Minor Gas Turbines : Projects Term 1

2016 / 2017

Project 1 : KLM E&M, Schiphol-Oost

Supervisor :

Source	KLM E&M Engine shop, Schiphol-Oost
Project	**Design of Lab Sample Process of engine parts meeting current & future demands.**
Company supervisors	Contact : Ruben Rijpkema 06 – 13394068 Ruben.Rijpkema@td.klm.com

Project description :
One of the most important aspects in engine parts repair concerns the safety & confirmation of the quality of each performed repair. Diverse non-destructive testing methods ensure the quality and integrity of performed repairs. Various methods require lab sample testing at which a sample processed with the same parameters as the repaired part, will be examined in the laboratory in order to obtain data to verify whether the specified quality and material characteristics are being met, allowing the repair to be approved. Apart from the technical process, lab sample testing can also be seen or approached as an administrative and logistic process. The smoother this process occurs, the shorter the TAT (Turn Around Time) of the repaired part.
The assignment : Design a Lab Sample process taking into account the current situation and future needs.
Main assignment requirements **:**
• (SWOT) Analysis of the current test sample : *Strength, Weaknesses, Opportunities, Threats*
• Current & future capacity requirements
• Improvement plan based on the "6M's" : – *Machines* – *Methods* – *Material* – *Measurements* – *Mother Nature* – *Manpower*
• Include a statistical analysis for future OEM (sample size) proposals
  – What would be the "ideal" sample size; properly ensuring part integrity
  – Relate sample size to approval rate & required statistical significance
• Determine staff requirements
• Required time for implementation
• Investment levels
• Comply with airworthiness regulations
• Compatible with / suitable for implementation within existing (IT) infrastructure : – SAP – Windows
• Cost efficiency : – Return On Investment (ROI) < 3 years – Value for money, minimum increase on cost

Project 2 : INNECS, Ter Aar

Supervisor :

Source	INNECS Power Systems BV, Geerweg 44, 2461 EB Ter Aar. www.innecs.nl
Project	**An annular burner :** A good alternative for the can-combustor of the Innecs PowerBurner?
Company supervisors	Contact : Pieter van der Meer +31 85 - 2733160 P.vdmeer@innecs.nl

Project description : The Innecs PowerBurner gas turbine has at the moment a single combustion chamber with a central swirl burner. This has a number of advantages, but also disadvantages. The application of an annular combustion chamber with several small burners in a circle can be an interesting alternative.
The project tasks are :

1. A small literature study into gas turbine combustion chambers, with several small burners. How is the fuel uniformly distributed over the burners ? How do these configurations look like ? What burning principles are used ? Etc.
2. Make a conceptual design of an annular burner for the PowerBurner based on the obtained literature information :
   A. The burner must be compact
   B. Low air side drag is required to maximize cycle efficiency
   C. Low emissions (NOx, SOx)
   D. Suitable or being able to be made suitable for different types of fuel. In the first instance : Natural gas
   E. Provide a uniform temperature profile at the turbine nozzles, while the hub will be colder than the tip.
3. Boundary conditions and interfaces of the compressor and turbine are available.

Project 3 : Uniper, ROTTERDAM / Maasvlakte

Supervisor :

Source	Uniper BV, Capelseweg 400, Rotterdam		
Project title	**Running a GT as a back-up**.		
Company supervisor	Louwerens Selier	+31 6 18135717	l.selier@uniper.energy

Project description : At Uniper Maasvlakte, a gas turbine with heat recovery boiler is installed to supply steam and heat to adjacent installations / companies. Due to the newly built MPP3 power plant, the usage of the GT will differ very from the last period. The general idea is to maintain the current installation for a couple of years and utilize it as a backup. The surplus of the technical lifespan of the GT will not be consumed.
A plan needs to be made how to utilize the GT in the most economical way for the next few years in combination to MPP3, and investigate the possibilities after end of service.

Expected project items to address :

- Status of the gas turbine (physical) as per date.
- Status of the maintenance of the gas turbine as per date
- Maintenance to be performed until e.o.s. (end of service) in combination with the different utilization (backup unit)
- Measures to be taken to “mothball” the installation
- Maintenance activities after “mothballing”
- Possibilities after end of service : e.g. stand by installation, sell installation onto market, scrap… (market research)
- Uncertainties to address.

