



The Renaissance of River Mills

Current in the river – there is much potential to obtain electricity, even in tributaries. The “Fluss-Strom Plus” centre of growth from the German Federal state of Saxony-Anhalt investigates ecologically compatible floating hydropower plants.

Evidence that boat mills or river mills worked on German rivers can be found back into the 6th century. They used the power of the running water to drive their millstone. In the region of Magdeburg, today’s capital of the Federal state of Saxony-Anhalt, over 20 such water mills floated on the Elbe, providing the towns in the hinterland with their milled and ground products. In the Altmark region, in what is now the North West of the Federal state, there was the highest density of water mills found anywhere in Germany. However, they stood in the way of the revival of the shipping industry at the end of the 19th century and disappeared from the riverscape.

An old boat mill from 1874 was renovated in Magdeburg as a technical monument and returned to the banks of the Elbe. Mario Spiewack and Heiko Krause, the two coordinators of the Fluss-Strom Plus centre of growth, want to incorporate it in order to awaken public interest for their project.

Modern technology for old concepts

Fluss-Strom Plus is a research association made up of 19 companies and seven research facilities, which are investigating the possibilities of ecological energy production from the river. Heiko Krause points out that the idea of obtaining electricity from the power of the water is not new. However, the cost of guaranteeing ecological consistency with conventional hydropower stations is very high: “We want to develop systems which do not interfere with the ecological equilibrium of the environment.” The engineer Heiko Krause comes from Thuringia’s Geraberg, where the Gera flows.

“In my hometown alone, there were 15 water mills,” he says. The idea that you could modernise the old mills and create electricity with them has followed him from an early age and has been taking shape in his engineering firm in Plauen for a number of years. Of course, he was part of it when the “Netzwerk Fluss-Strom” was founded in Magdeburg in 2008. It is housed in the Experimental Factory on the campus of the Otto-von-Guericke University and currently works with 38 partners from research and industry on the development of mobile micro hydropower plants. Mario Spiewack is the one who connects the dots and gets more and more new partners on board, in the proverbial sense. Speaking of boats: Spiewack says he already had ideas about floating energy technology even during the development of pontoon boats within the INNOBOOT research network.

Always on the go, as he is now, he also made contact with the “Wasserkraft-Altmark” association. This is where Spiewack and Krause met for the first time. Heiko Krause and his engineering firm had supported a student project in Salzwedel. The girls and boys had built the prototype of a floating hydropower plant and tested it out on the River Jeezel. It is simplicity that is difficult to make. Heiko Krause and Mario Spiewack now consider this project to be the initial spark for the rebirth of the river mill as a hydropower plant. Heiko Krause puts the functionality into simple terms: “A paddlewheel is mounted between two floats, like you get on pedal boats. This mobile is anchored into the river and propels a generator. The electricity obtained must then be channelled onto land.”

If that is so easy – why did the Federal Ministry of Education and Research finance the “Fluss-Strom Plus” innovation forum in 2012 and the centre of growth of the same name since this year? The experts chuckle. It is not so easy to effectively implement the simple principle in practice. “Generator, floats, ... everything has to be redeveloped because water is virtually incalculable,” replies Heiko Krause. “Water changes its flow speed with virtual unpredictability and the flow direction as well, depending on the water level. All the parts of a floating power station have to be adjusted to this. Even if the float lands on the bottom of the river at low tide, it should still be possible for the wheel to turn freely and supply electricity.”

“The challenge exists in finding the right solution for each location of these hydropower plants,” adds Mario Spiewack. “The environmental compatibility must also be proven.” For example, a fish-friendly, incremental dam is being developed with partner companies, so that fish can pass the hydropower plant both up and down river. With other industrial partners, cost-effective solutions for the cable connections and the transportation and supply of electricity into the grid must be developed according to the project coordinators.

“River Rider” for Europe and South Africa

There have long since been components for the small hydropower plants, since engineers usually find their fulfilment in construction, rather than stopping at visions: Float, energy converter, flotsam deflector, generator and control technology. For the last two years, a trial catamaran has been floating on the Elbe in Magdeburg and on the Elbe-Havel Canal. VECTOR has been developed by partners from industry and research and is used for the fatigue tests of turbines and paddlewheels of various manufacturers, for example. “Nowadays, such components are made from new materials with specific properties, which also place their own specific demands on the construction of our micro hydropower plants,” says Mario Spiewack.

For the last few years, the first “River Rider” micro hydropower plants have been tested on the Rhine, on the Neisse and in the Harz. They continually and reliably supply electricity – as well as lots of data and test results. These are incorporated into the development of marketable and affordable, mobile river-based hydropower plants. Mario Spiewack and Heiko Krause say demand is being registered all over Europe and even in South Africa, Argentina and Columbia. Both are confident. The “River Rider” water wheels will paddle to the top of the global market.

Caption: The “Fluss-Strom Plus” project managers, Heiko Krause and Mario Spiewack (from left) stand in front of the reconstructed boat mill from Magdeburg, which is more than 100 years old.

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