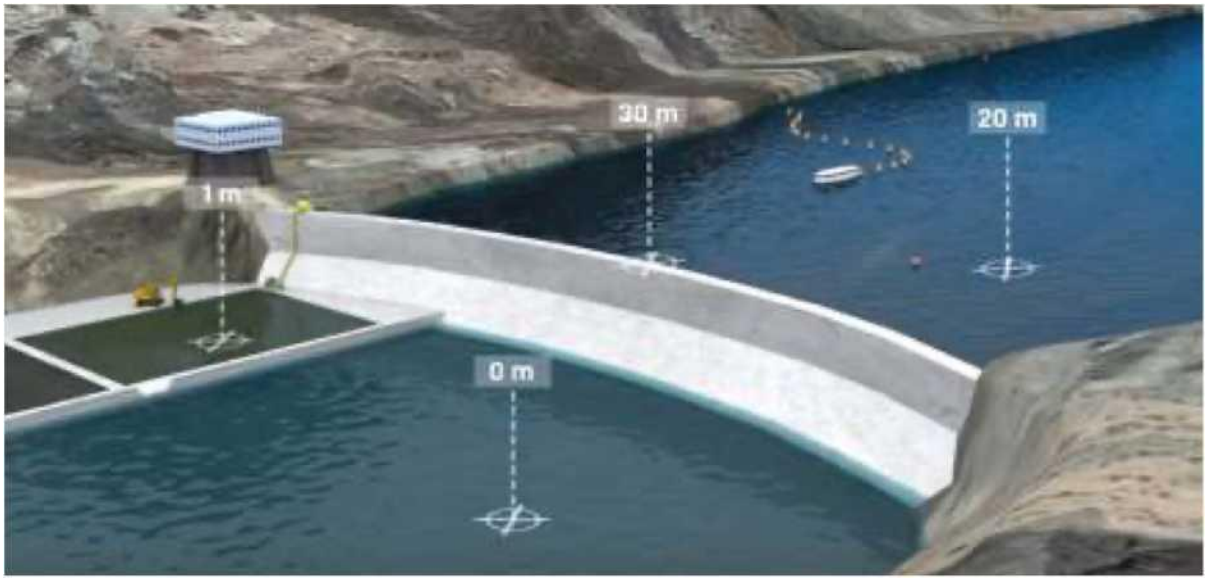
SEDIMENT CLEANING
AND
WATER RESTORATION



2021

Vacuuming sediments from reservoir

An innovative method of setting up structural elements that exclusively use accumulated water from an artificial lake as drive energy for the self-purification of consolidatedsediment located at the bottom of an artificial lake. In the way that the metal pipes are laid from the riverside, overthe existing dam, below the surface of the water accumulation, to the place of suction sediments at the bottom of the artificial lake.

Thus we obtain a closed system of connected metal pipes, which are filled with water from the accumulation, are under pressure from the known difference in the height of the water outlet relative to the level of the accumulation. When the water is released into the river, it starts the sediment from the bottom of the accumulation, and it is vacuumed utilising a vacuum. The work is provided by the well-known physical principle of the joining court, where regulated flow at the water outlet aims to equalise the actual difference of the water column relative to the level of the accumulation.

The Oroville dam, California is the highest dam in America, and the damage has lain due to excess water from seasonal rainfall. Innovation provides the possibility of a preventive and useful technical upgrade of the hydroelectric power plant.

Innovative solution provides new opportunities concerning existing solutions:

An innovative system is a future integral part of the hydroelectric power plant or accumulation for water supply (now it is a periodical and expensive cleaning of the accumulation, once in several decades),

The system initiates less than 1% of accumulated water annually, mainly used the overflow water resulting from abundant seasonal precipitation (now a tremendous amount of diesel fuel for starting ships, transport barges and pumps aggregates is used),

Bio-sediment in the river after two years becomes biodegradable, then very harmful to the ecology of the river, (the current accumulation suffers from this), the innovative solution provides the possibility that the sediment is automatically and permanently removed, firstly by filtering the water, its natural passage through an innovative cascade dam, followed byremoval of the sediment,

