

4.2 Stress Analysis

4.2.1 Gear Set Analysis

Three different spur gear sets will be used to adjust three separate DOF mechanisms. Analysis of the gear sets was performed and all were deemed satisfactory. By observation, it can be deduced that the roll and pitch gear sets will see more stress than the yaw mechanism and thus were the subject of our stress analysis here. It was determined that the factor of safety for tooth breakage of approximately 8.9 for the pinion and 6.7 for the gear. Factors of safety for pitting for the pinion and gear are approximately 1.8 and 1.2 respectively. Calculations and supporting data can be seen in Appendix B

4.2.2 Follower Attachment

Where the followers/rollers attach to the bottom plate was determined to be the most likely failure mode and was thus analyzed to determine likelihood of failure. The follower will be bolted to the mating part and was modeled as a direct bearing stress on a cylinder having .067 inch diameter (minor diameter of bolt). Maximum stress was calculated to be 448 psi, giving a safety factor of roughly 90 and thus easing all fears of failure. Relevant sketches and calculations can be found in Appendix D.