奈米機油於旋轉葉片接合器之增強熱傳之研究

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摘 要

本研究分別以氧化銅(CuO)和三氧化二鋁(Al2O3)兩種金屬成 份的奈米顆粒(粒徑分佈為20-30nm)混合於自動變速箱油內，另添 加消泡劑(Antifoam)於冷卻機油內做為比較，觀察其熱傳效果。並 與原始未添加之機油做一對照。實驗以即時四輪驅動動力傳遞系統 為工作平台，此系統採用最先進的旋轉葉片接合器之設計，但是隨 著轉速的增加造成旋轉葉片接合器內流體的平均溫度不斷上升，因 此若要改善此類問題，分析動力傳遞系統之內部旋轉槽流冷卻的熱 傳行為則必須被瞭解。實驗以400rpm, 800rpm, 1200 rpm 及1600 rpm 等四種不同轉速，測量旋轉葉片接合器外部溫度的分佈情形， 模擬實車在高低不同轉速之情況，探討何種成分混合液有較佳的熱 傳性能。以增進瞭解四輪驅動車輛之旋轉葉片接合器內部旋轉流場 槽內之熱傳現象，實驗結果顯示添加奈米顆粒以CuO(Case I)熱傳 效果最佳，Al2O3(Case II)次之，未添加奈米顆粒者再次之，僅添 加消泡劑者熱傳效果最差，Taylor 漩渦所產生之物理現象對軸向溫 度分布有重要的影響。此外，利用非接觸式紅外線熱控感溫方式， 順利完成旋轉葉片接合器和後差速器整體表面溫度之量測，並將此 實驗結果建立相關經驗式，供設計實務之參考。

關鍵詞 : 旋轉葉片接合器，熱傳，奈米流體

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