

臺灣潛盾隧道技術之回顧與展望

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摘 要

潛盾隧道工法在發明157年後引進臺灣，由於臺灣為一海島新生地盤，充沛的地下水與複雜地質條件，加上人文與施工環境，於配套的要件組合下在新地域自然也算是新技術。

本文藉由播種萌芽、灌溉成長、滋養茁壯與開創挑戰等幾個階段做一回顧探討，說明在各個階段潛盾隧道工程應用上所衍生之施工及設計問題，並針對設計概念演變及特殊施工案例等作一概要闡述，最後，提出臺灣潛盾隧道技術之未來展望，希望對爾後邁向更深、更大、更複雜的潛盾隧道技術，如何在環片設計合理化、維持開挖面穩定平衡機制、全生命週期維護管理及新工法應用等方面，提供改進方向。

關鍵字：潛盾隧道、潛盾機、開挖面、襯砌環片。

Review and Outlook of Shield Tunneling in Taiwan

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Abstract

The shield tunnel method was introduced to Taiwan 157 years after its invention. Because of the newborn ground, plenty of groundwater, complex geological conditions, and the cultural and construction environments of the island, this method can be considered a new technology.

This article reviews each stage of sprout, growth, robustness, and creation and describes the concerns related to the design and construction of the shield tunnel engineering applications at these stages. In addition, we briefly demonstrate the design concept evolution and a special case of construction. Finally, we propose a shield tunnel technology and focus on a deeper understanding of technologies that are more complex. In addition, we recommend improved directions for ring segment lining design rationalization, sustaining mechanisms of the stability of excavation faces, the maintenance and management of complete life cycles, and the application of new methods.

Key Words : shield tunnel, shield machine, excavation face, segment lining.

一、前 言

1818年法國工程師M.I. Brunnel觀察鑿船蟲嚙嚼木材，並釋放出類似石灰質之分泌液，固定內壁及支撐洞道，即以此靈感發明潛盾隧道工法並取得專利，參見圖一。1869年英國人Greathead等採圓型潛盾機、部分底版

(鋼板)鐵環片、壓氣工法，成功完成泰晤士河第二條河底鐵路隧道工程，奠定今日潛盾隧道工法之基礎。迄今，針對潛盾機處理開挖面穩定與地下水之基本功能，依不同地層條件發展出各式工法。臺灣使用過之潛盾機型式包括：開放型(手挖式、半機械式、機械式)及密閉型(泥水加壓式、土壓平衡式)，另外，曾使用一台盲(擠壓)式潛盾機。