

## REASONS FOR USING THE SEDIMENT VACUUMING TECHNOLOGY IN THE ACCUMULATION LAKES

Using the example, the application of the technology for cleaning the deposits from the accumulation lake on the Danube River, Hydroelectric Power Station Djerdap I

Technology used today	Innovative technology
A ship with a dredger or a suction line, which uses a tremendous amount of diesel as a fuel	A drainage pipe system and a smaller power non-diesel engine at the vessel is used, the pipe system uses a small amount of lake water as propellant fuel, less than 1%
An additional barge is used for the disposal of the cleared deposits	Sediment separation is used downstream from the dam, where those separated materials are a valuable asset
The deposits are transported to the separation point on the shore or disposed downstream of the dam. This costly method is consuming diesel in large quantities and is producing an enormous carbon footprint	The deposits are directly deposited in the separations, downstream from the dam, or if it required, they are deposited straight back in the stream without the use of diesel, the water from the lake is used as the propulsion fuel
The ship engagement is seasonal, the ship is reserved at the site of the accumulation lake, and it continually works to be profitable, employed. Such work operations are endangering the ecosystem of the river, especially when operating at low water levels	The vacuuming pipe system and the vessel, with the necessary equipment, is installed on the dam as an integral part of the hydroelectric power plant so that the deposits are cleaned as needed even in the river high water season
The ship works in one place, it mostly collects all the sediment layers as a whole, because in this case, the time is money	The map with the size and state of the deposit in the accumulation is made, the pipe system is positioned as needed on a specific surface of the deposit, and a certain portion is selectively grabbed over the surface and depth of the deposit
The suction of the deposits is very rough, and it all gets mixed; therefore, it is more complicated to separate it later if necessary	Suction is carefully done, and it is exact, it is sucked on the surface of the layer and the depth of the deposits, with the intensity of suctioning only the floating sludge, to the possibility and need to collect other heavier materials and rocks
Djerdap I, for 40 years, has deposited the amount of 400.000.000 m <sup>3</sup> of sediments, for its removal, it is needed to allocate min. 2 euros / m <sup>3</sup> = 800 million euros	To remove 400,000,000 m <sup>3</sup> of application, it is necessary to install a technology worth 60 million euros with a working process = 80 million euros = 0.2 euro/m <sup>3</sup>
For the next 40 years, it is necessary to allocate an additional 800 million euros	In the next 40 years, it is necessary to allocate an additional 20 million euros, where the total investment is covering itself from the additional earnings of the system
In the process of transporting the deposits, a river barge is used on which 1000 m <sup>3</sup> of deposits with extra water is placed = 400,000 full barges	In the process of the deposits transport, a pipe system is used, which casts off the deposits downstream from the dam with the 0 transport costs

<p>Lake Djerdap I, over 100 km in length, in it, the sediment is evenly distributed with the increase of its quantity towards the dam, so we can count 1/3 of its length as the average distance of the transport, 33 km x 400,000 barges with the deposits cover the range of 13,200.000 km in one direction, and the same length on the way back</p>	<p>The transport is done by tens of kilometres long pipes, partly arranged along the length of the lake. Transportation is a part of the deposit extraction work process, which is automatically shifted under the dam, so technically this type of transportation is the most adequate and the cost is incomparable</p>
<p>The hydroelectric power plant with this technological process has a huge and a constant maintenance costs, which threatens to make it unsustainable and unprofitable with the future additional cost of complete removal, which has an immeasurable environmental consequences</p>	<p>Hydroelectric power plants with an innovative technological process of sustainable work, have steady additional income and not expenditures, the costs of maintaining the lake deposit are low, so the dam with the accumulation lake in the future is a stable category, without harmful gases and with a vast improvement for the ecology and its sustainability</p>
<p>20 million people living in the upper Danube River Basin ease their needs every year polluting the water for 40 years. It continues to happen with higher and higher intensity, making it an ecological bomb until the moment that Djerdap I accumulation lake becomes an environmental catastrophe</p>	<p>Instead of toxic biological gasses, technology offers pleasure on accumulation lake Djerdap I, hospitality industry, tourism, water sports, sustainable and well-organised fish fund ..., a natural process of water self-cleaning takes place, a sustainable and lasting method of using natural resources in a perfect way</p>
<p>The process of operations requires loads of workers directly out at the terrain</p>	<p>The whole process is under the technological system, managed by several people from the room at the hydroelectric power plant.</p>
<p>Maintenance of equipment is extensive and costly</p>	<p>Maintenance of the equipment is reduced to controlling and minor repairs</p>
<p>Not working while there is high water, they flow over the dam, in some cases endangering the dam construction</p>	<p>High waters are additionally used, with the installed equipment for generating electricity</p>
<p>Not used</p>	<p>The old hydroelectric power plants projects, older than 50 years, were built up with the</p>
<p></p>	<p>thinking of engineers of that time, how to use the power of water with optimal means so that energy production is planned in the 24 h regime, which can be corrected with favourable sites construction for the new generators</p>
<p>Not used</p>	<p>It is possible to install the new positions with generators for the production of electricity, mainly at 16h operational day mode tailored for the local power requirements</p>
<p>Not used</p>	<p>Increasing the installed power of the generator on already existing dams with hydroelectric plants would be a welcome investment of capacity expansion (MW)</p>
<p>Not used</p>	<p>Expanded capacity of the hydroelectric power plant, would enable the water from the Djerdap II accumulation to be transferred into the Djerdap I accumulation during night hours, with the use of electricity from thermal power plants. It presents an excellent option for energy storage, which is mostly wasted today</p>

Not used	Water is pumped into a lower level of accumulation, and the cumulative positive effect is made together with the incoming water from the river, which creates an increased water pylon
Not used	Possible storage of water with the energy from nuclear power plants, wind and solar power plants which brings a greater possibility in redistribution of electricity production in the region. A smart solution that is nicely fitting within the new era of technological options for decentralised sustainable output and storage of energy without batteries
Not used	An additional cascade dam at the river entrance into the accumulation lake is made of natural material, porous for the water passage