

Determination of Number of Cane Hauling Units Based on Grade Ability Index at New Halfa Sugar Factory, Sudan

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ABSTRACT

The main objective of this study was to find the adequate number of cane haulage (transport) units, as a function of grade ability (ability to go up slope). The study was conducted at New Halfa Sugar Factory, with a cane crushing rate of 5000 tons/day. A 150 hp tractor was used on 1 km hauling route as the most critical grade from the second main center up to the unloading platform. The route was divided into four sections with different grades. The grade of each section was measured with surveying equipment. The road combined resistance, that has to be overcome by the hauling unit, is the sum of the route grade and the coefficient of rolling resistance. As per literature, the coefficient of rolling resistance is assumed to be 0.02 for all sections. The tractor was run on different gear meshes to determine its grade ability at different speeds. The total operation time, function of gear mesh and road combined resistance were determined and used to calculate hauling unit production rate. The factory crushing rate was divided by the hauling unit production rate to get the number of hauling units. Two replicates (route conditions) were used; namely, treated (stabilized) and non-treated. As a result, the required number of hauling units was 5 and 6 for treated and non-treated routes, respectively. Out of 36 gears in the tractor gear box, the number of gears actually used was 2 and 3 for treated and non - treated routes, respectively. This makes the use of tractor with standard gear box in cane hauling questionable; a simple gear box with three or four gear may suffice. The study recommends that similar studies should be conducted at other sugarcane factories, with different route conditions and crushing rates; and that the grade ability index be included in tractor test code.

Key words: Tractor; test code; gear box; rolling resistance