DIVERSION OF DIYAWINI OYA INTO THE SURGE CHAMBER OF SAMANALA WEWA POWER STATION

By
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Abstract

Investigations of the development of hydro power in the upper Walawe river basin using the head difference of about 350 m between the two pineplaines of the south eastern part of the central high lands of Sri Lanka had commenced in mid 1950's.

Several studies have been conducted since then on the possible ways of developing this potential .These studies lead to the finalization of Samanalawewa hydro power project in 1985.

The scheme envisaged the development of the potential in two stages .Under the stage I major components such as main dam, low pressure tunnel ,surge chamber ,a single penstock add power plant of 120MW capacity housing two generating units were to be developed. Work under stage I was completed and plant was commissioned in 1992.

Stage II of the scheme envisaged the construction of Diyawini Oya reservoir, a second penstock and an extension to the stage I power house to install two additional generating units to bring the total installed capacity of Samanalawewa hydro power project to 240MW.

According to the studies the installation of additional 120MW capacity in the second stage of the project was aimed at providing the needs of additional peaking capacity in the CEB generating system at a future date .The studies conducted in 1985 expected such requirement to be in the CEB system in early 21st century.

After completion of the wet blanketing of the reservoir to arrest the leakage which developed on the right abutment of the dam Ceylon Electricity Board wished to evaluate the feasibility of the development of stage II of the scheme in the early years of 21" century as envisaged ill 1985.

In 1999, CEB requested Central Engineering Consultancy Bureau to review the feasibility of implementing the stage II of Samanalawewa hydro power project. During this review the capacity of the existing system to cater for the conditions after the installation of additional units the feasibility of construction of Diyawini Oya reservoir and the installed capacity to be developed in the near future were evaluated. Most of components of the existing project are found to have sufficient capacity to cater for the increased flows after stage II . Some modifications are required in the surge chamber in order to connect the Intake from the Diyawini oya reservoir. A provision has already been made available for this purpose in the surge chamber.

Review of the feasibility of the development of Diyawini reservoir by CECB indicated that the water tightness of the reservoir is uncertain in the light of the latest geological information available .It was also noted that any treatment of reservoir to improve the water tightness will be prohibitively costly. Accordingly CEB apparently had given up the proceeding of stage II studies.

However it was interesting to investigate the possibility of using Diyawini Oya waters diverted in the direction of the surge chamber and released in to the surge chamber at a feasible point. This way additional water quantity from the stream can be pumped in to the surge chamber and it is added to generate electricity at the power station. It is very important to check the electrical energy loss when pumping such a quantity of water and then compared with the energy gain at the end. All relevant calculations were done and it indicates that the project is well profitable and impacts on Environmental and social aspects are in favor of the project.

DECLARATION

To the best of my knowledge and belief , the work included in this thesis in part or in whole has not been submitted for any other academic qualification at any institution.

Signed by :

A.R.M.M.S. Karunasena

Certified by :

UOM Verified Signature

Prof. Priyantha D.C. Wijayatunga
Director General - Public Utilities Commission
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Preface

This is a thesis on a specific project called "Diversion of Diyawini oya in to the surge chamber of Samanalawewa Power Station " carried out by me for partial fulfilment of Master of Engineering Degree (Electrical) at University of Moratuwa.

Review of the feasibility study of the development of Diyawini reservoir carried out by Central Engineering Consultancy Bureau in the year 2000, indicated that the water tightness of the reservoir is uncertain in the light of the latest geological information available. It was also noted that any treatment of reservoir to improve the water tightness will be prohibitively costly. Beside this ,energy gains of about 23 Gwh due to the addition of Diyawini reservoir is not economical compared to the cost of development .

Hence it was the intention of me to further study about the above mentioned Diyawini oya stream and construct a pump intake and divert as much flow as possible to the surge chamber while fulfilling down stream requirement of the people living . Also to ascertain the financial and social benefits that could be gained by Ceylon Electricity Board as well as the farmer community at the down stream and to evaluate any impacts in terms of social and environmental issues.

A.R.M.M.S. Karunasena
Samanalawewa Power Station.
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Prof. R.Lucas, Dr. Thilak Siyabalapitiya and Dr. Thusitha Sugathapala for giving me lot of valued inputs to improve this thesis during final evaluation.

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H.S. Somathilaka the Chief Engineer of the Samanalawewa Power Station , where I am presently working and this project site is located , has given his attention and fullest corporation to carry out my studies on this project .

Mr. Kamal Laksiri is one of the Chief Civil Engineers attached to CEB and presently working in the Kukule Hydro Power Station to whom. all critical civil design matters were referred and spending his precious time to help me in making this thesis a successful one .

Mr. W.H. Wickramaratna is the Mechanical Engineer of Samanalawewa Power Station who had always been discussed with me the Mechanical aspect of this project and very keen in giving a lot of valued information.

Mr. K.L.R. Perera an Engineer attached to Samanalawewa Power Station who was very helpful to me especially in computer related work.

Mr. Jayantha de Silva of M/s Lanka Development Network (Pvt) Ltd for prompt reply made to find out all pump data at present Sri Lankan market.

M/s ACL Cables (Pvt) Ltd for helping me with providing prices etc for cable products.

The International Centre for Hydro Power – Norway for selecting my paper on this project and inviting me to the international seminar held in Aruza in Tanzania in August 2003.

The Institution Of Engineers –Sri Lanka for giving me an opportunity to make a presentation on this project for 97th Annual session of Young members section on 24th October 2003.

All the farmers in the Surge Chamber Area for providing me their information during the interviews in all possible ways.

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Δp	pressure difference	[Pa] or [bar]
D	diameter	[m] or [mm]
f	friction factor	
g	gravitation	[m/s^2]
h	head	[m]
L	length	[m]
Q	flow rate	[m^3/s]
Re	Reynolds number	
v	velocity	[m/s]
μ	viscosity	[Ns/m^2]
π	3.1415	
ρ	density	[kg/m^3]
U	Evapotranspiration	[mm]
k	Coefficient of monthly consumption by vegetation	
P	Monthly percentage of day time hours of the year	
C	Coefficient of runoff	
i	Intensity of rain fall	[mm/hr]
A	Catchment area	[sqkm]
Z	Upsurge level	[m]
B	Width of the weir	[m]

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