Minutes of Meeting

VGB-Technical Committee:	**Generation and Technology**
VGB-Working Panel:	**PGMON**
	Power Generation Maintenance Optimisation Network
	45th Meeting on 18./19. 10. 2012 in Kopenhagen

Agenda

TOP 1: Optimization of DeNOx related Maintenance and Operation
Henning Lundstrom, Vattenfall

TOP 2: Key figures for the maintenance process
Heinrich Grimmelt, VGB

TOP 3: Experience with CBM
Niclas Sjögren, Rovsing Dynamics

TOP 4: Ways of the renewal and reconstruction of the equipment - coal power plants of CEZ Company.
Milan Andrejkovič, CEZ

TOP 5: Increased plant efficiency and plant safety by means of Bang&Clean
Markus Bürgin, Bang & Clean

TOP 6: Experiences with repair of the boiler in Melnik Power plant
Miroslav Krpec, CEZ

TOP 7: Use of a database with damage investigations for structural analysis of failures
Henk Wels, Kema

TOP 8: Detection and monitoring of compressor instabilities (rotating stall) on a heavy duty gas turbines
Antonio Alarcon, Laborelec

TOP 9: Experiences with Induced Draft Fans following a Flue Gas Cleaning Retrofit
Nicholas Codd, ESB

TOP 10: Place and date of next venue

TOP 1: Optimization of DeNOx related Maintenance and Operation
Henning Lundstrom, Vattenfall

The Danish government has increased the NOx emission fee 5 times to 3.3 euro/kg to encourage the power plants to reduce the NOx emissions.

With this back ground all aspects of operation and maintenances have been addressed and presentation in a comprehensive report. A potential reduction of approx. 10 % has been identified.

Maintenance plans and maintenance frequencies shall be reconsidered for all parts of the NOx reduction system, e.g. fuel mills - burners - ammonia injection – catalyst -etc.

A catalyst management program has been sat up and the need for verifying boiler CFD models will be investigated.

R&D must be aware of the special demands to catalysts when burning biomass.

During daily optimization of the operations mode one must pay attention still to have the quality of fly ashes and gypsum with in the specified qualities.

TOP 2: Key figures for the maintenance process
Heinrich Grimmelt, VGB

A Working group has created a VGB Standard which helps the maintenance people to judge and to optimize their processes in the maintenance field. The processes are shown in so called bath lanes diagrams. Most important process steps are described with a key figure, less important steps are combined with a check list. Example: If a fault report of a component is well done, nobody has to go to the component before preparing the necessary maintenance. The Standard will be published in November 2012.

TOP 3: Experience with CBM
Niclas Sjögren, Rovsing Dynamics

RD’s OPENpredictor solution empowers management within the Power generation industry to optimize operations which leads to higher asset availability (higher revenue) and decreased risk (reduced cost and higher reliability). Analysis of industry shows a potential to increase availability/revenue by 10%, by introducing condition or predictive based maintenance strategy. In order to do so a tool which monitors the real condition of critical machines is crucial.
Some of RD’s customers within the power sector who have implemented this strategy and using OPENpredictor™ to support it are utilities such as EDF, gasNatural fenosa, DONG and OEMs such as Alstom, Hitachi and Winergy/Siemens. Some other examples within Oil&Gas sector are BP, Petrobras and TAQA.

OPENpredictor™ offers a complete framework for supporting CBM. All modules are accessed through the same software interface and include Condition Monitoring (on and off-line), Reliability Monitoring, Performance Monitoring (forecast of performance degradation) and AutoDiagnosis (for developing as well as instantaneous faults). OPENpredictor™ is developed based on Fault Development Technology, where all potential faults for all components within a plant are monitored on-line. OPENpredictor™ detects faults very early on and allows the user to focus on the cases where a potential fault is developing as opposed to view all data for all potential faults, which is near an impossible task.
Stadtwerke Bielefeld (SwB) implemented OPENpredictor™ in 2004. SwB is a fairly small combined cycle plant producing 80MW power and providing district heating for the city of Bielefeld using 1 GT and 4 STs. SwB is winter operation only and need to have 100% availability on demand, normally 4000 operating hours per year. Objectives were to decrease cost of maintenance and reduce risk of unscheduled downtime. SwB wanted to move from time-based to CBM for critical machines. Together with RD they made a basic criticality analysis and selected machines were downtime would reduce plant output. During operation SwB asks RD to make an analysis/report in case of alerts and alarms from OPENpredictor™. Once a year RD provides a service report advising on maintenance which SwB use as a basis for their maintenance during summer overhaul. The results SwB have achieved is a reduction of maintenance costs of 50% and avoiding unscheduled downtime. Return on investment was 2 years.

