was within the tolerance of maximum 0,04 mm.
- The protection cover of the accessory coupling was fitted.
- Finishing of piping and the installation of flexible hoses.
- A team of TTS engineering, consisting of L. Vossen, F. v.d. Hout and J. Houben installed temporary equipment for emission monitoring and dynamic pressure measurement.
- Wagenborg/Nedlift finished its activities, concerning the re-assembly of rooftop, ventilation ducting, air inlet ducting and fuel gas supply lines.

Last nightshift

- The inner wall between gasturbine and generator was installed, after the earthing brushes of the generator were fitted.
- The cooling water lines for the flame detectors were fitted.
- The angle indicator of the IGV's was adjusted and secured with araldite.
- General cleaning activities.

Saturday, 29th of March 2008:

Dayshift only

- Final inspection of air intake filter house and clean air space.
- Final inspection of air inlet plenum.
- Final inspection of Exhaust duct.
- The 2 axial displacement probes were installed at bearing #1. One of the probes was renewed, because it had been damaged.
- General cleaning.

In the late afternoon the gasturbine was brought to 160 rpm speed and stopped in order to listen for strange noises and squeaks. When everything seemed to be OK, the turbine was put on the "slow roll" and left like that for the weekend.

Sunday, 30th of March 2008:

No activities.

Monday, 31st of March 2008:

Several small jobs and inspections were done during the morning, like installation of pipe clamps for the flame detector cooling water piping and general housekeeping in the turbine area.
When the fuelgas system was filled up until the Speed Ratio Valve, it turned out that the fuelgas lines on the rooftop near the block and bleed valves were leaking. Inspection of the flanges learned that they had not been fully tightened by Wagenborg/Nedlift. All flanges were tightened by slogging spanner, after which the system was gastight.
The machine was started two times on the starting motor. One time it was stopped, by simulating the overspeed trip and the other time it was stopped by emergency push button in the turbine area.
The gasturbine was first started with ignition around 19.00. Shortly after ignition it started blowing from a secondary flame detector connection of chamber #9. It turned out that the blind cover had not been fitted. The turbine was stopped and the blind cover was fitted. The turbine was kept on “slow roll” during the night.

Tuesday, 1st of April 2008:

The gasturbine was started and slowly brought to base load during the course of the day. The parameters were checked and the machine kept on running during the night

Wednesday, 2nd of April 2008:

The turbine was operating during the whole day at various output levels in pre-mix mode and lean-lean. The emissions and the dynamic pressures were measured in order to establish the optimum position of the gas splitter valve.

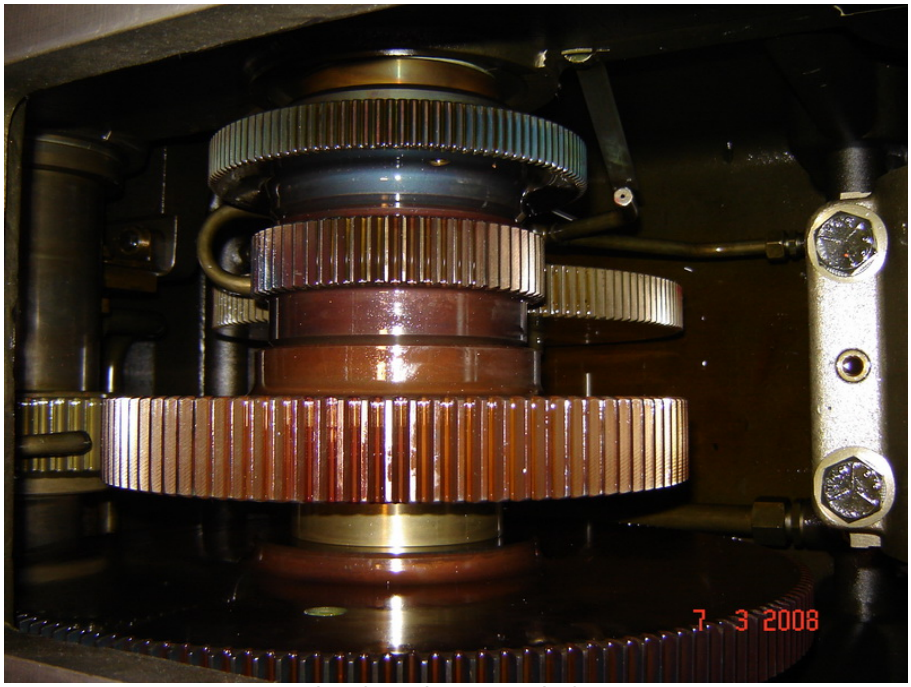
Thursday, 3rd of April 2008:

The gasturbine had been stopped the evening before and was cooled down enough to work on it. The measuring equipment for the emission and dynamic pressure measurement was removed. Blindplugs were re-installed in the combustion chambers.
Several instrumentation jobs were done, like replacement of an improper functioning primary flame detector, an LVDT for the Speed Ratio Gasvalve and some other small jobs.
The manhole of the exhaust duct was opened again to remove a loose support pipe for the support of the emission measuring probe. This pipe had moved inward during the trial run, but was still laying before the exhaust silencers.
Around 11 am, the turbine was ready for operation again.
The compressor was cleaned “off line”, after which the turbine went into operation for permanent use. The output of the turbine was raised slowly during the afternoon, depending on the steam requirements.
The tool container was made ready for transportation and the site was finally left around 18.00.

SUMMARY

Accessory gearbox:

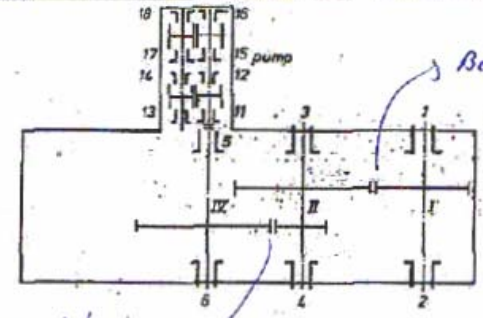
The accessory gearbox was visually inspected through the inspection hole at the top. No bearing damage or gear damage was observed. The clearances were measured as indicated on the next page:



View from the top at shaft #1

BHS VOITH

Bearing Clearances Auxiliary Gear



	radial	axial
shaft I lemon bore	horizontaly 0,332-0,376mm vertica ly 0,122-0,166 mm 0,4 mm	0,50-0,82 mm 0,52 mm
shaft II lemon bore	horizontaly 0,21 -0,35 mm vertical y 0,072-0,17 mm 0,17 mm	0,50-0,82 mm 0,40 mm
shaft IV	0,06-0,15mm 0,13 mm	0,44-0,76 mm 0,48 mm
pump bearings	0,08-0,12 mm	0,305-0,355 mm

(measured clearances)

Accessory coupling:

The accessory coupling of the “Flexibox” dry plate type was visually inspected. No distortion of the plates or other damage was observed.

General view at accessory coupling

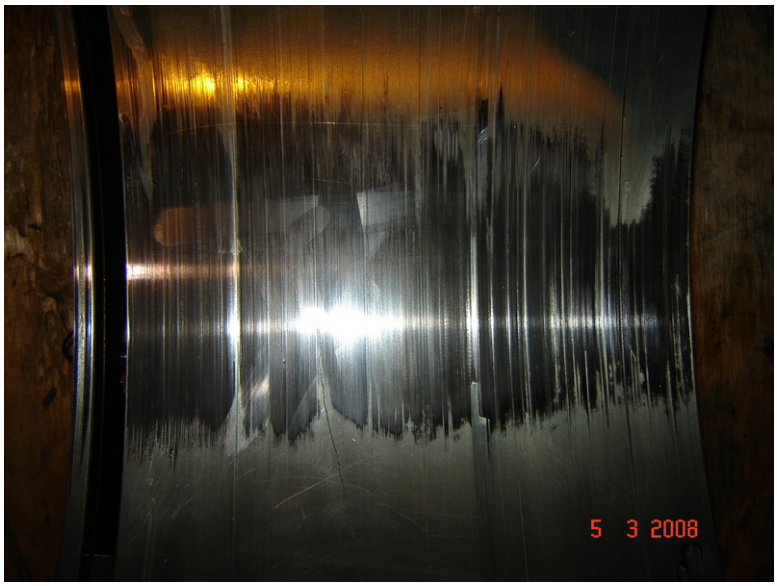
Load coupling:

The load coupling was disengaged at the generator side. The bolts were loosened and fastened according to the ABB procedure with the appropriate hydraulic tools. The coupling bolts and internal bushings were inspected.

