THE POSSIBILITY ARRANGEMENT OF MICROHYDROPOWER ON FINIŞ VALLEY COMPLETED IN ORDER TO PRODUCE CLEAN ENERGY

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Abstract: *Valorification of hydropower potential of streams in Romania should be regarded with a high concern in perspective shift to clean and small price energy production. Water based energy production can answer many requirements of modern society, namely low cost, high safety in operation of energy systems and not least about or no impact on the environment. Water resources are characterized by the fact that they are practically inexhaustible and have many and varied uses. Due to special interest posed by water for industry, agriculture, forestry and for any activities of people, it is necessary that the use of hydropower resources to be taken into account all the needs in order to provide a comprehensive and full recovery of water flows from mountains areas, where these is present. Successful attempt from Bărănelul Valley of the hydrographic basin Timiş river or Oituz Valley of the hydrographic basin Trotuş river, where they installed small hydropower (3 to 30 kW) showed that the concerns in this regard are in vain those providing power supply and operation of a forest cottage, trout nursery respectively, wich contribute to the well development of the activities but also to the decreasing of the production expenses in the trout's reproduction and capitalization. The case study presents some aspects concerning the technical feasibility of the arrangement of hydropower on Finiş Valley from Codru-Moma Mountains to finish installing a trout nursery to ensure energy independence. More exactly, on the basis of absolute 3D coordinates of sections from water course and flows results in this sections was made an representation hydroenergetic survey on the valley, the situation of available power and power generated by different models of turbines (Francis, Banki, Kaplan), the potential maximum power and maximum power possible, wich can capitalize the debits and small fall (specific mountains areas waters), so that it.*

Key words**:** *clean energy, potential,arrangement, power, microhydropower*

INTRODUCTION

The industrial, agricultural and forestry development needs more and more energy but the low resources used so far, lately stressed by the oil policy, imposes a reconsideration of development strategies based on predictions and prognoses that had been issued meanwhile, the latter being linked especially to the possibility of exploiting new energy sources (TĂNĂSESCU F.T.,1986). Any water stream must be regarded as a hydro energetic potential and in consequence a huge attention must be given to these streams in order to value their potential. To this aim a few energetic characteristics have been analyzed like: the available power, the maximum potential power and the maximum possible power which represents the technical fundament for the introduction of a small power micro hydro central (up to 30 kW) on the Finis Valley.

MATERIAL AND METHODS

The Finis Valley springs from the Codru Moma Mountains. The valley is a left tributary of the Black River, it has a length of 13 km and crosses a forestry fond of 2456 hectars. It has a hydrographic basin with a surface of 46 square kms, it is characterized by a longitudinal profile with an average slope of 93% (*** 1). The hydroenergetic potential of this valley comes out from the relatively small variations of the water flow and it is an advantage that can be easily valued if a micro hydrocentral would be introduced which could transform the potential energy of the water in a mechanical energy and last but not least in an electric one.

For the beginning we take into consideration the following water flow divided, with the help of three sections , in two sectors, their limits being numbered as follows: upstream 2, upstream section, mhc (micro hydrocentral) location, downstream section, upstream 1 being an intermediary section which divides the river in two sectors. The annual minimum water flows, the Q, quotas towards the black Sea level – Z and the lengths towards the mhc location sector (downstream) L are known in each characteristic section: in the mhc location, in upstream 1, in upstream 2. The water flows are considered as introductory data as well as the absolute 3D coordinates of the section points in which they had been determined (table1).

Table 1

The 3D coordinates of the sections considered on the water flow where the mhc is intended to be built

The coordinates of the section points	X(m)	Y(m)	Z(m)
Location	*572733.9*	*292830.8*	*220.0*
Upstream 1	*572902.9*	*293141.6*	*230.0*
Upstream 2	*573389.1*	*293204.3*	*250.0*

The calculus relation of the hydaulic power (theoretical and rough)) P_h for a hydroenergetic outfit is:

$P_h = 9{,}81\ Q\ H_b$ [kW].

