車輛破撞之動態反應分析

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摘 要

由於國內每年平均車輛肇事率達2.18(件/萬輛)，導致乘員的死亡率高達2.04(人/件)，且乘客車肇事率更高達45.2%，因此本論文以乘客車之周邊式車架(perimeter frame)及Ford Taurus乘客車做為研究對象，應用美國聯邦機動車輛安全標準法規(FMVSS208、214、224)之規定，採用有限元素分析軟體LS-DYNA來進行碰撞(前撞、側撞、後撞)模擬分析，首先以圓柱撞擊實驗及簡易扭力盒車架(toque-box frame)撞擊研究，來評估軟體之碰撞分析能力，其次進行周邊式車架及Ford Taurus乘客車全車車體結構碰撞分析，研究車架及車體受碰撞之變形、能量吸收、速度、加速度等動態反應。結果顯示，周邊式車架於前撞時其前端車架轉折處產生摺疊崩潰現象，其能量吸收約佔98%；於側撞時其乘客區車架與前端車架有高低差因素，當受側向撞擊時會產生嚴重結構潰縮變形，其縱樑能量吸收約佔20.8%；於後撞時乘客區車架與後端車架有高低差因素，當受後方撞擊時會產生過度摺疊現象，其後端車架之能量吸收約佔12.6%；而全車於前撞時其前潰縮區最主要能量吸收為前端車架約佔14.66%：於側撞時其乘客區最主要能量吸收為縱樑車架約佔17.69%；於後撞時其後潰縮區最主要能量吸收為行李箱結構之底板約佔48.3%。此外，本論文並研析彙整世界著名車廠之安全防護設計理念，供設計改善參考；以及車架及全車碰撞研究成果希能供未來車輛結構設計之參考。

關鍵詞 : 周邊式車架、Ford Taurus汽車、變形、能量吸收

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