General view at coupling bolts and coupling

Bearing #1:

Bearing #1 was renewed because of damaged babbitt. A new bearing was brought from a sister plant in Germany. The holes for the thermocouple wiring had to be machined on site in the new bearing.
The active and in-active thrust bearings were visually inspected and found to be fit for re-use. The same thrust shims were used for the active and in-active bearing, so the axial rotor position or rotor float didn't change. All thermocouples were renewed. All labyrinth seals were inspected and re-used.

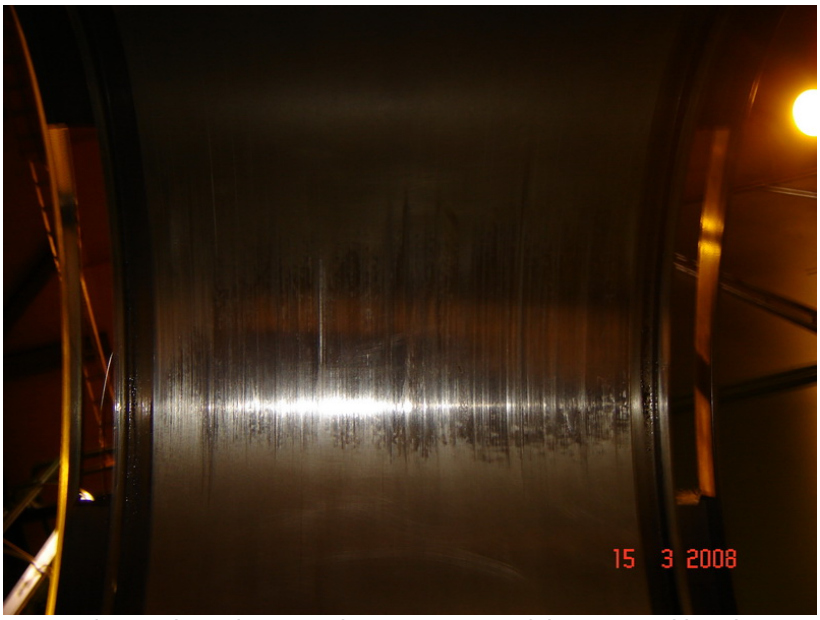


A view at the damaged bearing after removal

Tangential grooves are visible during dye penetrant check

Bearing #2:

Radial bearing #2 was renewed, because the formerly installed bearing had a too big dimension. The labyrinth seals containing the brush seals were renewed. The other seals were in good condition and were not replaced. All thermocouples were renewed.



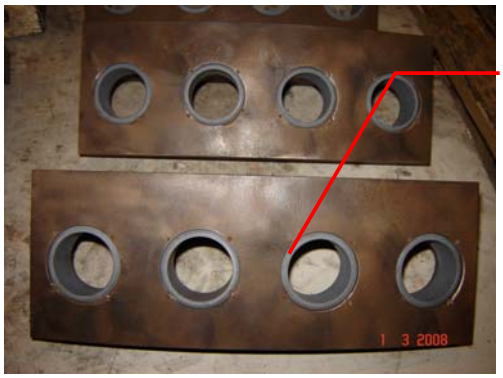
A view at the quite normal wear patterns of the renewed bearing

Bearing #3:

Tilting pad bearing #3 was removed, inspected and cleaned. The babbitt was inspected by dye penetrant and by ultrasonic testing. After inspection and cleaning, it was re-installed. All thermocouples were renewed. The labyrinth seals were inspected and found to be in good condition and therefore re-used.

IGV's:

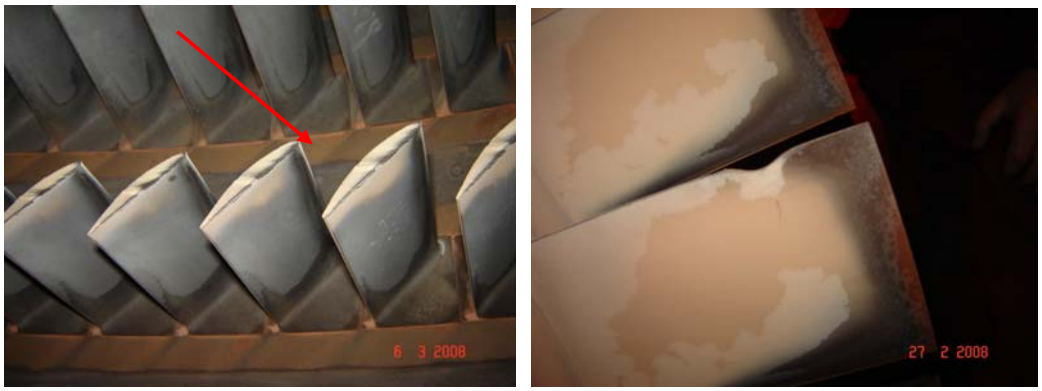
All IGV clearances were measured and the inner bushing wear of IGV #38 was at a high level (1,38 mm). Therefore it was decided to change out all except the IGV's itself. The following parts were renewed: Gears, cup springs, outer bushings, thrust plates and inner bushings. The IGV's were visually inspected, cleaned and dye penetrant checked at random.



New inner bushings were installed

Compressor:

The blade rock of the compressor rotor blades was measured, because some of the blades in the lower stages were quite loose. None of the blades exceeded the maximum of 3,6 mm. The highest measured value was 1,9 mm.
The rotor blades and stator blades were not cleaned by hand. This would have been difficult with the rotor inside the machine.
Several stator blades in the upper half showed rubbing marks and sharp edges and were therefore blended with a stone.



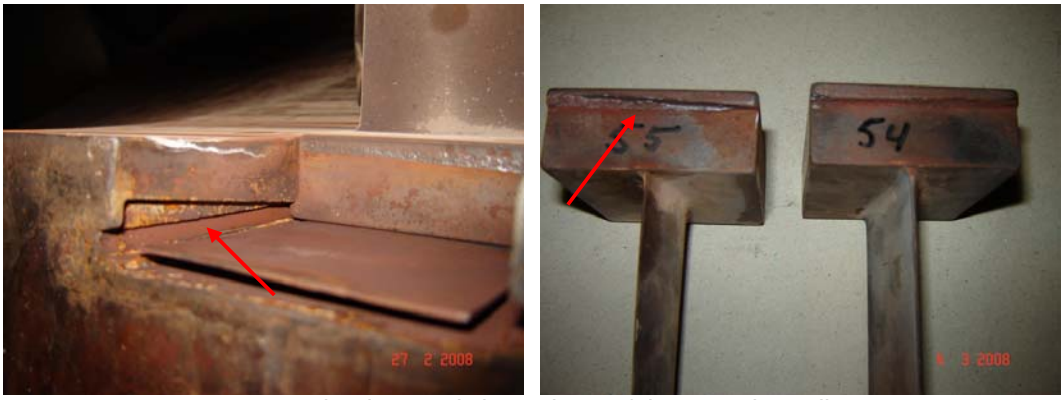
Rubbing marks which were blended and old damagee of R17 blades

One shim of the S1 blades in the bottom half had gone loose and was protruding into the flow path. It was not possible to remove it, so it was tack welded.

