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Abstracts - VGB PowerTech Journal 9/2016

Editorial: Welcoming address to the VGB Congress “Power Plants 2016”

Dr. Bernhard Fischer and Erland Christensen

The electricity market and the power generation industry in Europe are still experiencing radical transformation. Corporate structures are changing. Renewables and conventional generation are having to grow together. The Paris Agreement of December 2015 raises further demands for climate protection. At the same time, we see unsettled energy markets with an extensively uncertain legal framework and a market situation burdened and inhibited by regulatory intervention. Subsidies on one side and competition on the other are counterproductive in terms of reliable power supply. There are fewer and fewer investors willing to fund the developments necessary for the future - in all sources of energy. [\[more...\]](#)

The economic situation of large hydropower in Bavaria: Increasing burdens but dwindling revenues

Klaus Engels, Carsten Gollum, Karl Heinz Gruber, Frank Pöhler and Albrecht Schleich

The current price development in the German electricity market results in significant economic challenges also for larger hydropower assets. Although an ideal partner for the transformation of the German energy system (“Energiewende”), the decline of electricity prices increasingly endangers adequate operations and sustainable investments, too. Hence, not only the renewable, emission-free, flexible and decentralised generation is questioned but also multiple additional services for the society which are not remunerated by an “energy only” market. Price determination mechanisms as well as remunerations system in general need to be reviewed - an improvement of these structures is essential for larger hydropower assets.

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Regulatory frameworks for hydropower in Europe - Comparing the examples of Germany, France and the United Kingdom

Regulatory frameworks for hydropower in Europe - Comparing the examples of Germany, France and the United Kingdom

Devid Krull, Claus Till Schneider, Michael Detering, Andrew Logie and Jürgen Seyler

The regulatory framework for hydro power in the European countries Germany, United Kingdom and France is compared. All have as a common target on the one hand an increase of the share of renewable energy production and to this means a support regime for hydro power among other renewable technologies. The respective support mechanisms in the three countries are summarised. As part of the implementation of the European Water Framework Directive the countries formulate stricter environmental requirements for water bodies leading to reduced electricity generation and necessary investments in technical adaptations.

The project Linthal 2015 - Pumped hydropower plant Limmern

Norbert Wohlkinger

Kraftwerke Linth-Limmern AG (KLL) is expanding its hydroelectric facilities by adding a flexible and powerful pumped-storage power plant (the “Linthal 2015” project). With four reversible single-stage vertical shaft Francis pump-turbines, the new plant’s pump and turbine power capacity will be rated at 1,000 MW. This will increase the overall capacity of KLL’s plants from currently around 520 MW to 1,520 MW. Machine group 1 was connected to the grid for the first time in December 2015 and load tests are currently ongoing. The plant has taken about seven years to build. Its construction is and was an impressive logistical feat.

Latest developments for an integrated automation solution for hydro power plants

Clemens Mann and Matthias Pairits

Huge market drivers as IT-technologies and telecommunication industry lead to a common platform for an automation solution for power plants covering excitation, electrical protection, hydraulic turbine governor and synchronisation. The main focus of this platform is a common hardware architecture and a common engineering tool which supports engineers during design and commissioning phase as well as maintenance engineers with easy handling. Increasing renewable energy production requires energy storage systems. A pump storage power plant is one of the efficient state of the art solutions. Challenges for both the primary measuring equipment and solutions for an electrical protection system are described as an example of the platform.

Condition monitoring for a large fleet of wind turbines

David Futter

This paper describes the challenges of providing regular monitoring to a large fleet of wind turbines. The monitoring covers vibration data coming from installed Condition Monitoring Systems (CMS) and other process data. The purpose of the monitoring service is to provide information

which allows the site teams to optimise their maintenance procedures. The results by Uniper Technologies since the start of the fleet-wide monitoring have been interesting. During 2015 over 600 alerts have been raised. SA significant number related to early detection of fault conditions, resulting in condition monitoring providing a positive return on investment.

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Holistic performance monitoring of wind farms - The iSpin Guardian approach

Harald Hohlen

Determining the true performance of each wind farm turbine is extremely difficult. Nowadays performance measurements in wind farms are limited to single turbines with free wind sectors. The spinner anemometer technology iSpin can change this situation and provide more transparency and insights in turbine performance. Due to its unique position and measurement principle in front of the rotor it is possible to overcome limitations. It is possible to measure the main aspects which define the wind input. The iSpin measurements shows high robustness for local flow conditions, different from those of e.g. a reference measurement on a prototype site. An approach is presented using these capabilities for performance monitoring and performance comparisons.