The hydraulic power P_h is transfrormed by the turbine in mechanical power P_m, called power to the turbine tree and it is calculated with:

$P_m = P_h \cdot \eta_h \cdot \eta_t = 9{,}81 \cdot Q \cdot H_b \cdot \eta_h \cdot \eta_t$ [kW]

where η_h şi η_t stands for the hydraulic efficiency and of the turbine respectively (SETEANU I., RĂDULESCU V., BROBOANĂ D. 2000).

A lot of losses take place during the process of the hydraulic transformation: losses in the collecting and supllying water system, both in the turbine as well as in the generating set (SMUDA E., MUGEA N.,2001), so that the output must be taken into consideration for the situations in which the losses are maximum.

The characterictic powers of a hydroelectric power station that are important in its fitting out and which outline the exploitation conditions of the fitting out are defined as follows:

- *the installed power* – represents the sum of the nominal powers of the hydroaggregates installed (the nominal power of each group can be read on the generating set plate) ;

- *the available power* – represents the maximum power that the fitting out can develop at a certain time, on condition that there is enough water flow and water falls different from the calculus ; the availabe power can only be less or at least equal to the installed power, the difference representing the so called *unavailable power* given by the unavailability coefficient of the aggregate (due too the usage, flow or fall deficit) ;

- *the guaranteed power* –is the power with a certain guarantee, usually between 75% and 95% according to the type of the fitting out, guarntee that can be read on the standing curve of the powers (analogous to the flow standing curve);

RESULTS AND DISCUSSIONS

The 1st, the 2nd, and the 3rd drawings have been done for the comparative analysis in which we tried to see the fesability or the unfesability for installing a mhc reported to the energy consumption from two functional trout nursery ponds and to the natural conditions existant.

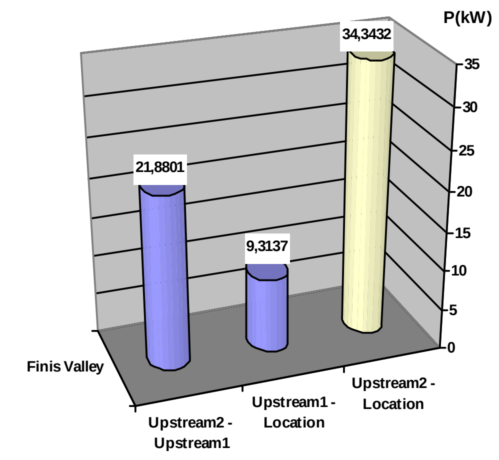

Figure 1: The comparative graphic representatrion of the available power on each sector,P[kW], for the two sector cases

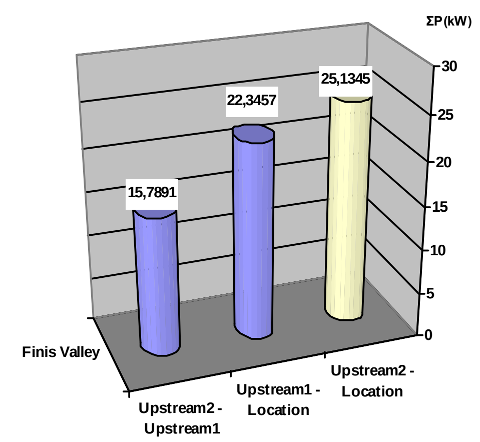

Figure 2: The comparative graphic representation of the available power summed on the whole water flow, ΣP[kW], for the two sector cases

In figure 1 it can be noticed that all the variants are reliable from the point of view of the available power P [kW]. In figure 2 it can be noticed that all the variants are reliable from the point of view of the summed available power ΣP [kW]. Figure 3 presents the specific lineary powers, p [kW], to which the cost for fitting out an mhc is conversely proportional.

From this point of view it can be noticed that the fitting outs can be considered reliable as available power on all the studied sectors.

