

ELECTRIC FENCE

BARRIER FOR THE SAFEGUARDING OF FISH FAUNA.



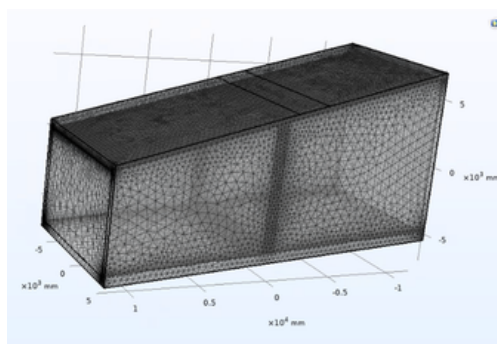
ELECTRIC FENCE

GENERAL DESCRIPTION

The HVEX Electric Barrier is an environmental protection system engineered to prevent fish from entering the suction structures of hydroelectric turbines through the use of controlled low-frequency electric fields. With a continuous operational capacity of up to 120 kVA, the barrier consists of tinned electrolytic copper electrodes affixed to epoxy-reinforced fiberglass structural frames, which exhibit exceptional resistance to abrasion, submersion, and corrosion. The system is fully automated and monitored via an industrial PLC, functioning both locally and remotely with adjustable intensity ramps and Modbus TCP/IP communication. Its architecture facilitates integration with the existing SCADA systems of the power plant, delivering real-time data on voltage, current, conductivity, and water temperature. This solution was developed from an R&D project undertaken by HVEX, validated in both laboratory and field settings with over 20 native species from the Tocantins, Araguaia, Amazon, and Paraguay river basins.

PRIMARY APPLICATIONS

- Hydroelectric Power Plants (HPPs) – safeguarding of Kaplan, Francis, and bulb turbines;
- Water intake and conveyance systems – preventing the ingress of aquatic fauna;
- Pumping stations and locks – safeguards against bioinvasion and pump malfunction;
- Transposition systems and diversion channels – management of species migration;
- Environmental mitigation initiatives – adherence to environmental licensing regulations (IBAMA, CONAMA, ANA).

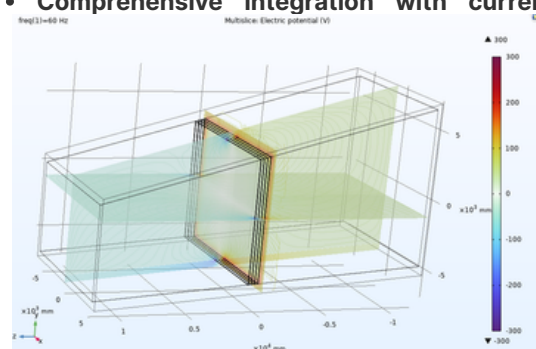


• SYSTEM FUNCTIONALITY

- Electric Field Generation – Frequency inverters modulate alternating voltage between 20 and 120 Hz, establishing a repulsion zone on the submerged plane.
- Active Monitoring – conductivity meters and field sensors assess the intensity of the electrical gradient in real time;
- Intelligent Control – the PLC dynamically modifies the signal based on the water's conductivity and temperature;
- Recording and Monitoring – data is transmitted to the SCADA system, including alarm history, logs, and environmental indicators;
- Environmental Protection – the electric field operates in a non-lethal manner, repelling fish and safeguarding the ecosystem.

• ADVANTAGES AND DISTINCTIONS

- Demonstrated environmental protection reduces fish ingress into turbine suction zones by as much as 95%.
- Nationally developed and patented technology, created by HVEX in collaboration with universities and Eletrobras, tailored to Brazilian fish fauna.
- Turnkey installation encompasses comprehensive delivery, including design, manufacturing, assembly, commissioning, and training.
- High structural durability, along with anti-corrosive and abrasion-resistant materials, guarantees a lifespan that exceeds 10 years.
- Automated and secure operation, integrated safeguards, user-friendly interface, and automatic logging.
- Regulatory compliance: Adheres to NR-10, NR-12, and international electrical and industrial safety standards.
- Comprehensive integration with current SCADA h Modbus



ELECTRIC FENCE

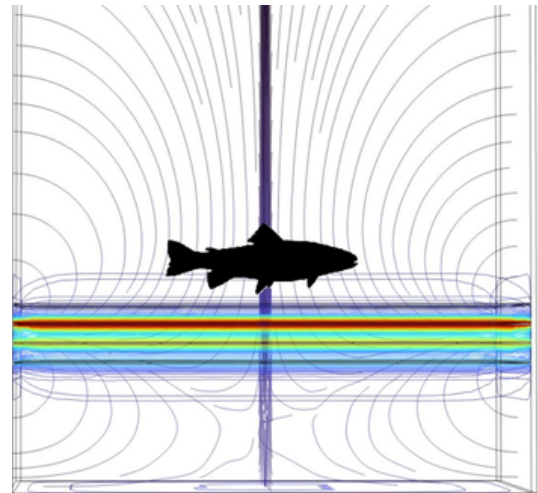
- **SYSTEM FUNCTIONALITY**

For each power plant, an engineering design is developed for the electrical configuration and gradient.