TOP 4: Ways of the renewal and reconstruction of the equipment - coal power plants of CEZ Company.
Milan Andrejkovič, CEZ

Content of the presentation:

1. CEZ GROUP
2. SITUATION
3. THE WAYS OF THE RENEWAL AND RECONSTRUCTION OF THE EQUIPMENT – CEZ COAL POWER PLANTS
4. THE PROS AND CONS, EXAMPLES
5. CONCLUSIONS AND DISCUSSION

The nowadays situation brings changing to operation of coal power plant units - coal availability and price, uncertain and unfavorable prediction of future electricity price, lifetime of units, new limits of emissions, CO2 allowances etc.
It brought changes in approach to the maintenance of conventional power plants portfolio, it had to be adapted to this new threats. But also solving of ending lifetime of units has to be adapted to this course.

We follow three ways:

1. Construction of a new unit

   This way is suitable for long-term operation - especially from the perspective of fuel.

2. Renewal of units - reconstruction of main components in one project

This way is suitable for sites with shorter lifetime expectancy.

3. Prolongation of the lifetime - reconstruction of main components only when necessary

This way is suitable for sites with uncertain or limited future operation. It brings time for following decisions.

TOP 5: Increased plant efficiency and plant safety by means of Bang&Clean
Markus Bürgin, Bang & Clean

To be added later

TOP 6: Experiences with repair of the boiler in Melnik Power plant
Miroslav Krpec, CEZ

To be added later

TOP 7: Use of a database with damage investigations for structural analysis of failures
Henk Wels, Kema

Many failure mechanisms and causes for failures of components are well known. Therefore, when investigating failures, potential mechanisms and causes could be checked efficiently in a database with earlier failure investigations. Comparison of the failure under investigation with this database can give the client a better idea whether the failure is "normal", whether it is early or late given the time of occurrence, etc.
On behalf of the utilities present in the DNV-KEMA Technical Service Agreement (TSA), an Access database was made together with a graphical presentation similar to an Event & Causal Factor Chart, as used in Root Cause Analysis. The database was filled with DNV-KEMA failure investigations of boilers and steamturbines. Not only the damage summaries already present in the TSA Closed User Group were used, all 550 DNV-KEMA reports were checked as well. It is envisaged to extend the database and its graphical tool with other damages, for instance at gasturbines, generators, transformers, etc. A link with operation conditions has to be developed further in able to assess the risk on damage when operating conditions are changed.

TOP 8: Detection and monitoring of compressor instabilities (rotating stall) on a heavy duty gas turbines
Antonio Alarcon, Laborelec

Under specific circumstances (mostly during gas turbine run-ups and run-downs) flow separation can occurs on the suction side of one compressor rotor blades, the formed wake (stagnating flow) acts as a flow blockage and the flow is redirected around it. When the size of this wake is important, it affects the flow in the neighbouring blade passages. For the neighbouring blades on the suction side (opposite to the direction of shaft rotation) this results in an increased angle of incidence, while for the blades on the other side the angle of incidence is reduced. The blades with increased incidence will tend to stall, while the blades with decreased incidence will tend to un-stall. “Developed rotating stall” is a situation where a “stall cell” is formed (a wake covering different rotor blades and passages), which rotates around the compressor annulus in the opposite direction to the shaft rotation (in the reference frame of the rotor blades), however with a lower speed than the shaft speed.
Rotating stall phenomena is not damaging if the compressor pressure oscillation amplitudes caused by rotating stall remain limited and doesn’t excite natural frequencies of compressor components, i.e. rotating stall exciting compressor blades natural frequencies can became harmful in presence of blade corrosion pits (a blade corrosion pit together with other factors can contribute to crack initiation, while rotating stall could contribute to crack propagation by exiting blade natural frequencies and causing high cycling fatigue).
Experience with a GE 9FA unit: Laborelec installed dynamic pressure sensors in some existing compressor wall taps in order to characterize the phenomenon and identify the driving parameters. The aim of this investigation project was to understand the problem in order to consolidate our position for discussing with the OEM the importance of those compressor instabilities and find possible solutions to limit the incidence of the phenomenon and avoid catastrophic incidents.
Rotating stall was identified more persistent during run-downs, when the machine reaches ~2150 RPM. Suddenly a pattern of pressure variations appears (with a frequency of 60% of the running speed). When those compressor pressure oscillations became important cause also important sub-harmonic shaft vibrations.

TOP 9: Experiences with Induced Draft Fans following a Flue Gas Cleaning Retrofit
Nicholas Codd, ESB

To be added later

TOP 10: Place and date of next venue

The next meeting will be held on 11./12. April 2013 in Amsterdam.