NEWS :

Focus on natural gas technologies

CAN AN UNTREATED TAP WATER SPRAY BE USED IN AIR-COOLED CONDENSERS?

Laborelec provided an answer to this question from the Voghera Power Plant in Italy. To do so, our experts carried out a series of tests on a small scale air-cooled condenser test bench at Laborelec. After a 300-hour test run, they advised the plant against using tap water.

The Voghera Power Plant uses air-cooled condensers to remove heat. When the outside temperature is high, the capacity of the condenser may be insufficient to maintain the power plant load. Evaporative cooling of the air is a good option to counter this issue. This cooling is accomplished by spraying pressurized water into the air inlet of the condensers.

'Although demineralized water is generally used for this purpose, the Voghera Power Plant asked us to assess the impact of using untreated tap water,' explains Serge Blockerye. 'Tap water is cheaper but carries an inherently greater risk of scaling and damage to the condenser.'

Operating conditions simulated with scale model

In order to provide Voghera with the most accurate answer, Laborelec adapted a scale model of an air-cooled condenser by designing and implementing a similar evaporative cooling system. Particular attention was paid to reproducing actual operating conditions. 'After 300 hours using water with half the hardness of Voghera's, scale deposits were already visible on the fins of the condenser,' notes Blockerye. 'This deposit reduces heat transfer efficiency and consequently degrades the vacuum at the turbine outlet, thus resulting in an output decrease. In addition, fouling increases the consumption of the fans due to an additional pressure drop. We consequently advised Voghera not to use local tap water for the evaporative cooling of their air-cooled condenser.'

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MULTIDISCIPLINARY SKILLS OPTIMIZE THE GROUP'S NATURAL GAS OPERATIONS

The increasing international demand for energy requires the GDF SUEZ Group to maximize the availability and efficiency of their natural gas-fired power plants. Laborelec supports the Group in achieving this. Our multidisciplinary expertise enables us to assist operators in inspecting the quality of incoming spare parts, performing root cause analyses of incidents, investigating cycling opportunities, et cetera. Participation in various R&D programs such as the European Limousine project enables us to extend our knowhow even further. This edition of Laborelec News illustrates our strengths in natural gas technologies.

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By developing a 3m x 1m model of an air-cooled condenser, our experts monitored scaling.

SERVICE AGREEMENT WITH ELECTRABEL ITALY

Planned and unplanned interventions covered

At the beginning of 2010, Laborelec signed an annual framework agreement with Electrabel Italy. It covers both recurring and ad-hoc requests from their power plants, primarily gas turbines in combined cycle units. Some of the interventions carried out thus far are listed below.

Monitoring component condition and repair works

Laborelec conducts visual inspections and non-destructive testing of new and repaired gas turbine components, such as blades and vanes. 'In the event that we identify quality issues, we provide advice and define actions that need to be undertaken by the original equipment manufacturers,' explains Steve Nardone. 'At the Roselectra Power Plant, for instance, we discovered a design difference within a set of second stage vanes. After reporting this to the OEM, they replaced the entire set of vanes with the correct design.'

Laborelec also assists plants with blade life management. Our experts carry out lifetime assessments of ex-service components and can follow the quality of blade repairs. At the Voghera Power Plant, Laborelec currently assists with the follow-up of blade and vane repairs by a third party.

Analyzing component failure incidents

The service agreement also calls Laborelec in to carry out root cause analyses in the event of a component failure. Earlier this year, for instance, our experts were involved in the root cause analysis of a blade failure at the Leini Power Plant. 'An initial investigation was carried out by an independent university, but the plant contacted us to assist in the definition of the work scope and to discuss the results,' recalls Steven Keyzer. 'This investigation is still ongoing. Further analyses are required to identify whether other fleet turbines of the same design are likely to experience similar issues.'

Increasing plant flexibility

Grid constraints require combined cycle power plants to operate increasingly in a flexible way. By auditing combined cycle plants, Laborelec can suggest measures for further flexibility improvements. Such assessments were recently carried out at the Leini and Roselectra power plants.

'During an assessment, we stay on site for a week to observe all the start-up and shut-down sequences,' explains Nicolas Masquelier. 'We identify all possible improvements — quick wins and more complex modifications — in a report. Typical recommendations include the automation of manual valves and modifications in the plant start-up sequence. After the assessment, we offer our support to the power plant on the changes that follow our recommendations.'

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The service agreement also covers interventions during or after an unexpected issue, such as a broken turbine blade.

In short

- Laborelec signed a yearly service agreement with Electrabel Italy at the beginning of 2010
- The agreement covers quality monitoring of planned inspections, repairs, and overhauls
- It also covers ad-hoc interventions and queries

INCOMING INSPECTION OF NEW SPARE PARTS IN SAUDI ARABIA

Laborelec offers power plants an additional quality check on incoming parts to verify whether the original equipment manufacturer meets his quality requirements. This is crucial to mitigate the risk of unplanned downtime and the expenses of an emergency overhaul.

Earlier in 2010, Laborelec inspected the quality of incoming combustion and hot gas path components for a combined cycle power plant in Saudi Arabia. 'We inspected all combustion parts for two Frame 7FA+e gas turbines as well as a complete set of buckets and nozzles on site and in only a week's time,' reports Steven Keyzer.

Checklist for efficient inspection

Laborelec inspects the incoming parts visually. Our in-house developed checklist ensures the inspection is carried out efficiently. 'We have a checklist for every component, highlighting the most critical areas. This both simplifies and speeds up the inspections without losing sight of something,' explains Kurt Boschmans. 'It also facilitates the training of local employees to assist us during the quality check. In Saudi Arabia, for instance, we coached four of the local staff.'

