Free Hanging Steel Rod Frequency Analysis

Morano, Cressman, Baima, Pickering, Smith

Development of an Active Acoustic Tension Cable Damage Localization Package

Hu, Vincent

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1 Introduction

In order to develop a system for acoustic monitoring of tension cables, it is first necessary to determine the viable frequencies and amplitudes which should be used in the system. Acoustic resonance will specifically be studied in order to optimize the future package. Acoustic resonance is the tendency of a system to oscillate with greater amplitude at some frequencies than at others. By determining the resonant frequencies of the system in which this package will be deployed, it is possible to generate much stronger vibrations which will be easier to detect and study. The purpose of this experiment is to explore the resonant frequencies in smaller scale steel rods in order to optimize the larger scale acoustic system to be developed.

2 Experimental Procedure

This experiment will explore two different scenarios. The first will be an *unsupported* hanging steel rod. The second will be several unsupported rods secured in to a bundle. Prior to the experiment, the theoretically expected resonant frequencies will be calculated. This will be completed in matlab and will provide incite as to what frequencies should be expected to arise in the lab test. 5 - 10 modal frequencies will be calculated prior to the experiment.

PROCEDURE GOES HERE

3 Results

After data has been collected through several experimental trials, it will be analyzed for several components. A time series of impact events will be generated, as well as plots of the frequency spectra. The power density spectra will also be analyzed. The found experimental frequencies will be compared to those calculated prior to the experiment in order to confirm or deny the current method for theoretically modeling the vibrations in these rods/cables.

3.1 Considerations

Certain considerations will need to be made before and after the experimentation process. What noise will be present (i.e mechanical, electrical, background)? What type of filter will provide the best results? How might the experimental process be adapted in the event that the results to not comply with the theoretical calculations?