Megawatt fuel cell power plant in the industrial sector

Martin Ohmer and Katja Mattner

The fuel cell technology is fully developed and is already being used to generate electricity and heat in high power fields for industrial applications. During summer 2016 a fuel cell with a nominal output of 1.4 MW went operational at FRIATEC AG in Mannheim and for the first time a facility in Europe exceeds the megawatt threshold. The natural-gas powered fuel cell power plant was configured and build by E.ON Connecting Energies and supplied by FuelCell Energy Solutions (FCES). It will provide the specialist provider of wear-resistant materials with an annual volume of around 11.2 GWh of electricity and 6,000 MWh of thermal energy for its own use.

Standardised instrumentation and control system for centralised operation of power plant fleets

Wolfgang Gerndt

Whether used to compensate for fluctuations in power supplied from renewable energy sources or as a backup reserve when large units go offline, small, distributed power plants equipped with gas turbines or designed for combined heat and power production are playing an increasingly important role. Local on-site control stations at such plants, however, are not ideally suited for fulfilling these tasks. One alternative is to establish central control stations that enable coordinated control of entire power plant fleets. The individual plants' control rooms, however, are almost always equipped with differing instrumentation and control systems, depending on when they were built

and their budget. Standardizing those local systems would be very costly. It would be much more efficient to retain the local infrastructure and establish a common operating interface at the central control station. Instrumentation and control systems such as the SPPA-T3000 from Siemens are capable of doing this.

Flexibility by individual boiler optimisation

Gunter Bentsch

BORSIG Service GmbH has significantly increased the flexibility of the steam generator at a paper mill in Lower Saxony. Prior to the optimization of the plant, the paper mill's steam demand had decreased and the cost of gas used had risen considerably. The paper mill has one coal-fired and one gas-fired boiler, each with a steam capacity of 60 t/h at approx. 60 bar and 500 °C live steam temperature. In the 1990's, the company installed a gas turbine with an output of 5 MWe. In the future, the cheaper coal-fired boiler should cover the majority of the reduced steam demand. The gas-fired boiler should only operate with GT exhaust as a heat recovery steam generator without supplementary firing and a steam generation of approximately 8 t/h. At the same time, all other operating modes should remain available if required. The BORSIG Service GmbH solution comprises the installation of convective heating surfaces in the bypass duct and the implementation of innovative instrumentation and control.

Lighting-up of pulverised solid fuels at electrically heated fuel nozzles

Bernd Stoll, Waldemar Huwa, Michael Lüpke and Alfons Leisse

The bituminous coal operated dual blocks at "Gemeinschaftskraftwerk Hannover" supply the VW Hannover and Conti Hannover manufacturing plants with power, process steam and heat as well as the Hannover Public Services with power and district heating in cogeneration. At total capacity the power production accounts to 230 MWe_{el} with simultaneous heat extraction of 430 MW_{th}. Within the scope of optimisation program the power station succeeded in reducing fuel oil consumption rapidly for ignition purposes since boilers commissioning period. The installed pulverised coal burners of the DS type are characterised by distinctive stability behaviour over the whole service range and consequently allow a trouble-free operation during extremely low burner or boiler loads.

Laboratory investigation on the effect of SRHT-temperature on the sensitisation state of the heat resistant austenitic Cr-Ni steel HR3C - applicability of the electrochemical potential-dynamic reactivation (EPR) method

Sven Schmigalla and Sabine Schultze

By using the example of the heat resistant austenitic Cr-Ni steel HR3C (X6CrNiNbN25-20) it is demonstrated how the heat input due to welding as well as due to stress relief heat treatment

(SRHT) can cause sensitisation of this alloy. Especially the effect of SRHT procedures became of special interest during the last years owing to the application of type T24-boiler steel that requires such a procedure to prevent stress induced cracking during plant commissioning. The present paper reports about the applicability of the electrochemical potentiodynamic reactivation (EPR) method to detect critical sensitisation states on the alloy HR3C.

Experiences with the VGB-R 165/VGB-S 165 by the implementation of current requirements for improving the safety of H2 in operating turbogenerators

Sven Arndt

To improve the H2 safety in a harmonised European market, the VGB-R 165/VGB-S 165 gives uniform recommendations to manufacturers and operators. The article describes measures to implement the VGB-R 165/VGB-S 165 to improve the H2 safety for hydrogen-cooled generators by way of examples. On the basis of representative generator sets technical solutions, practical examples and consequences will be shown, which can be used for design of new or operation of existing power plants. Already successfully implemented services show that the measures taken to prevent or restrict an explosive atmosphere significantly increase security for staff and power plants. At the same time could be achieved in an individual case an upgrading of the installation, as well as increasing the availability and maintenance expenses, plus minimization of other maintenance costs.

Our green steam-turbines contribute to the world-wide climate protection

Klaus Behnke

Interview with Dipl.-Ing. Klaus Behnke, Vice President Head of Engineering Steam Turbines, MAN Diesel & Turbo, Oberhausen, about the value of steam turbines for global climate protection. The interview was conducted by KlimaExpo.NRW and Klimametropole RUHR 2022.