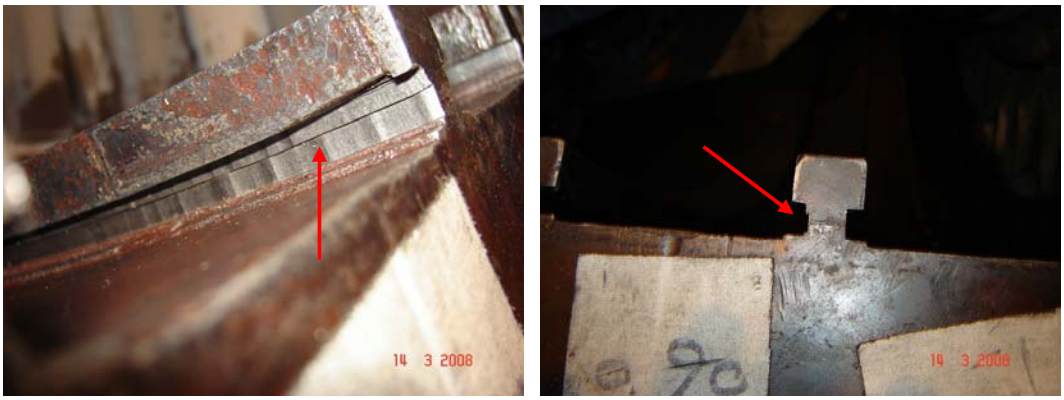
The shim before and after welding

EGV's

There was an old and existing problem with the S17 and EGV1 and EGV2 blades. These blades had a lot of clearance in the slots and had therefore been shimmed during former inspections. EON decided to machine these slots and insert an extra piece inside the machined groove in order to fit the blades. TTS engineering did not recommend this method, so therefore this modification was done under supervision and responsibility of EON. The blades with damaged dovetails were sorted out and replaced by new ones.



The damaged slot and one of the worn dovetails



The machines slots

Detail of EGV1 blade after modification

Inner barrel:

The lower half of the inner barrel was removed for the inspection and renewal of the high pressure brush seal. The brush seal was renewed. The lock screw for the seals were not inserted into the lower half. This will make it easier during future inspection to replace the seal.

Fuel nozzles primary:

The fuel nozzle tips were all renewed and flow tested at TTS. The covers were installed according to the flow test sheet.

Detail of fuel nozzle tip (lightly sooted)

Fuel nozzles secondary:

The secondary fuel nozzles were renewed and installed according to the flow test certificate.

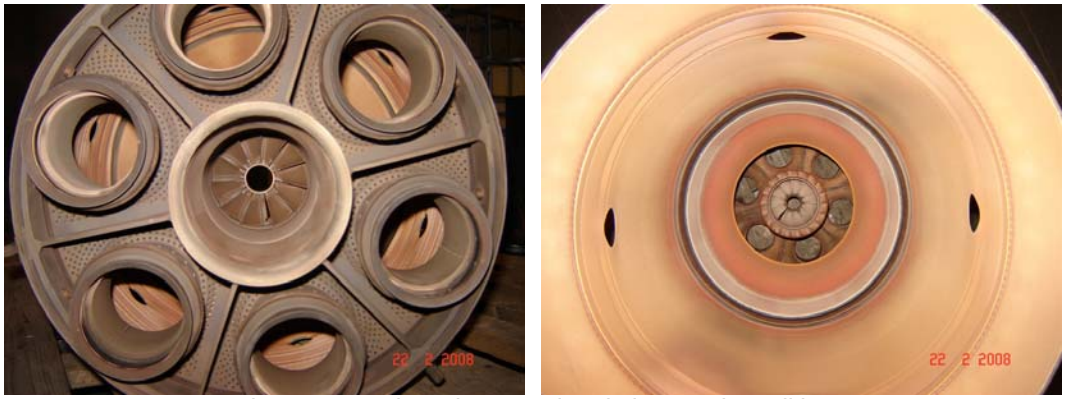
Detail of secondary fuel burner (left) and transfer burner tip (right)

Flow sleeves:

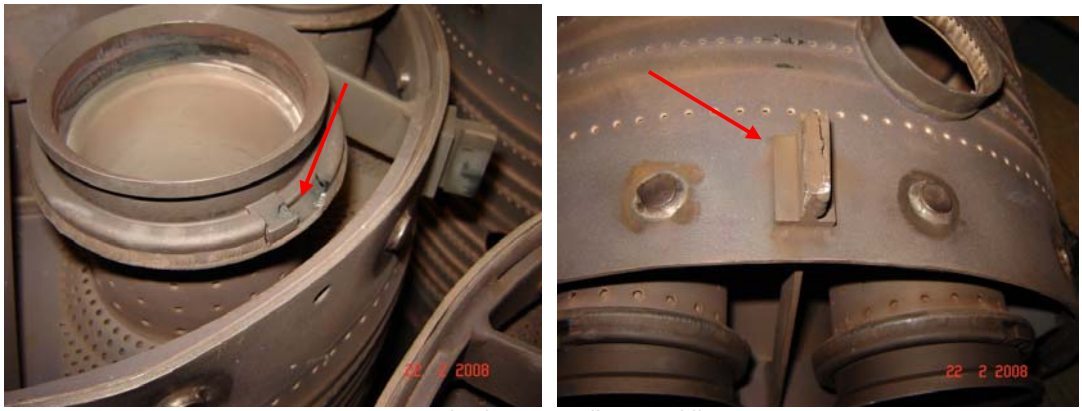
The flow sleeves were brought to “Sulzer Elbar” for repair of the liner stops. Special probe holes were drilled on site for the installation of dynamic pressure probes. After repair, the flow sleeves were re-installed.

Liners (extender type):

The liners were replaced by a refurbished set of liners. The disassembled liners were in a relative good condition. There was some wear at the liner stops and at the burner collars



Liner caps and coating were in relative good condition



Some wear at the burner collars and liner stops

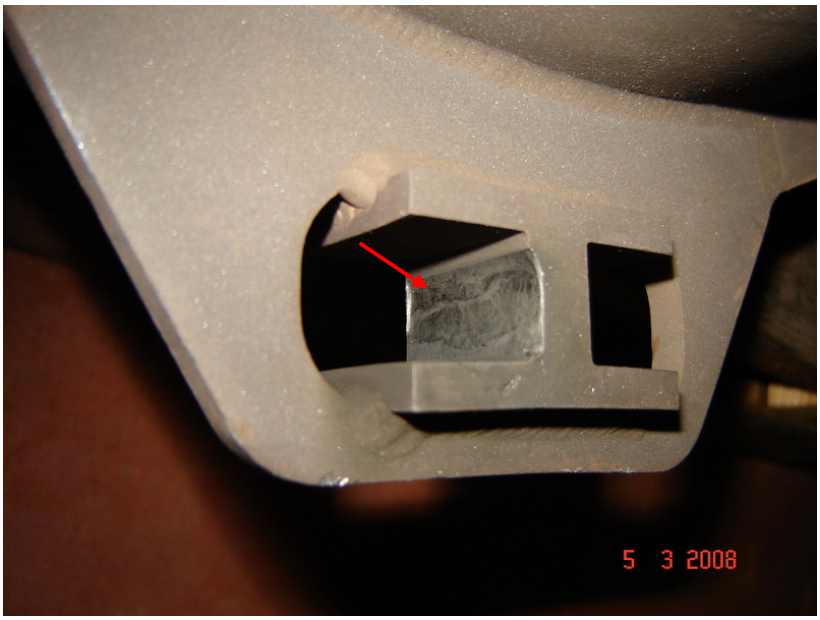
Crossfire tubes:

The crossfire tubes and retainers were replaced by a refurbished set. The disassembled crossfire tubes were still in good condition and showed no hot spots or burned away material. They showed light signs of wear.

