

## OP 415

### Experimental and computational fatigue strength analysis of typical penstock welds

**Claudia Pollak-Reibenwein**

*ANDRITZ HYDRO GmbH, Linz, Austria*

In the course of a pumped-storage hydro power project executed by ANDRITZ HYDRO GmbH, fatigue tests were carried out on welded high-strength steel specimens made of S500ML and S690QL.

The most common used pipe welds of steel penstocks – the longitudinal butt welds and the circumferential backing-strip welds – were investigated by laboratory testing to validate the required material and welding parameters specified for this project. Another aim was to show that the fatigue evaluation of these main welding details corresponds well to the experimentally derived SN-curves based on the tested specimens. In the best case, it should be shown that prior calculation carried out by means of different stress assessment techniques following guideline-based assumptions - in this case IIW's "Recommendations for Fatigue Design of Welded Joints and Components" - might be conservative compared to the experimental results.

In addition, following questions should be clarified: Does material strength and does welding process influence the fatigue life of the welded components, since these factors may be of economic relevance? The former could be clearly verified for the backing-strip specimens made of S690QL, the evaluations of the fatigue tests showed a significantly higher SN-curve.