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Submerged Floating Tunnel

Prof. Shaikh Sameer J, Ms.Pooja Dabhade,Ms.Mayuri Misal,Mr.Vishwanath Kalyane,Ms.Amruta Gawli,Mr.Awes Shaikh
Civil Engineering Department,MGM'S Polytechnic College, Aurangabad, India
Corresponding Author: Prof. Shaikh Sameer J

Abstract: *Submerged Floating Tunnel is a new concept, It is a new type of transport structure. It is very different from other structures like bridges and tunnels, It is the new invention in which the conventional structure in crossing long , large and deep water areas. For construction of this type of structure it is an challenge to all the technology this article discuss some problems and challenges, which are faced in design and construction of SFT, Such as wave load determination, vibratuins,reduction of accidental load. The technology difficulties and corresponding solution were proposed. At last, the several key problems to be need further research were proposed, so as to provide for the design, construction and project risk analysis of future SFT*

Keywords: *submerged floating tunnel , design, construction, durability, risk analysis.*

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I. Introduction

Tunnels are built over four thousand years ago, but floating tunnels are much more recent. Certainly an engineer and builder of railways, S.preault, proposed to built an SFT across the Bosphorus in 1860, under water railway viaduct with spans of about 150 m founded on piers, located some 20 m below the surface. Going back to 1882 , Edward reed proposed a submerged railway tunnel across the English channel but parliament of England rejected his proposal due to fear of invasion. Once the first immersed tunnel has been successfully built in 1893.

II. Indentations And Equations

Here, we use Euler-Bernoulli beam to model the tube of a submerged floating structure. For simplicity, the mooring tethers of the submerged floating structure are regarded as hinged supports of the tube. All the hinged supports are equally spaced.

Coordinate x is the axial direction of the tube, while coordinates y and z are the directions perpendicular to U(cross flow) and parallel with U(in-line), respectively. Distributed van der pol equations are employed to describe the wake dynamics in both cross flow and in-line directions with the consideration of fluid structure interaction, the equation for the dimensionless mathematical model are as follows.

$$\frac{\partial^{2y}}{\partial\tau^2}+\frac{\gamma}{\mu}\frac{\partial y}{\partial\tau}+b^2\frac{\partial^4}{\partial x\sim}=MLql-yg$$

$$\frac{\partial^{2ql}}{\partial\tau^2}+\delta l(q^2l-1)\frac{\partial ql}{\partial\tau}+ql=Al\frac{\partial^{2y}}{\partial\tau^2}$$

III. Figures And Tables

Parameter values :

As shown in table 1, the design parameters of the submerged floating tunnel prototype in Qingdao lake of china were employed to calculate the values of the dimensionless parameters in equation 1. Note that the velocity in Qingdao lake was adjusted so that they can excite the vortex induced vibration of the tube. The parameters related to the van der pol oscillators in equation 2 have the values of ξl=ξd=0.3and AL=AD=12. The vertical acceleration time history of this seismic wave was imposed on the supports in cross flow direction , while the 180 degree acceleration time history excited the vibration of the tube in line direction.

Design parameters	Symbol	Unit	Value
Length	L	M	100
Outer diameter	d	M	4.39
Inner diameter	D1	M	3.55
Self weight per unit length	W	Kn/m	115
Equivalent elastic modulus	E	Gpa	140
Water density	Pw	Kg/m^3	1000
Added mass coefficient	Ca	-	1.0
Strouhal number	St	-	0.17
Lift coefficient of fixed cylinder	Clo	-	0.3
Drag coefficient of fixed cylinder	Cdo	-	0.2
Flow velocity	U	m/s	8.0

IV. Performance Analysis

For the better understanding of this submerged floating tunnel we made a miniature model of submerged floating tunnel. We made a tank of 60×40×40 cm from glass. And then we took PVC pipe of 15cm diameter. We built a road section in that pipe and also provided thin small pipes for ventilation purpose, we also provide LED Lights in the pipe for better vision. And then we stick the pipe with the help of water sealed material with the skilled hands. We provided cardboard piers at the bottom of tank and pipe. And we also provided pontoon at top of the pipe. Our project of this miniature model is sponsored by Anandi Infrastructures, Aurangabad,Maharashtra.

V. Conclusion

The submerged floating tunnel will setup trends in transportation engineering and which shows with the advances in the technology that will reduce the time required for travelling and make the transportation more effective by hiding the traffic underwater by which the duty of landscape is maintained and valuable land is available for other purpose.

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