

## Process involved in designing of an intelligent additional track mechanism tracked vehicle for swamp peat terrain

### ABSTRACT

Different types of off road vehicles are widely used in agriculture, oil industry, mining and military operations but none of them can effectively operate over the swamp peat terrain because of its low bearing capacity of  $7\text{kN/m}^2$ . Segmented rubber tracked vehicle and intelligent air-cushion system tracked vehicle were developed in Malaysia for swamp peat terrain.  $16\text{kN/m}^2$  of ground pressure was exerted by using the segmented rubber tracked vehicle during field operation therefore could not be operated efficiently. The air-cushion tracked vehicle increased the floatation capacity but at the same time increased the frictional effects therefore the tracks of the vehicle easily slipped out from the traction wheels during operation. Addressing these issues an intelligent additional track mechanism for tracked vehicle has been designed to improve the mobility over swamp peat terrain where the additional track would be increased the ground surface area and reduced the vehicle ground pressure. This paper presents the process involved in designing the intelligent additional track mechanism tracked vehicle for transportation of agricultural and industrial goods on the swamp peat terrain with bearing capacity of  $7\text{kN/m}^2$ . The mechanical design comprises of track vehicle frame with track mechanism. Additional track mechanism with Fuzzy expert system. The design parameters are optimized using developed mathematical model based on the dynamics and kinematics behavior of the vehicle. In order to increase the vehicle contact surface area and reduce the surface contact pressure the additional track mechanism is designed in such way that it can be folded and unfolded from its position by using the ball-screw scissor lift mechanism. While, Fuzzy expert system is used to control the movement of the lift mechanism based on  $70\text{mm}$  critical sinkage of vehicle detected from a set of sensors. The completed to vehicle system would be used for off-road applications as required.

**Keyword:** Additional track; Fuzzy logic controller; Off-road vehicle; Segmented rubber tracked; Swamp peat terrain; Tracked vehicle