

## 石門水庫淤泥受壓之流動性試驗與採礦法開挖淤泥之初步評估

### A Compressive Extrusion Experiment on the Sludge and Its Application for Sludge Mining in the Shih-Men Reservoir

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#### 摘 要

石門水庫之淤積狀況嚴重，造成蓄水量減少並可能發生日後潰堤之風險，因此，使用永續經營之概念來解決石門水庫淤積之問題，為當前一大挑戰。本文針對使用採礦方式開挖石門水庫淤泥之概念，進行水庫淤泥之流動性試驗，探討實驗室尺度中，淤泥在不同含水量、應力與開孔直徑下主動出泥之可行性。本研究改良土壤單向壓密試驗儀並設計單向壓密出泥試驗，以了解石門水庫淤泥受壓情況下之流動特性。試驗結果顯示，淤泥主動出泥之適當含水量約為 27.2~39.7%。由現地土水分布造成之載重與配合假設狀態下之水庫底泥含水量分布，考量輕質骨材燒結所需之含水量介於 30~42%，則適當開挖位置約在土水界面下 14 公尺，若採用主動出泥方式有土水坍塌之風險，因此，在本研究假設含水量分布條件下，建議使用被動開採方式進行石門水庫淤泥開挖。未來若能獲得石門水庫淤泥含水量對深度之分布，可更精確確認適合開發位置，再進行相關開採之可行性評估。

**關鍵詞：**石門水庫、淤泥、採礦、出泥試驗、含水量。

#### Abstract

The deposit problem of the Shih-Men Reservoir is serious. It induces a decrease of storage and an increase in failure risk of the dam. The sustainable concept may help to overcome the deposit problem of reservoirs. This study applies the mining concept to remove the sediment in a reservoir and focuses on the estimation of the extrusive behavior of the sediment. A mud extrusion experiment is designed and built up by modifying the existing consolidation test. The experiment considers the factors of water content of sludge, compressive stress, and opening size to evaluate the active extrusive rate of wet sludge in laboratory scale. The active extrusion of mud means that the mud can be extruded out from the opening under a compressive condition. The experiment results show that the suitable water content of the sludge for an active extrusion is 27.2~39.7%. Considering 30~42% water content of the sludge for the use of lightweight aggregate and a cross

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