Light wear of crossfire tubes

Transition pieces (extender type):

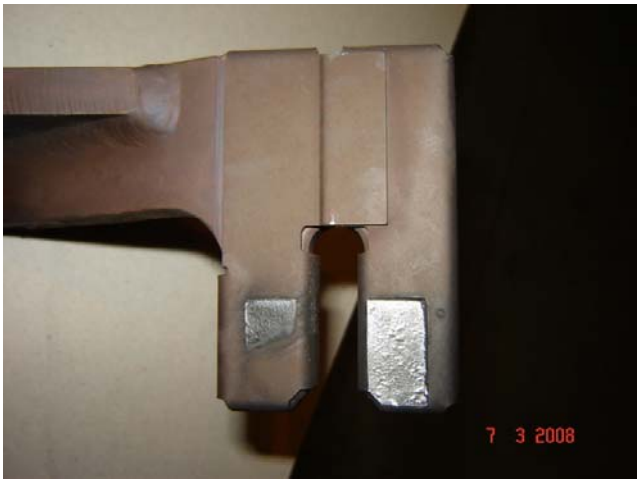
The transition pieces were replaced by a refurbished set. The disassembled ones were still in a relative good condition. There was some light wear at the “H” brackets and the side seal slots.



Light wear at “H“ bracket

Bullhorns (extender type):

The bullhorns were replaced by a refurbished set. There was some wear at the hard metal facing. The new ones had to be grinded a little, to make them fit into the “H” bracket.



Wear of the hard metal contact surface

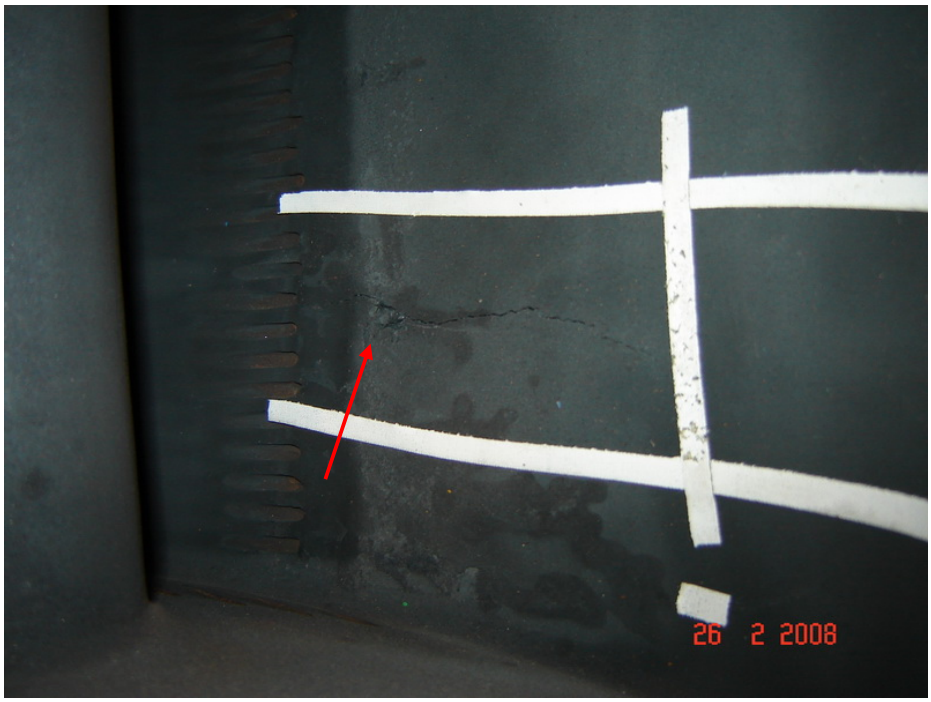
Side seals (extender type):

The side seals and retainers were replaced by new ones. The side seals showed severe wear.

Wear at the tip of a side seal

1st stage nozzle:

The 1st stage nozzle was replaced by a refurbished nozzle. The disassembled nozzle showed cracks and erosion and cracks near the cooling holes.



Some of the cracks in the vanes

Erosion and cracks at the pressure side of the nozzle vanes

2nd stage nozzle:

The 2nd stage nozzle segments were replaced by a refurbished set. The disassembled set had some light cracks at the corners of the vanes.

Light cracks at the corner of the vanes

The diaphragm seals of these nozzles contained brush seals. The assembled nozzle segments contained new brush seals.

One of the disassembled nozzle segments with brush seal in the diaphragm

3rd stage nozzle:

The 3rd stage nozzle segments were disassembled, inspected and re-installed. No damages or cracks were observed.

1st stage buckets:

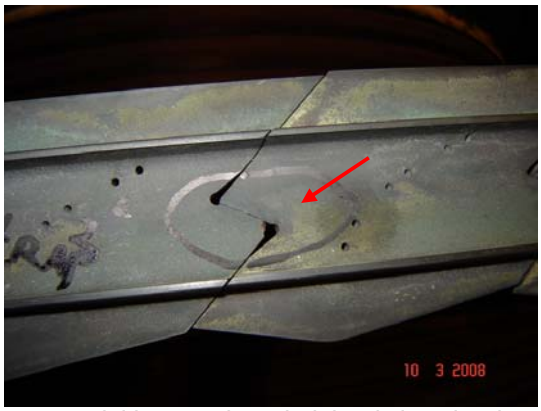
The first stage buckets were replaced by a refurbished set. The set was installed according to the attached balance weight chart.

Detail of one disassembled and assembled bucket

2nd stage buckets:

The 2nd stage buckets were not replaced. The twistlocks were inspected, because they had been badly staked at a former inspection. No signs were noticed that they had moved since then. There were no severe signs of bucket deflection, although some buckets had some material loss at the shrouded tips.

Detail of formerly damaged twistlock and no severe deflection noticed at tips



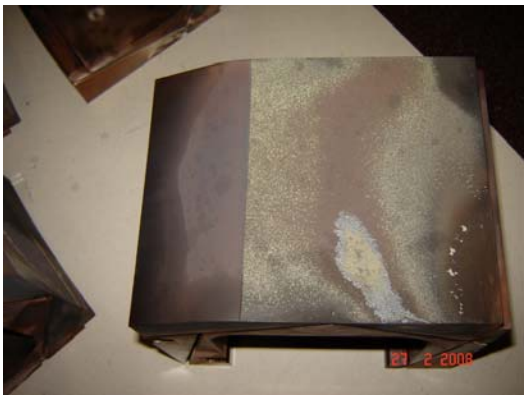
Material loss at shrouded tips (3 locations)

3rd stage buckets:

The 3rd stage buckets were disassembled for access to the flex seals of the exhaust casing. After the flex seal repair, the buckets were installed with new twistlocks in the same position. No damage was observed, except for light deposits at the inside of the shrouded tips.

1st stage shrouds:

The 1st stage shrouds were replaced by refurbished ones. The disassembled as well as the assembled ones had cloth seals.




A disassembled and an assembled shroud block

2nd stage shrouds:

The 2nd stage shrouds were in good condition, but nevertheless replaced by a reconditioned set of shrouds. The disassembled set as well as the assembled set were a normal set without honeycomb seals.

3rd stage shrouds:

The 3rd stage shrouds were not replaced. They had to be removed for the disassembly of the 3rd stage buckets.

Lubricating oil filters:

All cartridges of the filter in use and the stand-by filter were renewed.

