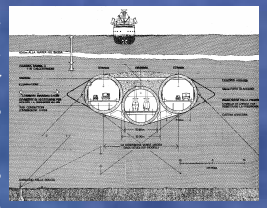
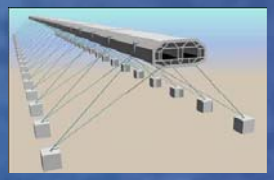
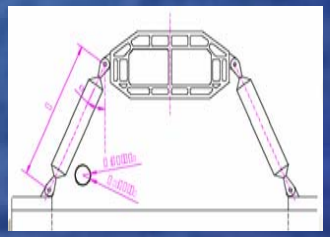
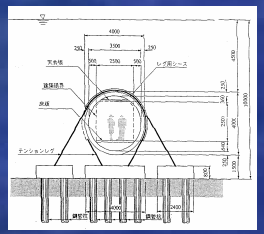
BACKGROUND

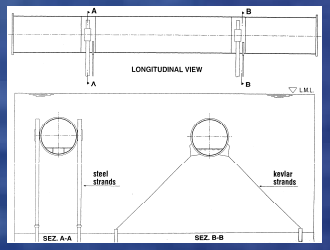
Many feasibility studies and preliminary designs have been already developed or they are in advanced stage. They have been carried on in many Countries, as for example in Italy for the Messina Strait crossing, where a SFT solution was proposed for the first time (1969) by Alan Grant. Later on (1984) this solution was patented under the name of Archimedes Bridge and extended structural analyses have been performed. The SFT has been proposed to cross the Høgsfjord in Norway and the Jintang Strait in the Zhousang Islands in China. Other projects are currently discussed in Japan (Funka Bay), in USA (Lake Washington), in Switzerland (Lugano Lake) and in Italy (Como Lake).

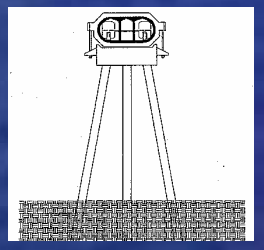






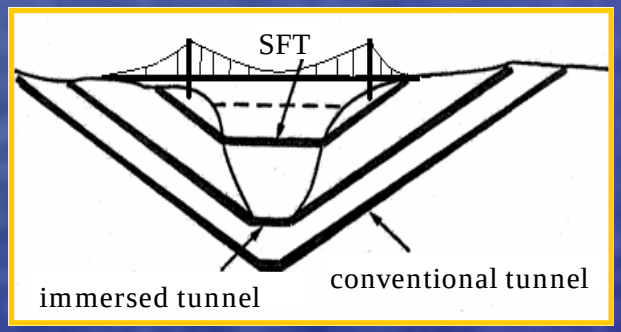






FIELDS OF APPLICATION

The Submerged Floating Tunnel is an advantageous solution for waterway crossing with respect to the traditional systems



Ideal for application when it is requested to fulfil given prerequisites:

- Low environmental impact
- No interference with the water surface traffic
- Technically and economically suitable solution for large crossing spans
- Limited slopes and reduced dimensions of accessing ways
- Minor problems due to the presence of faults on the sea bottom
- Stability in every phase of the construction

Supported by the Italian Ministry of Foreign Affairs General Directorate for Promotion and Cultural Co-operation

SIJLAB

Sino-Italian Joint Laboratory of Archimedes Bridge

THE PARTNERS

Ponte di Archimede S.p.A.

University of Naples "Federico II"

Technical University of Milan

Chinese Academy of Sciences

INTRODUCTION

The Archimedes Bridge is a Submerged Floating Tunnel (SFT), which represents an innovative structural typology for water crossing. Until now, seas, rivers and lakes have been considered as obstacles to get over in order to connect two ends of land. On the contrary, the SFT is conceived to interact with the water, exploiting its bearing capability. In fact the buoyancy represents a permanent load as the gravity load, which confers to the anchorage system the fundamental pretension state. More than 100 immersed tunnels have been already constructed from the beginning of the 20th century, but only in the last decades, after a great development of the offshore engineering technology, the attention has been addressed to a partially buoyant structure anchored to the seabed, such as the SFT.

OBJECTIVE

In 2004 the SIJLAB was created, having as main objective the realization of the first prototype of Submerged Floating Tunnel in the World. Since a SFT has still never been realized, this prototype will be the first step towards a big revolution in the field of waterway crossing. The prototype will give the possibility to study the dynamic behaviour of this kind of structures under the environmental loads and, at the same time, to set up and test adequate construction and installation procedures for the Submerged Floating Tunnels.

MAIN TOPICS

Cross-section

The composition and size of the cross-section are determined by functional and static requirements. A multi-material sandwich cross-section has been conceived for the prototype

Anchoring system

The anchoring system provides vertical restraint and contributes to the lateral stiffness of the tunnel. Steel cables in tension will be used for the prototype

Foundations

The selection of the foundation system depends on the geo-technical features of the seabed

Joints between modules

The technical solution derives from a compromise among static, waterproofing and installation requirements

Shore connections

The design deserves particular attention to the end elements having the delicate task to accommodate the relative movements, also referring to earthquake effects, being necessary seismic joints

Loads

Permanent loads, service loads, deformation loads, environmental loads, accidental and incidental loads must be carefully considered in the analyses

Structural modelling

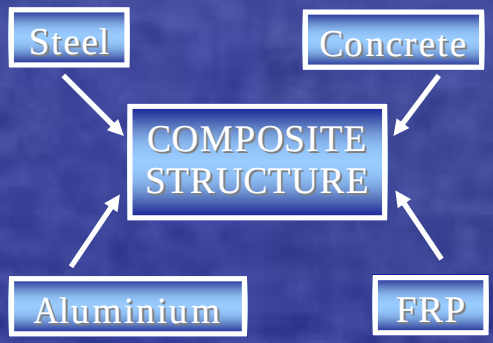
This delicate aspect requires the set-up of sophisticated numerical models to analyze the global dynamic behaviour of the structure and the local problems

Construction and installation

Both aspects play a very important role for the realization of the first prototype of SFT

MATERIALS

The optimization of the materials' performance requires that each of them plays a specific role, which exploits the potential benefits and minimizes the defects



THE SITE

Qiandao Lake
Zhejiang Province
PR of China