Copy2 of Bike Crank - Verification & Validation

Author: Rajesh Bhaskaran, Cornell University

Verification and Validation

Total Deformation

In the last section, we found the max deflection at the tip of the crank to be about 0.05 in for the specified loading condition. Back in the pre-analysis we had predicted this max deflection to be around 0.04 in. Our results agree pretty well considering that we had simplified the calculation for deflection by essentially using one guess height instead of accounting for the variable height along the x-direction which would have been much more complex. We are therefore confident that our result from the ANSYS simulation is in the right ball park.

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along the height of the cross-section

Now that we found normal stress along the y-direction of the cross section (i.e on the path), we can compare these results with Euler-Bernoulli beam theory. Remember that back in the Pre-Analysis, we determined that it would be sufficient to simply comparing our results at the top of the gauge only. Also remember that the value found in the hand-calculation actually came from a height value that we had approximated from the crank diagram. Well now that we have our model in ANSYS, we can find what the height truly is using the coordinates tool. We find the total height at the middle of the crank to be 0.662 in and therefore the new coordinates representing the middle top of the gauge to be (2.448", 0.331") from the left whole center. Calculating

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with this revised height yields -12,287 psi. When comparing this value with ANSYS, we find our results to match extremely well!

ANSYS Result	Hand-Calculation Result	Percent Difference
-12,761 psi	-12,212 psi	4.4%

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