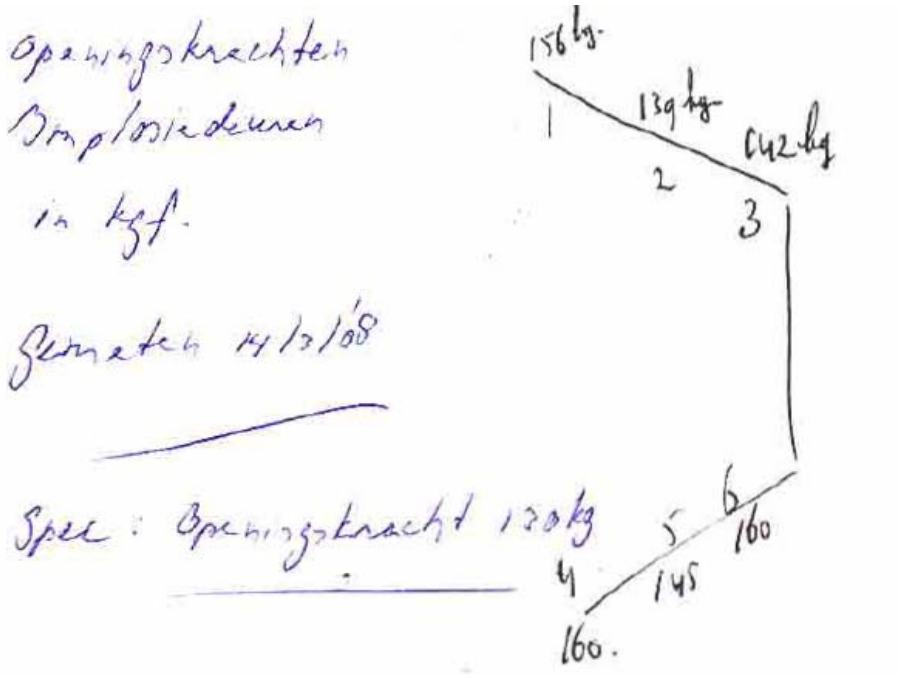
Hydraulic oil filters:

Both cartridges were renewed.

Hydraulic servo filters:
All 5 “Pall” filter cartridges were renewed for the 4 gas valves and the IGV’s.

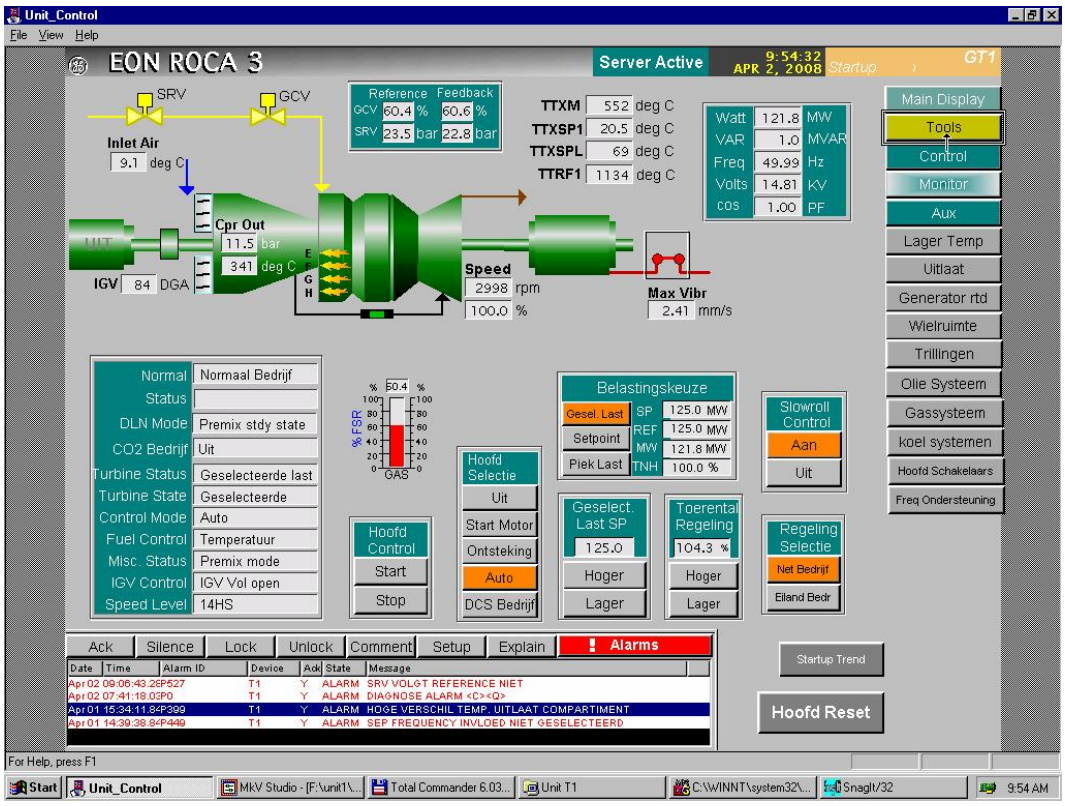
Air intake filter and implosion doors:

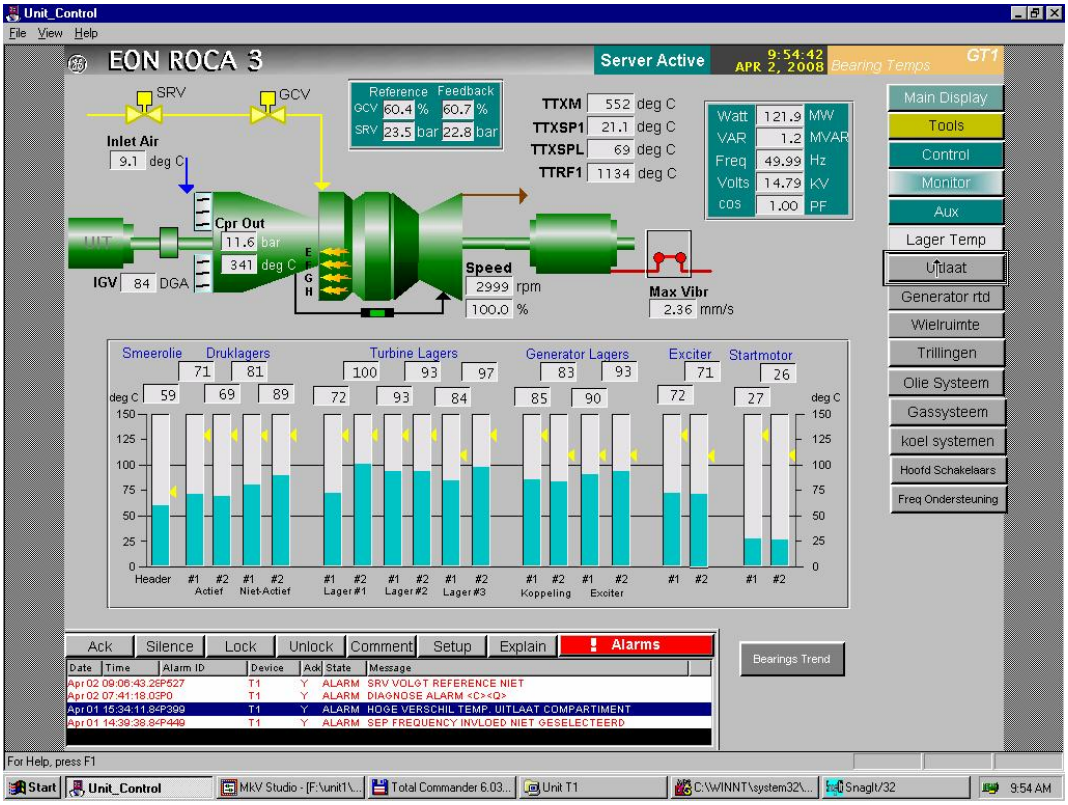
The implosion doors were tested with an electronic scale. The following opening forces were noted.

