

Internship Plan

Weir Minerals

Weir Minerals Netherlands (Venlo), established in 1916, is part of the Weir Minerals division, spread over 20 production companies and several service centers across the globe.

Weir Minerals designs, produces, and sells technologically high-quality capital goods, like High Pressure Grinding Rolls (HPGR) and Pumps. These products are used around the world in major industry sectors including mining industries. As a global market leader, we are at the forefront of making the mining industry more sustainable.

The VTG (Venlo Technology Group) hosts all innovation projects and provides support for all other departments within the organization where cost reduction, product improvement and increased service to customers are highly valued. We remain accountable from request through delivery to aftercare and support within service trajectories. Weir Minerals Netherlands functions as knowledge hub for displacement pump technology and high-pressure grinding rollers within the Weir Group. Continuously pushing the boundaries of our knowledge is of paramount importance to our department.

Background/Challenge:

GEHO PD Slurry pumps are used in continuous duty applications in the mining and mineral processing industries, with typical design lives of 25 years. The abrasive and potentially chemically aggressive slurries transported by the pumps have a severely detrimental effect on the fatigue behaviour of the pump components. To provide components fatigue strength in such aggressive conditions, a special kind of expensive stainless steels is normally used.

The autofrettage compressive residual stress technique has been shown to increase fatigue performance of the high pressure components by significantly reducing mean stress levels in highly loaded locations. This allows further optimization of material used in pump components as well as the use of less expensive carbon steels instead of stainless steels. This will improve sustainability as well as economic parameters.

Internship Topic : Finite Element Simulations of Autofrettage Applied to GEHO PD Pump Fluid Ends.

Period : 3-5 months

Prerequisite : The intern student must be currently enrolled in a Master study in Mechanical Engineering and must be pursuing his/her study in the direction of Finite Element modelling in Structural Mechanics and have basic understanding of the plasticity phenomena in steels.

Internship Goal:

The autofrettage procedure is a technique of inducing plastic strains in pressure components by application of pressure overload. Such overload introduces residual compressive stresses into pressure components, which leads to decrease of fatigue stresses under operating pressure conditions. The autofrettage method is to be applied to GEHO PD pump fluid end parts and simulated according to the rules determined by WMNL development engineers. The

goal of the internship is application of this simulation procedure to multiple GEHO fluid end sizes, which involves the following steps:

- Application of the Finite Element method in MSC Marc/Mentat software to obtain the autofrettage compressive residual stress field through series of simulations involving nonlinear contact and plasticity problems.
- Application of fatigue calculation in nCode software for the parts with induced autofrettage compressive residual stresses obtained from FEM simulations.

Information?

For more information about this internship please contact Frank Schuurmans via frank.schuurmans@mail.weir or approach Stefan Luding via s.luding@utwente.nl