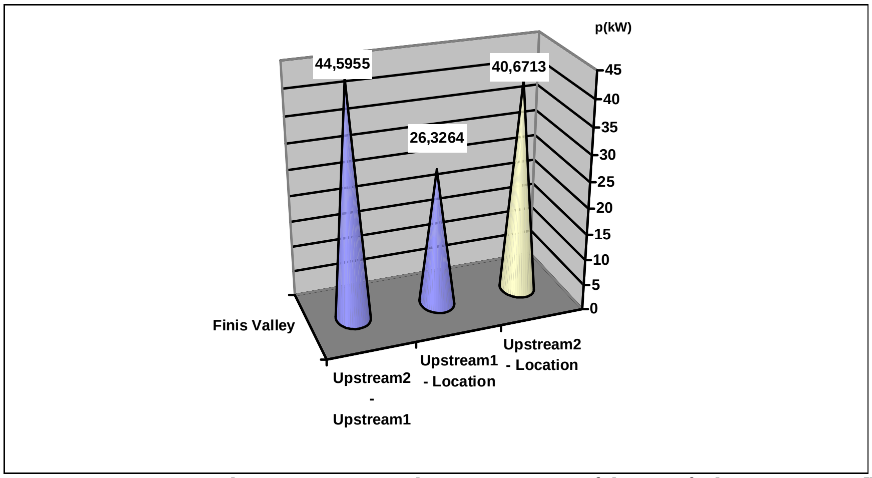

Figure 3: The comparative graphic representation of the specific lineary power, p[kW], for the two sector cases

Figure 4 pesents the maximum potential power, marked with green and calculated with the value of the flow processing coefficient (ε) de 0,25 and with the maximum possible power marked with violet, in the ideal case where ε = 1 (with the total processing of the flow and with no losses). From this nomogram it can be noticed that for the results obtained from the study of the Finis Valley it is worth installing functional turbines based on the Banki or Kaplan principle, that correspond to the water flows and falls existing in that area.

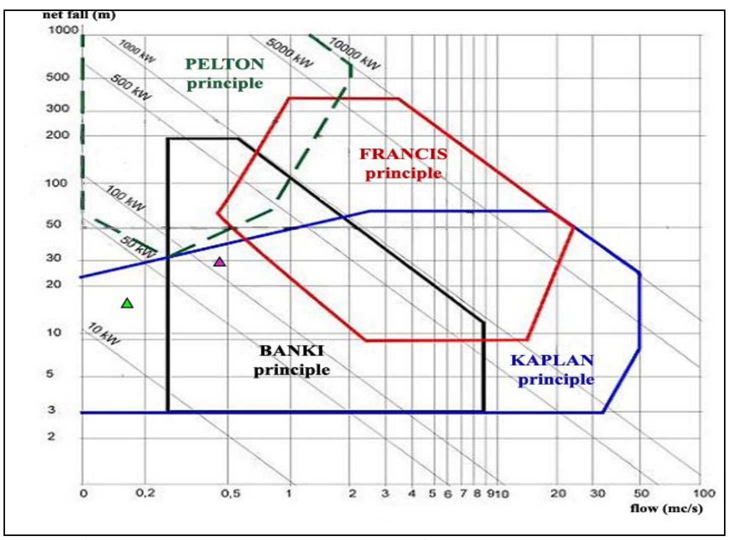

Figure 4:The nomogram of the maximum potential power and of the maximum possible power generated by different types of turbines, in coordinates (H [m]; Q [m^3/s]) (POPA B., PARASCHIVESCU A. V.,2007)

CONCLUSIONS

From the regenerator energies, the low power hydro component must have the first place among the preocupations linked to energy production on the basis of the technical, economical and ecological arguments (VOIA I.,1996).

The necessity to install a micro hydrocentral comes out from the bigger and bigger need for energy aked by the population and by the economy, a less polluting and as cheap as possible type of energy and not least as accessible in extreme areas, where it is considered an extraordinary advantage.

Installing a micro hydrocentral on mountain river flows, near trout nursery ponds, can contribute in a substantial way to an increasing trout production besides insurring the electric power needed for other activities related to trout breeding. In case in which the water flow used to put the installation in function is afterwards orientated towards the basin admission and supply canals then it can highly insure an oxygenated water so necessary for the trouts especially during the summer period, when an increased water temperature leads to a decrease of the diluted oxygen quantity.

The place for positioning the micro hydrocentral must be established after having studied the hydroenergetic micro potential of the hydrographic basins that do not belong and that are not part of the great hydroenergetic fitting outs, on the basis of the priority resulting from the studies: easy to build, available material and equipment, economivcally proven. (SFICHI R.,1984).

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