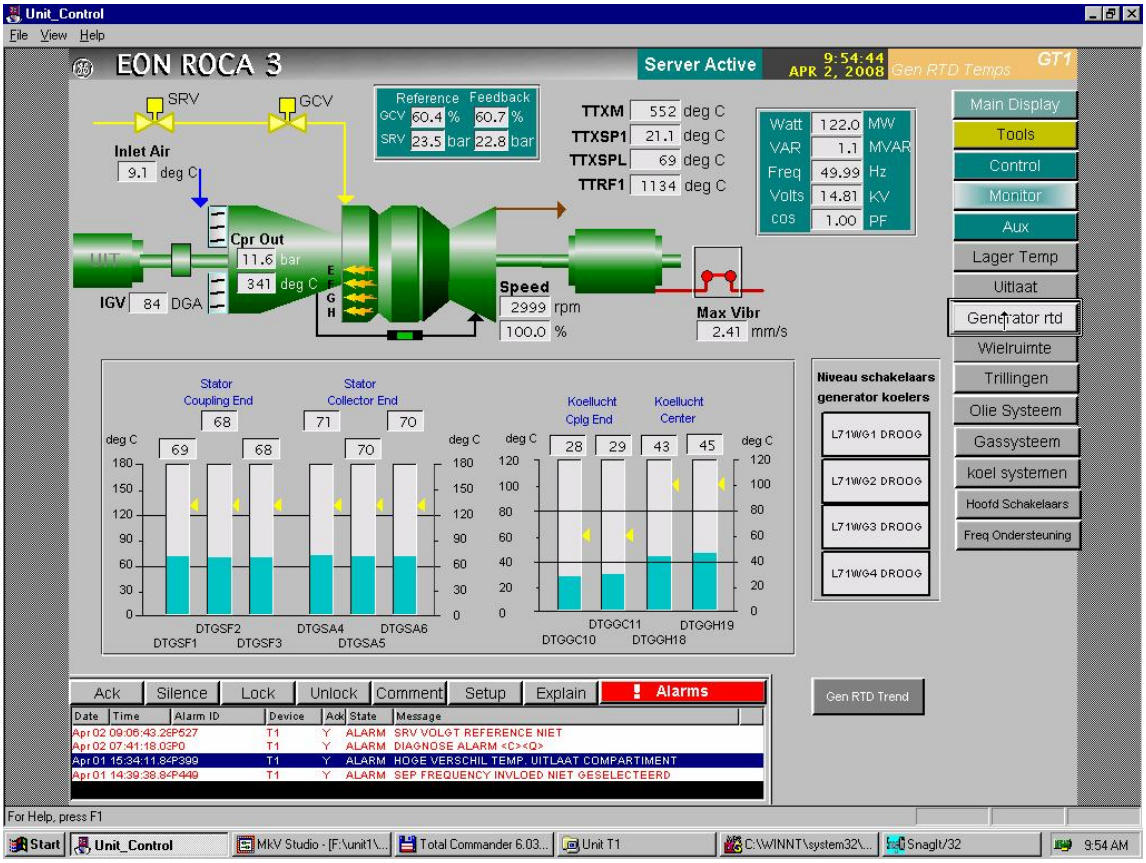


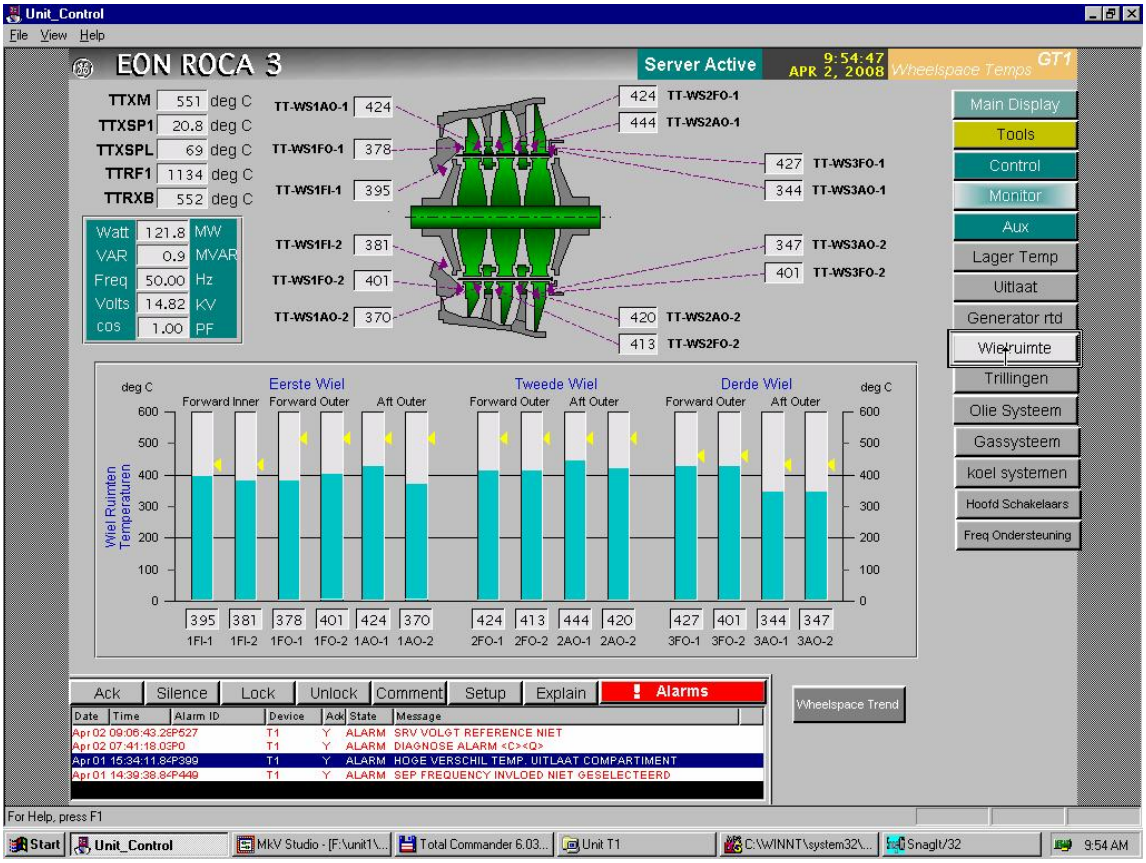
The water separators were cleaned under supervision of EON personnel.
Upon final inspection of the clean air space of the filter house, it was noticed that there were heavily corroded spots underneath the filter cartridges on the floor. The loose debris was removed.
It is recommended though at a future stop to remove the corrosion and scale form these spots with a needle hammer and put a new coating on it.

