

REDUCE THE RESERVED FLOW AND ACHIEVE BETTER ENVIRONMENTAL RESULTS: MISSION POSSIBLE

This paper has been written within the framework of the “Thematic Network on Small Hydro Plants” coordinated by ESHA and supported by the European Commission; the paper tries to prove the thesis that the reserved flow downstream of a weir or a dam can be reduced - achieving anyway a better environmental result - if the effect of some additional parameters is duly taken into account in the reserved flow calculation: length of diversion section, tributaries, slope, riverbed structure.

The scope of the document is not to give a solution, but to stimulate discussion among the major key actors of the field and to provoke counterexamples aiming to the confutation of the thesis.

As everybody knows, the value of reserved flow imposed to small hydro plants comes in most cases from “universal” and “desk-top” formulas which are – as typical for politically driven decisions - the result of a compromise between the rights of the plant owner and the environmental requirements.

Very often (almost always) reserved flow disappears in the riverbed because of the width of the river is great or the geo-morphological structure is such that reserved flow has preferential sub-superficial paths. It results in almost no water visible in the river with bad both visual and ecological effect. By the other side, a good ecological effect of the reserved flow – in terms of typical abiotic parameters, e.g. water depth, velocity and so on – could be obtained only with so disproportionately high values of the reserved flow that the plants should be decommissioned.

So, an optimised solution of the reserved flow problem should aim to:

- a) Achieve the best results for local environment.
- b) Achieve the best results for global environment. This means to maximise the energy production from a small hydroelectric plant.
- c) Keep the investment in a small hydroelectric plant profitable.

To get the scope a modification of the riverbed structure can be made.

The design of successful measures needs a deep understanding of river morphology and hydraulics. They can consist, for example, in realising a low water riverbed with slope and width such that water depth and velocity are higher enough to get a good visual and ecological result. Alternate to this narrower river stretch can be realised areas with stilling water (pools) to favour fish spawning.

Anyway riverbed structure modification can help in reaching the scope of obtain with a lower value of reserved flow the same environmental beneficial effects of a higher one, with a double benefit for the environment: the production of a higher amount of renewable energy and a reserved flow hydraulically (and therefore biologically) correct.

In the paper this approach is described by two examples, a torrent and a low slope river, using a multicriteria method and a specific software “Hypse” realised within the 5th FP of the EC, to choose the optimised solution of the problem.

So, we tried to demonstrate that values of reserved flow imposed to small hydroelectric plants owners should duly take into account some parameters which allow for reducing reserved flow released downstream of the weir, if some “accompanying measures” are taken.

In particular the modification of the riverbed structure and the consideration of the beneficial effect of tributaries along the diverted stretch have a very good positive environmental impact not only locally, but also globally if the reduction of reserved flow with respect to conventional methods of calculation is granted.

The result of the proposed approach is that the higher the value of reserved flow is, not necessarily the best the solution for the environment is, intending the environment in the widest possible sense. Moreover, we want only to point out the necessity to face the reserved flow in global terms, because we think it's dangerous to try to save the leaf forgetting the tree or the forest.

With this paper we don't want to be conclusive. On the contrary, we want to promote the discussion about this matter, inviting everyone involved in the small hydroelectric plants field to add positive and negative examples and to supply counterexamples or to confute the thesis proposed.

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