Innovation provides the possibility that the built hydroelectric power plants have a permanent position in the river because the sediment in the accumulation is continuously and automatically cleaned (this was not the case, the sediment is now the most significant load for the operation of hydroelectric power plants that threatens to stop them),

Innovation provides the possibility that the accumulations intended for water supply of the settlements will be correctly maintained with proper and purified water (this was not the case so far),

Innovation with its solution has excellent regulation of the suction and position of the vacuum cleaner, so that the floating sludge is pulled up to a large material that is automatically separated by concrete cassettes under the dam, on the riverside (now a mechanical excavation which does not recognize the layers of deposited material is used, not selective cleaning),

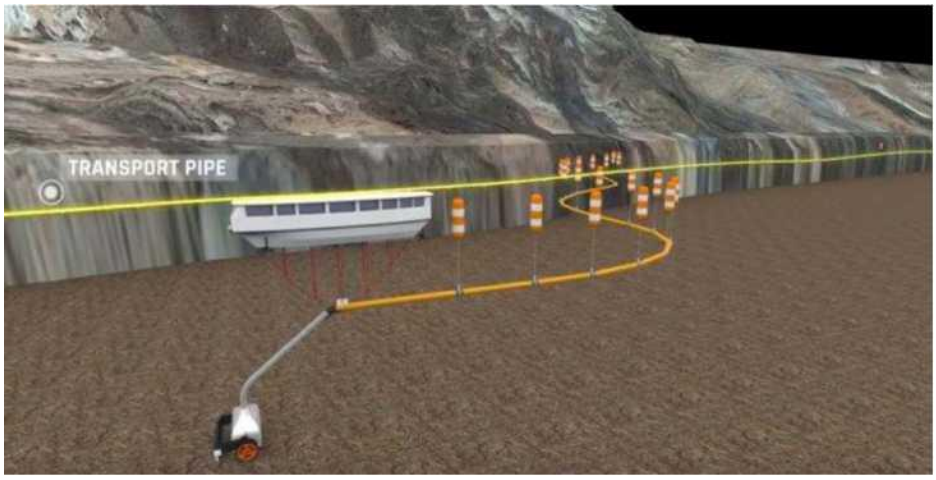
The described innovative process of setting and operation of the system of connected pipes requires several times less investment of funds, and multiple additional benefits are gained for the hydroelectric power plant itself concerning the existing methods of cleaning, Innovation provides additional opportunities, for example, the installation of other
generators on existing hydroelectric power plants to use high water and higher daily electricity production,

Innovation predicts that classical hydroelectric power plants will become reversible hydroelectric power plants, which would be the storage of surplus electricity from thermal power plants and nuclear power plants for the night and day regime, as well as for periodic production of wind energy (today the existing hydroelectric power plants are an unused resource for this Additional possible purpose),

The whole process, the management of self-cleaning of the accumulation for several employees, located in the machine room at the hydroelectric power plant, using the technical systems with video surveillance, all accompanied by sonars and other well-known equipment.

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 nondiesel 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 deposed 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^3 of sediments, for	To remove 400,000,000 m^3 of application, it is necessary to install a technology worth 60
ts removal, it is needed to allocate min. 2 euros / m^3 = 800 million euros	million euros with a working process = 80 million euros = 0.2 euro/m^3
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^3 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
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	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
The hydroelectric power plant with this technological process has s 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	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
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	Instead of toxic biological gasses, technology offers pleasure on accumulation lake Oerdap 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
The process of operations requires loads of workers directly out at the terrain	The whole process is under the technological system, managed by several people from the room at the hydroelectric power plant.

Maintenance of equipment is extensive and costly	Maintenance of the equipment is reduced to controlling and minor repairs
Not working while there is high water, they flow over the dam, in some cases endangering the dam construction	High waters are additionally used, with the installed equipment for generating electricity
Not used	The old hydroelectric power plants projects, older than 50 years, were built up with the
	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
Not used	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
Not used	Increasing the installed power of the generator on already existing dams with hydroelectric plants would be a welcome investment of capacity expansion (MW)
Not used	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
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

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