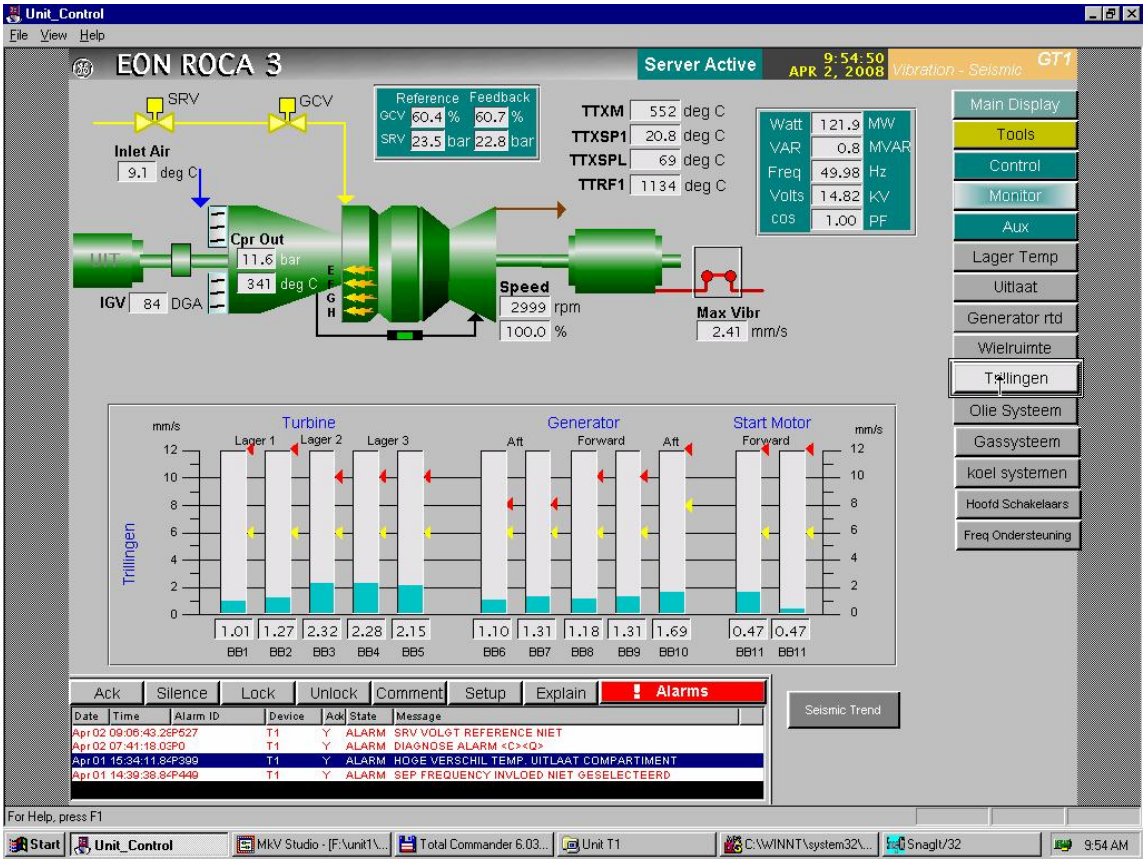
SPEEDTRONIC IMAGES AT BASE LOAD

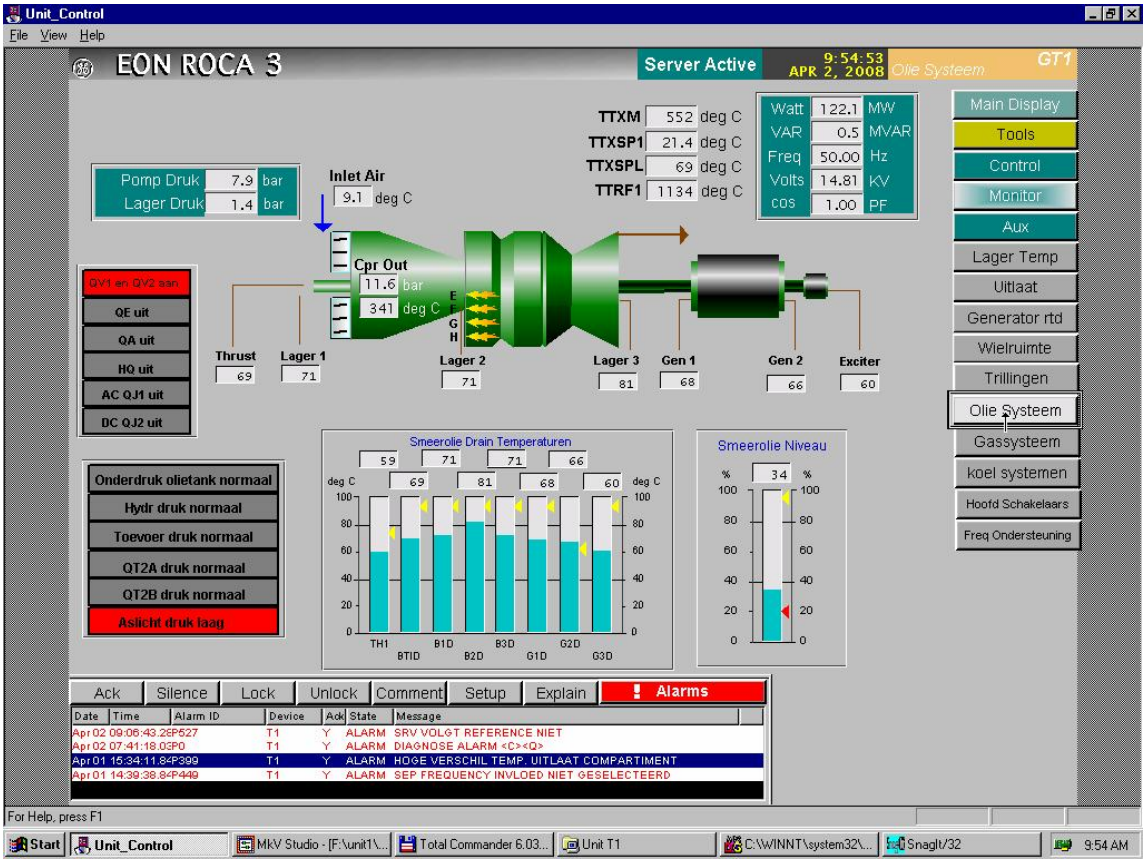



Unit_Control
File View Help
EON ROCA 3
Server Active
9:54:42
APR 2, 2008
Bearing Temps
GT1
SRV
GCV
Reference Feedback
GCV 60.4 % 60.7 %
SRV 23.5 bar 22.8 bar
Inlet Air
9.1 deg C
TTXM 552 deg C
TTXSP1 21.1 deg C
TTXSPL 69 deg C
TTRF1 1134 deg C
Watt 121.9 MW
VAR 1.2 MVAR
Freq 49.99 Hz
Volts 14.79 kV
cos 1.00 PF
Cpr Out
11.6 bar
341 deg C
IGV 84 DGA
Speed
2999 rpm
100.0 %
Max Vibr
2.36 mm/s
Main Display
Tools
Control
Monitor
Aux
Lager Temp
Uitlaat
Generator rtd
Wielruimte
Trillingen
Olie Systeem
Gassysteem
koel systemen
Hoofd Schakelaars
Freq Ondersteuning
Smeerolie
Druklagers
Turbine Lagers
Generator Lagers
Exciter
Startmotor
deg C
Header
Actief
Niet-Actief
Lager #1
Lager #2
Lager #3
Koppeling
Exciter
Ack
Silence
Lock
Unlock
Comment
Setup
Explain
Alarms
Date Time Alarm ID Device Ack State Message
Apr 02 09:06:43.26P527 T1 Y ALARM SRV VOLGT REFERENCE NIET
Apr 02 07:41:18.03P0 T1 Y ALARM DIAGNOSE ALARM <C><Q>
Apr 01 15:34:11.84P399 T1 Y ALARM HOGE VERSCHIL TEMP. UITLAAT COMPARTIMENT
Apr 01 14:39:38.84P449 T1 Y ALARM SEP FREQUENCY INVLOED NIET GESELECTEERD
Bearings Trend
For Help, press F1
Start
Unit_Control
MkV Studio - [F:\unit1\...
Total Commander 6.03...
Unit T1
C:\WINNT\system32\...
SnagIt/32
9:54 AM