- Grounded in computer simulations and historical testing.
- Design;
- Mash (integration gradient);
- Frequency domain analysis;
- Laboratory simulation involving target species.

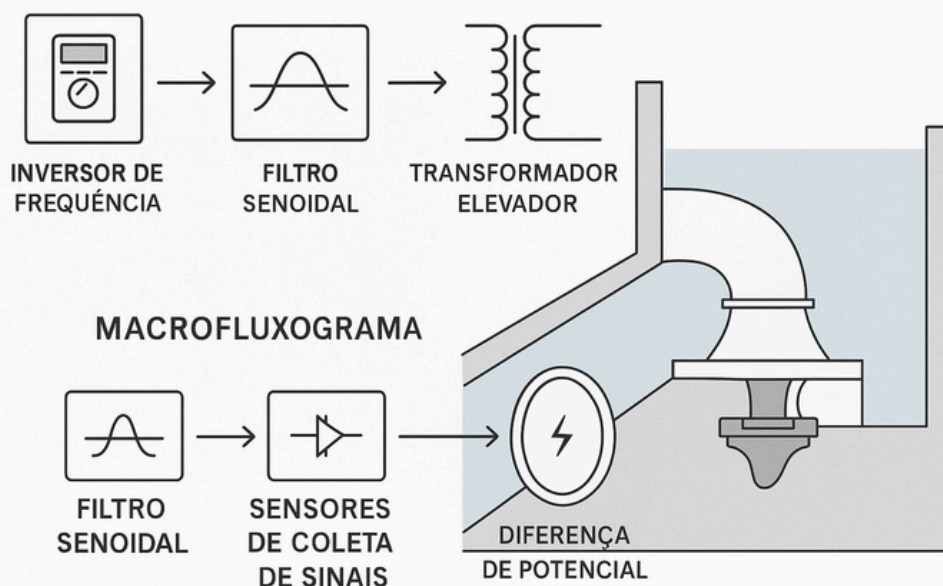
- **OPERATIONAL PERFORMANCE**

- The frequency inverter produces modulated electrical signals.
- The sine wave filter enhances the signal's smoothness, thereby preventing distortion.
- The transformer elevates the voltage to energize the rings.
- The rings generate a progressively intensifying radial electric field directed toward the spiral casing.
- The sensors identify fluctuations in the field and the presence of fish.
- The control panel autonomously modifies the parameters to ensure the barrier's effectiveness.



BARREIRA ELÉTRICA DO ANEL PARA REPULSÃO DE PEIXES

Promove interferências elétricas crescentes e homogêneas nos peixes



Technical Specifications

Nominal Capacity	50A 250kVA
Number of Phases	Two-phase
Prohibited	380 V Three-phase $\pm 10\%$ + Ground
Output voltage	2P + Ground, output voltage ranging from 0 to 980 V
Adjustment accuracy	$\pm 2\%$
Efficiency	$\geq 96\%$
Frequency	20 to 60 Hz (established during calibration)
Conductive substance	Copper or aluminum
Insulation resistance	$> 5 \text{ M}\Omega$
Isolation Level	2500 VAC sinusoidal for one minute without flashover or breakdown.
Protective function	Protection against short circuits, undervoltage, overvoltage, phase failure, underfrequency and overfrequency, ground faults, ground overcurrent, and directional overcurrent.
Instantaneous overload capability	1.6 times nominal for 1 minute
Remote Controller	Communication through Modbus TCP/IP
Weight	250 kg to 1 ton

We offer solutions aimed at enhancing the efficiency and quality of the power generation, transmission, and distribution sectors. With a highly specialized team proficient in research, development, and innovation, HVEX has created customized solutions for the Brazilian market. Our extensive product range includes solutions specifically designed for signal transduction in measurement and protection.

HVEX

Driving Innovation



☎ 35 3622-2699

✉ contato@hvex.com.br

🌐 www.hvex.com.br

📍 R. Ismael Pinto de Noronha, 86,
Nossa Sra. de Fatima, Itajubá-MG