

Hydro Kinetic Energy Harvesting for Wastewater Treatment Facilities

Control #: 1411-xxxx

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- Technology Summary:** The Converter is a radically different technology
- Harnesses MHK energy even from slow currents/rivers/tides (2kt)
 - Mimics fish-school kinematics which employ alternating lift
 - Enhances and controls catastrophic instabilities to induce alternating lift
 - Is environmentally compatible
 - It is simple: cylinders oscillating on springs driven by natural fluid-structure interaction instabilities
 - Achieves high power-to-volume density by close school formation
e.g., 480-602 W/m³ in 3knots currents (wind farm equivalent 0.01 W/m³)

Key Idea / Takeaway:
Use the effluent from the Wastewater Treatment Facility of the city of Ann Arbor, MI, along with the flow of the Huron River, where the effluent is discharged, to harness up to 10kW in an environmentally friendly way.

- Project Goal:** Generate clean renewable energy from the effluent of the Wastewater Treatment Facility of Ann Arbor, MI, along with the Huron River flow.
- Adapt the VIVACE Converter to the topography,
 - Optimize its harvesting efficiency through controls,
 - Produce a manufacturable design that can be easily deployed and maintained.

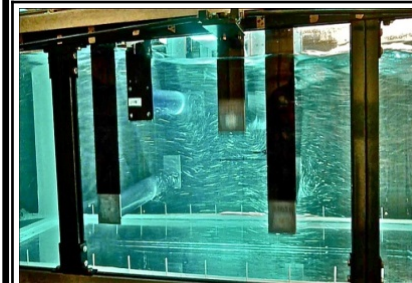


Figure 1: 4-cylinder converter in the MRELab recirculating channel, 2005

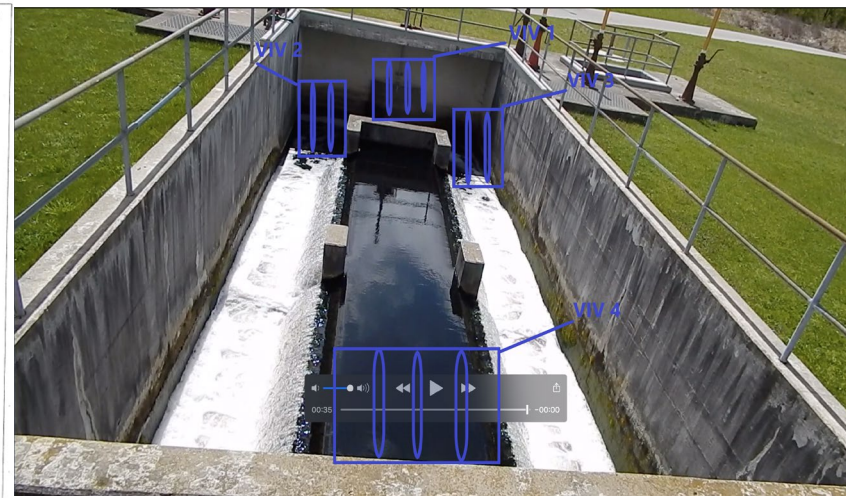
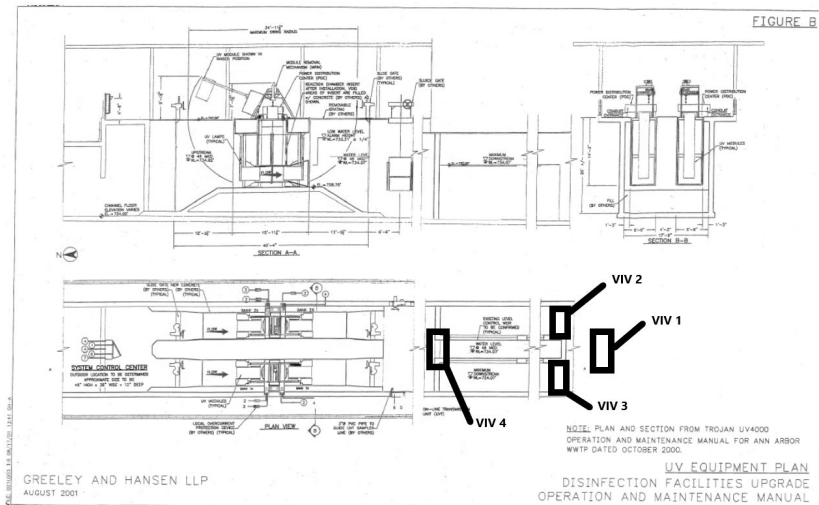


Figure 2: Deployment in a canal in the Netherlands, January 2013



Figure 3. Oscylator-4 deployed in St. Clair River, Port Huron, MI; 2016.

One of the locations of deployment at the city of Ann Arbor facility:



- Impact:**
- Use wastewater and discharge river flow to generate up to 10kW
 - Can supply electricity to 10 households
 - Clean renewable energy
 - Environmentally compatible by concept since it is based on fish-school biomimetics
 - First prototype of its kind that can be placed in over 16,000 municipal wastewater plants in the USA
 - Numerous other plants discharge water into rivers; e.g. cooling towers