

The 240 MVA Motor Generators for the Pumped Storage Power Plant Reißeck II – An electrical rotating machine beyond threshold

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The motor generators for the pumped storage power plant Reißeck II of VERBUND Hydro Power (VHP) are among the most challenging generators in design and manufacturing for ANDRITZ HYDRO during the last decade. The new cavern power plant connects the existing Reißeck/Kreuzeck and Malta group.

With a rated output of 240 MVA, 50 Hz, and a rated speed of 750 rpm, these generators are in the midst of the most powerful units globally considering the output per pole and air as cooling medium.

On one hand the technical tender explicitly favours very low losses and consequently efficiency rates above 99% in operation. On the other hand very restricted values for stress limits, life time and rotor dynamics require a very robust but highly utilised design. For instant 6 start-stops per day for a lifetime of 70 years have to be taken into account and proven by calculation according design guideline “FKM – Forschungskuratorium Maschinenbau” with a safety factor of 2.

By fulfilling all technical requirements a special pole fixation design had to be reactivated and incorporated in modern design and manufacturing issues. Special design features and 3 D CFD and CHT (Computational Fluid Dynamic and Conjugate Heat Transfer) computation techniques for extreme low ventilation losses had to be employed. By calculating the entire efficiency rate (without bearing losses as specified by the customer) a guaranteed value of 99.24% resulted in the entire optimisation of the design.

This paper describes the specific generator design features to meet the high requirements and represents the latest commissioning measurement results confirming the performance of the generators. It also will give an indication, if such high efficiency rates are the top limit of large hydro generators.

Werner Ladstätter, MBA graduated in Electrical Engineering at the University in Graz, Austria. He worked several years for Alstom Power in Switzerland, where he started his career as an electrical design engineer and became later responsible for stator design of turbogenerators. In 2005 he took over the responsibility of the R&D department of High Voltage insulation at Isovolta Group in Austria. In June 2011 Mr. Ladstätter moved to ANDRITZ Hydro and has been in charge of R&D of hydro- and turbogenerators in Weiz-Austria and in 2015 he took the responsibility for the engineering of hydro generators in the same company.

Since 2008 he has been member of the IEC working group TC 2 / MT 10 for the “Qualification, Tests and Diagnostics of Winding Insulation Systems for Rotating Machines”.

Matthias Gerhold graduated in Mechanical Engineering from Graz University of Technology in 2000. Since then he has been working for ANDRITZ Hydro as a mechanical analysis engineer. He is in charge of the Mechanical Analysis group for hydrogenerators and since January 1st 2013 Principal Engineer for Mechanical Structures.

Dr. Florian Senn

Florian Senn, born in Innsbruck/Austria in 1980, graduated in electrical engineering with focus on high voltage engineering at Graz University of Technology in Austria, receiving his Master's Degree (Dipl.-Ing.) in 2005 and Doctorate Degree (Dr. techn.) in 2010, both with honours. Since August 2005 he worked in the electromagnetic design of hydro power generators and development of high voltage insulation systems for rotating machines before joining VERBUND Hydro Power GmbH in June 2010.

He currently works in the department of Electrical Engineering and Control Systems, heading the Electrical Machines Team since July 2014. Besides key activities in the area of condition assessment, maintenance and engineering of generators and power transformers he is project manager for hydro power plant refurbishment projects.

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Was born on May 25th 1966 in Klagenfurt/Austria. After graduating at the technical high school in Klagenfurt, he studied in the fields of electrical engineering at the Graz University of Technology, where he graduated in 1995. Since 1995 he has been working for Verbund Hydro Power GmbH and since 2014 he is the head of the department Electrical Engineering and Control Systems. In 2011 he became the head of the expert committee „Elektrische Maschinen der Österreichischen Gesellschaft für Energietechnik im Österreichischen Verband für Elektrotechnik“.