Non-destructive testing

If visual inspection is not sufficient and closer inspection is required, our experts can call upon a vast set of non-destructive testing tools. Keyzer cites a few examples: 'We can quickly analyze a component's coating thickness using eddy currents or detect cracks with liquid dye penetrants.' Once all parts have been checked, our experts list all quality issues in a report. 'We also advise on the appropriate follow-up actions; for instance, if the customer should contact the manufacturer or if additional research is necessary,' concludes Keyzer. Customers can count on Laborelec's expert assistance during the entire process.

Laborelec's in-house checklist ensures efficient and comprehensive inspection of gas turbine components.

FOLLOWING OEM ROOT CAUSE ANALYSES

When a company was confronted with a broken compressor blade in one of its Frame 5 gas turbines, the original equipment manufacturer (OEM) insisted on performing the root cause analysis themselves. However, the customer contacted Laborelec to collect evidence material on site. Our experts were also asked to steer and follow the investigation.

The customer operates 26 gas turbines. So, when an incident occurs in one of these machines, the company wants to be sure other machines will not suffer the same issue. The broken compressor blade therefore triggered the customer to contact the OEM and Laborelec to find the root cause of the incident.

Defining inspection scope

'The analysis was conducted by the OEM, however we set out the entire scope of the investigation together,' states Steven Keyzer. 'We defined which tests needed to be conducted and in what order. We also determined the witness points during the investigation.'
Our experts monitored the project's proceedings via an on-line collaboration platform. All parties shared their documents, reports, and research results via a secured server.

Evaluating results

Based on its research, the OEM concluded that the crack initiated at a corrosion pit on the side of the compressor blade. Through fatigue, this crack was able to propagate and ultimately cause the blade to break. Laborelec, however, urges the OEM to investigate further. Keyzer explains: 'We have found similar corrosion levels on blades that did not break. We will discuss the next steps at the follow-up meeting.'

The root cause analysis of the broken compressor blade was executed by the OEM in close collaboration with Laborelec.

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STRENGTHENING YOUNG POTENTIAL

Modelling combustors in European Limousine project

Because of the rising demand for lean and clean combustion technologies, the European Commission is funding the Limousine project. This multidisciplinary initiative gives young engineers in Europe the opportunity to build expertise in this domain. Laborelec is one of the participants.

The Limousine project is a new Marie Curie Initial Training network. It unites sixteen young European scientists and engineers from various domains of expertise such as computational modelling, material science, and combustion. Together they investigate thermo-acoustic oscillations in combustion systems.

Training young engineers

Twelve European research institutes, universities, and industrial companies give the participating engineers the opportunity to extend their knowledge. 'The scope of the project ranges from theoretical analyses of acoustics and combustion dynamics to running heat transfer simulations with real-life combustion data,' explains Salvatore Matarazzo, one of the 16 engineers selected. 'At Laborelec, we focus on the latter. We have also organized a training session on super-alloys and root cause analyses for all project partners.'

Linking theory to practice

Laborelec has assembled an international team of young engineers from various expertise domains. Together, they are building a realistic model of the DLN2.0 gas turbine combustors.
'We will model the combustors using computational fluid dynamics and the finite element method. Thanks to the multidisciplinary knowledge at Laborelec, we can create a realistic model based on real-life operational data, material characteristics, and combustor geometry,' explains Matarazzo. 'Once the model is in place, we can simulate variations in combustion modes, airflows, and other characteristics and calculate how these changes impact the combustor's expected lifetime.'

The project runs until October 2012.

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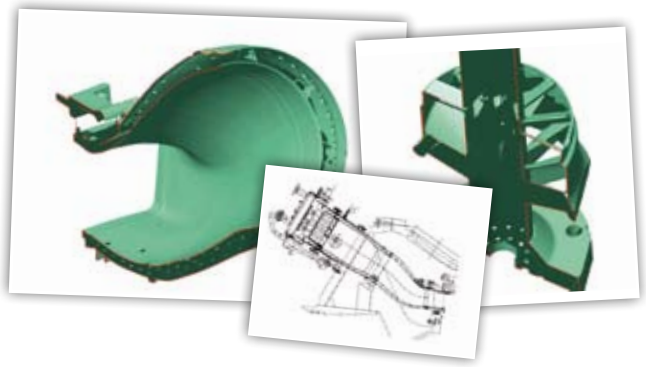

Laborelec brought together young material and combustion experts to build a simulation model of a gas turbine combustor.

In short

- The Limousine project is a new Marie Curie Initial Training network funded by the European Commission
- The project aims to extend the expertise of young engineers in thermo-acoustic oscillations in combustion systems
- Laborelec assembled a multidisciplinary team of young experts to build a simulation model of a gas turbine combustor based on real-life data

Initiating activities in Germany

In the next weeks, Laborelec will be starting up its activities in Wuppertal, Germany. Together with Wuppertaler Stadtwerke Energie & Agentur (WSW) and COFELY, we will offer a complete range of energy services, from energy efficiency studies to contracting.
'Our German branch office will operate as a 100% daughter company of Laborelec Belgium. The new branch will reinforce WSW in their energy performance contracting and will develop an energy management system offer for industrial companies that conforms to German regulations,' explains Laborelec CEO Bart Boesmans. 'The new operations in Germany constitute yet another major advance in our international growth strategy.'

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Laborelec and WSW sign agreement for collaboration in the German market.

(from left to right: Rudy Van Beers (Director Electricity, Grids and End-Use Laborelec), Ulrich Rieke (Manager Product Development WSW Energie und Wasser AG), Andreas Feicht (CEO WSW Energie und Wasser AG), Marcel Didden (Business Developer Laborelec), Bart Boesmans (Managing Director Laborelec), Uwe Selberg (Sales Manager WSW Energie und Wasser AG)

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