Expected project output / concrete results :

- Detailed status of the GT
- List of preventive maintenance during last years of service
- List of activities to mothball the installation.
- Market research

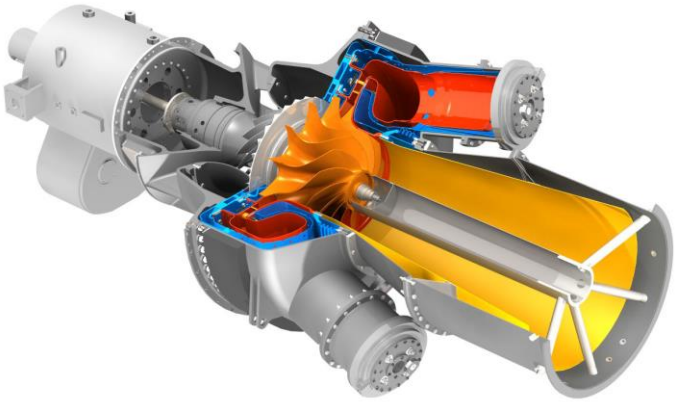
Project 4 : OPRA, Hengelo

Supervisor :

Source	OPRA Turbines BV, Opaalstraat 60, 7554 TS Hengelo (Ov.)
Project title	**OPRA Gas Turbine Package Parts Catalogue.**
Company supervisor	H. Bult Tel: +31 6 11760869 E-mail: h.bult@opra.nl

Project description :
For maintenance and training purposes we will need a so called Parts Catalogue. This is a detailed overview of all main and sub components in the OPRA package. So not only the gas turbine but all auxiliary systems: lube oil-, starting-, fuel, filtration systems etcetera. This includes a small description of the functions of the parts in the entire system.
This catalogue is partially available but needs to be revised and upgraded to include all auxiliary systems. After completion of this assignment you will have an exclusive and in depth overview of all components used both in the OPRA gas turbine as well as all associated systems.

- For this assignment you will create a complete parts catalogue and prepare a presentation
- You will have to write your report and present in English
- You will get an exclusive introduction into OPRA Turbines' world-class technology
- This project will involve working with information on OPRA proprietary technology being confidential information. The final report will remain OPRA property, and can't be divulged to any third party without first obtaining prior written permission of OPRA Turbines.



Project 5 : KLu, Woensdrecht

Supervisor :

Source	KLu Woensdrecht, Hoogerheide.
Project title	Feasibility study D-Level maintenance APU NH90
Company supervisors	Leo Voorhout (Head Production Engineering Squadron Component maintenance) tel. nr. : 0612791536, L.Voorhout@mindef.nl

Project description :
What is required to implement depot level (D-Level) maintenance of the NH90 helicopter Auxiliary Power Unit (APU) at Squadron 981 Component maintenance.

Expected project items to address :
- Technical requirements
- Law and regulation requirements
- Are the 4M's (men, means, methods, materials) in place?
- Strategic implementation plan with time schedule
- Total implementation costs
- Risk analysis.

Expected project output / concrete results :
- Project plan
- Project advice report
- Project presentation

Project 6 : NLR NOP

Supervisor :

Source	NLR Noordoostpolder, Voorsterweg 31, 8316 PR Marknesse		
Project title	Heater(s) for compressed air to drive expansion turbines for wind tunnel testing.		
Company supervisor	Gerrit Kool	Gerrit.Kool@nlr.nl	+31 88 511 4290

Project description :
In short time a conceptual design study will be performed at NLR/DNW on "Heater(s) for compressed air to drive expansion turbines for wind tunnel testing". The heater capacity is now estimated to be 4 MW.
The following questions need an answer :

- Who can deliver suitable electrical heaters (worldwide) ?
- What is technically seen a good solution : 1 heater of 4 MW, or 2 heaters of 2 MW each or 4 heaters of 1 MW each ?
- What does this mean for the costs ?
- Where are comparable heaters in use, preferably in the Netherlands ? What temperatures , pressures and gasses are used and what are the experiences ?
- Because this is a new subject, new questions will arise.
- The use of GSP (Gas Turbine Simulation) program will probably also be included.
- The final report is expected to be available in the end of October, which then suits very well in the NLR / DNW planning.
- A final presentation is expected at NLR / DNW in the Noordoostpolder.

G. Doornbos, August 30, 2016.