THE INFLUENCE OF STA (SEAT TUBE ANGLE) OF BIKE’S FRAME TOWARD BIKER’S INJURED RISK VALUE

Name : Putu Pusparini
NRP : 2105 100 026
Department of : Mechanical Engineering FTI-ITS
Supervisors : 1. Prof. Dr. Ing. Ir. I Made Londen Batan, M.Eng
2. Ir. Eko Nurmianto, M.Eng. Sc, DERT

Abstract

In 2008, Flexy Knock Down Bike was designed and made. One of the evaluation results which can be obtained from the bike was that biker’s injured risk value using RULA method was 3. It means that the bike design using RULA method is not ideal enough and less ergonomic. Some experts say that in designing a bike, the geometry of the frame is the main part which determines the comfort of a bike to be ridden. Beside the dimension, Seat Tube Angle (STA) is also the main factor which establishes the comfort of a bike. Some references say that the most ergonomic STA is between 68° and 84°.

For those reasons, this Final Project will analyze the connection between STA and the biker’s injured risk value by analyzing biker’s injured risk value (RULA). Verification is executed by doing some experiments of bike paddling by some respondents. After paddling the bike, respondents fill a form of Nordic body diagram to get the data of body’s segments which get pains with the STA variation between 68° and 84°. The analysis is complemented by the calculation of biomechanics energies.

From the analysis which has been done, it is obtained that: (1) By using RULA method, the biker’s injured risk value in geometry of bike’s frame with STA 68° is 3, while a bike with STA value between 69° and 84° is 2. (2) From the experiments of bike paddling with the variation of STA, it is found that the increment
of STA causes the increasing of the average of complaints about tiredness. (3) From the biomechanics analysis on the back segment, it is known that the increment of STA causes the energies which work on back segment become smaller while the opposite thing happens for the legs segment where the energies which work become bigger. From the analysis which has been described, it is suggested that STA value from the ergonomic geometry of mountain bike’s frame is between 69° and 73°.

**Keyword:** RULA, injured risk, Seat Tube Angle (STA), ergonomic, biomechanics.