

Project description

Feasibility study on an electric fish barrier

The environmental engineering client was tasked with preventing the migration of juvenile fish through the water intake for a power plant. This is to be done by an electrical barrier consisting of several electrodes with different voltages. It is designed to produce an approximately linear increase in the electric field in the direction of flow in the water intake. Fish are thus prevented from swimming into the water intake. Since the fish are to escape against the flow, they must not fall into galvanic anaesthesia, as is usual with electrical barriers.

It had to be clarified whether the electrical barrier at the water intake could be realised and safely operated. In the first step, I created a realistic model of the water intake. In the process, I first had to digitize old plans.

An approximately equal electric field strength in the water over the entire cross-sectional area of the water intake was required. I then optimised the electrode configuration and the voltages at the individual electrodes in several iteration steps. Thus, the desired fields could be achieved. Through measures in the design, it was possible to prevent the fish from swimming to the excessive fields directly at the electrodes.

By using the AC solver, I calculated the electrical resistances and capacitances at each electrode. These values were the basis for a network model that combined electrodes and generator. This allowed me to calculate the necessary generator power for various operating parameters.

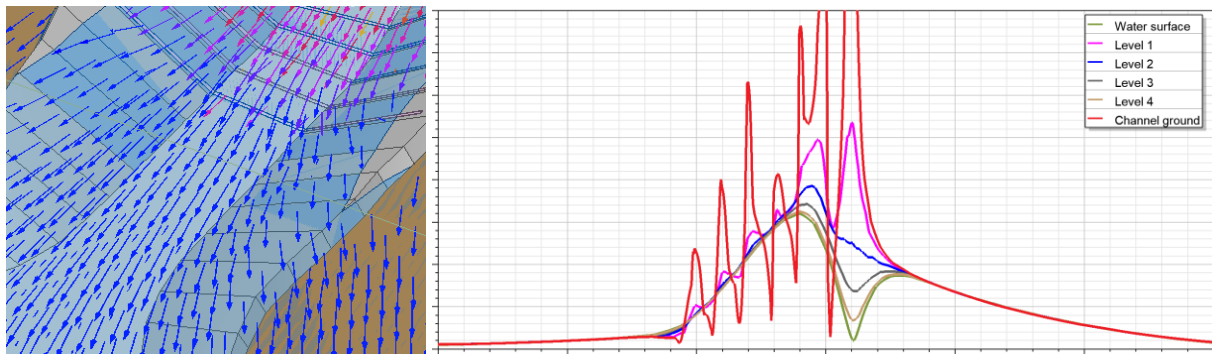
All the requirements for the electrical barrier at the water intake I have met by the elaborated concept.

This study should also examine whether there are any aspects regarding safety that make it impossible to install the electric fish barrier. I found nothing in the investigation that could not be solved by appropriate measures.

I estimated the investment costs for the proposed concept by means of quotations and price lists. I also analysed the possible maintenance of the electrical barrier and the running costs.

The results of this study are the basis for the decision to implement the electric fish barrier at the water intake.





Targets and key figures



- ✓ Water intake digitised from old plans
- ✓ Configuration and geometry of the electrodes optimised
- ✓ Voltages at the electrodes calculated and generator designed accordingly
- ✓ Safety aspects analysed and measures to reduce risks developed
- ✓ Investment and operating costs estimated
- ✓ Maintenance effort analysed



July - December 2022



Budget CHF 30,000



Independent project work



Environmental technology

Testimonial

«Reinhard brought a diverse and valuable expertise in electric field modelling and pulse generator design. He was able to integrate the specifications of the situation and document the subject matter to enable constructive exchange throughout the project. His network also enabled him to propose interesting measures for risk analysis and hazard prevention.»

Project manager of the client

