

廢輪胎變形大小與土石流衝擊力之消減

The Impact of the Debris Flow against the Used-Tire with the Consequent Reduction of the Impact Force and the Deformation of the Used-Tire

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摘要

廢輪胎承受土石流衝擊，一般來說，變形愈大，消減衝擊力的效果愈好。限於實驗設備，為使廢輪胎變形大，本衝擊研究模擬防砂構造物前加置內填或不內填砂石之小汽車廢輪胎，並撞擊不同的胎位與點面，分析撞擊時消減之能量與最大撞擊力多寡，期能了解凹陷量與勁度等相關特性，使設計保護結構物安全時更有明確之依據。

本實驗之結果顯示，在輪胎內加入碎石級配後可以有效控制壓縮量，促使廢輪胎可以保持良好的緩衝效果，不受衝擊過大壓扁而減低消減衝擊力的效果。經計算使用空廢輪胎在試驗配置高差 0.95 公尺，鐵球滾下時將廢輪胎完全壓扁，此時最少可降低約 62% 之最大衝擊力，且動能消減比例仍可達 75%，其餘衝擊試驗皆未壓扁廢輪胎(含填充碎石級配組及試驗高差 0.54 公尺空胎組)可降低 95% 以上最大撞擊力和動能的效果。

關鍵詞：土石流，撞擊，廢輪胎凹陷量

Abstract

The debris flow impacts the used-tire; generally speaking, the severer the deformation of the used-tire, the better it works on reducing the impact force of the debris flow. Restricted by the experiment facilities, to cause huge deformation of the used-tire, we model in this research a Sabo structure with a used-tire in front. The used-tire is stuffed with gravel in one condition and is without any stuffing in another. Then we pose impact on different points of the used-tire with an iron shot. Subsequently, we analyze the reduced energy and the variation of maximum impact force caused by each impact to learn the relations among deformation, stiffness and other factors, so that one can refer to this research when designing protection devices of Sabo structures.

The experiment shows that used-tires stuffed with gravel can effectively control the amount of compression made by the impact of the debris flow, and thus assure its

effectiveness as a cushion by preventing itself from being pressed flat. Through precise calculation, in the height difference of 0.95 meter, the used-tire without stuffing was pressed flat by the iron shot rolling downward. In this condition, the used-tire can reduce at least 62 percent of the maximum impact force and absorb up to 75 percent of the dynamic energy. On the contrary, the used-tire was not pressed flat in other test groups (the two groups in which the stuffed used-tire was impacted by the iron shot rolling down in the height difference of 0.95 meter and 0.54 meter and the one group in which the used-tire without stuffing was impacted by the iron shot rolling down in the height difference of 0.54 meter); in these conditions, the used-tire can reduce more than 95 percent of both the maximum impact force and the dynamic energy.

Keywords: debris flow , impact , deformation of the used-tire