Unit_Control
File View Help
EON ROCA 3
Server Active
9:54:44
APR 2, 2008
Gen RTD Temps
GT1
SRV
GCV
Reference Feedback
GCV 60.4 % 60.7 %
SRV 23.5 bar 22.8 bar
Inlet Air
9.1 deg C
TTXM 552 deg C
TTXSP1 21.1 deg C
TTXSPL 69 deg C
TTRF1 1134 deg C
Watt 122.0 MW
VAR 1.1 MVAR
Freq 49.99 Hz
Volts 14.81 KV
cos 1.00 PF
Cpr Out
11.6 bar
341 deg C
IGV 84 DGA
Speed
2999 rpm
100.0 %
Max Vibr
2.41 mm/s
Main Display
Tools
Control
Monitor
Aux
Lager Temp
Uitlaat
Generator rtd
Wielruimte
Trillingen
Olie Systeem
Gassysteem
koel systemen
Hoofd Schakelaars
Freq Ondersteuning
Stator Coupling End
Stator Collector End
Koellucht Cplg End
Koellucht Center
deg C
DTGSF1 DTGSF2 DTGSF3
DTGSA4 DTGSA5 DTGSA6
DTGGC10 DTGGC11
DTGGH18 DTGGH19
Niveau schakelaars generator koelers
L71WG1 DROOG
L71WG2 DROOG
L71WG3 DROOG
L71WG4 DROOG
Ack Silence Lock Unlock Comment Setup Explain Alarms
Date Time Alarm ID Device Ack State Message
Apr 02 09:06:43.26P527 T1 Y ALARM SRV VOLGT REFERENCE NIET
Apr 02 07:41:18.03P0 T1 Y ALARM DIAGNOSE ALARM <C><Q>
Apr 01 15:34:11.84P399 T1 Y ALARM HOGE VERSCHIL TEMP UITLAAT COMPARTIMENT
Apr 01 14:39:38.84P449 T1 Y ALARM SEP FREQUENCY INVLOED NIET GESELECTEERD
Gen RTD Trend
For Help, press F1
Start
Unit_Control
MkV Studio - [F:\unit1\...
Total Commander 6.03...
Unit T1
C:\WINNT\system32\...
SnagIt/32
9:54 AM


Unit_Control
File View Help
EON ROCA 3
Server Active
9:54:47
APR 2, 2008
Wheelspace Temps
GT1
TTXM 551 deg C
TTXSP1 20.8 deg C
TTXSPL 69 deg C
TTRF1 1134 deg C
TTRXB 552 deg C
Watt 121.8 MW
VAR 0.9 MVAR
Freq 50.00 Hz
Volts 14.82 KV
cos 1.00 PF
TT-WS1AO-1 424
TT-WS1FO-1 378
TT-WS1FI-1 395
TT-WS1FI-2 381
TT-WS1FO-2 401
TT-WS1AO-2 370
424 TT-WS2FO-1
444 TT-WS2AO-1
427 TT-WS3FO-1
344 TT-WS3AO-1
347 TT-WS3AO-2
401 TT-WS3FO-2
420 TT-WS2AO-2
413 TT-WS2FO-2
Main Display
Tools
Control
Monitor
Aux
Lager Temp
Uitlaat
Generator rtd
Wielruimte
Trillingen
Olie Systeem
Gassysteem
koel systemen
Hoofd Schakelaars
Freq Ondersteuning
Eerste Wiel
Tweede Wiel
Derde Wiel
Forward Inner
Forward Outer
Aft Outer
deg C
Wiel Ruimten Temperaturen
395 381 378 401 424 370
1FI-1 1FI-2 1FO-1 1FO-2 1AO-1 1AO-2
424 413 444 420
2FO-1 2FO-2 2AO-1 2AO-2
427 401 344 347
3FO-1 3FO-2 3AO-1 3AO-2
Ack
Silence
Lock
Unlock
Comment
Setup
Explain
Alarms
Date Time Alarm ID Device Ack State Message
Apr 02 09:06:43.26P527 T1 Y ALARM SRV VOLGT REFERENCE NIET
Apr 02 07:41:18.03P0 T1 Y ALARM DIAGNOSE ALARM <C><Q>
Apr 01 15:34:11.84P399 T1 Y ALARM HOGE VERSCHIL TEMP UITLAAT COMPARTIMENT
Apr 01 14:39:38.84P449 T1 Y ALARM SEP FREQUENCY INVLOED NIET GESELECTEERD
Wheelspace Trend
For Help, press F1
Start
Unit_Control
MkV Studio - [F:\unit1\...
Total Commander 6.03...
Unit T1
C:\WINNT\system32\...
SnagIt/32
9:54 AM


Unit_Control
File View Help
EON ROCA 3
Server Active
9:54:50
APR 2, 2008
Vibration - Seismic
GT1
SRV
GCV
Reference Feedback
GCV 60.4 % 60.7 %
SRV 23.5 bar 22.8 bar
Inlet Air
9.1 deg C
TTXM 552 deg C
TTXSP1 20.8 deg C
TTXSPL 69 deg C
TTRF1 1134 deg C
Watt 121.9 MW
VAR 0.8 MVAR
Freq 49.98 Hz
Volts 14.82 KV
cos 1.00 PF
Cpr Out
11.6 bar
341 deg C
IGV 84 DGA
Speed
2999 rpm
100.0 %
Max Vibr
2.41 mm/s
Main Display
Tools
Control
Monitor
Aux
Lager Temp
Uitlaat
Generator rtd
Wielruimte
Trillingen
Olie Systeem
Gassysteem
koel systemen
Hoofd Schakelaars
Freq Ondersteuning
Turbine
Generator
Start Motor
Lager 1
Lager 2
Lager 3
Aft
Forward
Aft
Forward
mm/s
Trillingen
1.01 1.27 2.32 2.28 2.15
BB1 BB2 BB3 BB4 BB5
1.10 1.31 1.18 1.31 1.69
BB6 BB7 BB8 BB9 BB10
0.47 0.47
BB11 BB11
Ack
Silence
Lock
Unlock
Comment
Setup
Explain
Alarms
Seismic Trend
Date Time Alarm ID Device Ack State Message
Apr 02 09:06:43.26P527 T1 Y ALARM SRV VOLGT REFERENCE NIET
Apr 02 07:41:18.03P0 T1 Y ALARM DIAGNOSE ALARM <C><Q>
Apr 01 15:34:11.84P399 T1 Y ALARM HOGE VERSCHIL TEMP UITLAAT COMPARTIMENT
Apr 01 14:39:38.84P449 T1 Y ALARM SEP FREQUENCY INVLOED NIET GESELECTEERD
For Help, press F1
Start
Unit_Control
MkV Studio - [F:\unit1\...
Total Commander 6.03...
Unit T1
C:\WINNT\system32\...
SnagIt/32
9:54 AM


Unit_Control
File View Help
EON ROCA 3
Server Active
9:54:53
APR 2, 2008
Olie Systeem
GT1
Pomp Druk 7.9 bar
Lager Druk 1.4 bar
Inlet Air 9.1 deg C
TTXM 552 deg C
TTXSP1 21.4 deg C
TTXSPL 69 deg C
TTRF1 1134 deg C
Watt 122.1 MW
VAR 0.5 MVAR
Freq 50.00 Hz
Volts 14.81 KV
cos 1.00 PF
Cpr Out 11.6 bar 341 deg C
Thrust 69
Lager 1 71
Lager 2 71
Lager 3 81
Gen 1 68
Gen 2 66
Exciter 60
QV1 en QV2 aan
QE uit
QA uit
HQ uit
AC QJ1 uit
DC QJ2 uit
Onderdruk olietank normaal
Hydr druk normaal
Toevoer druk normaal
QT2A druk normaal
QT2B druk normaal
Aslicht druk laag
Smeerolie Drain Temperaturen
Smeerolie Niveau
Main Display
Tools
Control
Monitor
Aux
Lager Temp
Uitlaat
Generator rtd
Wielruimte
Trillingen
Olie Systeem
Gassysteem
koel systemen
Hoofd Schakelaars
Freq Ondersteuning
Ack Silence Lock Unlock Comment Setup Explain Alarms
Date Time Alarm ID Device Ack State Message
Apr 02 09:06:43.26P527 T1 Y ALARM SRV VOLGT REFERENCE NIET
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For Help, press F1
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Unit_Control
MkV Studio - [F:\unit1\...
Total Commander 6.03...
Unit T1
C:\WINNT\system32\...
SnagIt/32
9:54 AM