IPRO 306

Technical and Business Analysis of Challenges and Opportunities Associated with Guitar String Products

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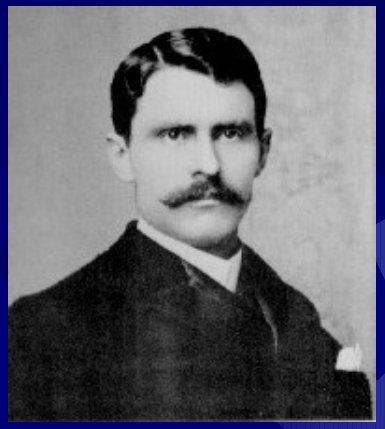
Intro

- The purpose of IPRO 306 was to investigate the waning sales of Gibson guitar strings and to make suggestions which could improve the companies efficiency.
- This was completed by four distinct tasks.
  - Industrial Assessment
  - User Survey
  - Retail Survey
  - Technical Analysis of Strings

Background - Gibson

- Orville Gibson creates the Gibson Mandolin - Guitar Co. (1902)
- Aggressive marketing and refinements make Gibson industry leader (1903-1914)
- Gibson's first Spanish Electric guitar the ES-150 introduced in 1936
- J-200 introduced in 1937
- Les Paul model introduced in 1952, Gibson's 1st solid body
- Humbucker invented by Seth Lover in 1957
- Nashville plant is opened in 1974



Background - The Problem

- The 1960's brought a demand for guitars and related products
- Gibson soon began to manufacture various guitar accessories including guitar strings
- Because of Gibson standard of high quality, they became a leader in overall string sales
- Due a sharp increase in guitar string manufacturers and a general decline in Gibson string quality (60s-70s) Gibson lost its place as the leader in the market

Background - IPRO 306

- Due to these factors the Strings and Accessories division of Gibson desired to support an IPRO team
- After an initial visit with the client, it was determined that the group focus on the following
  - Evaluate the divisions operations
  - Help Gibson better understand their place in the market (i.e. what they can improve upon)
  - Perform comparison of Gibson strings with the leading brands

Industrial Assessment

- The client desired us to perform an assessment on the plant to improve production, layout, efficiency, etc
- We were assisted by Prof. Keith McKee
- We discussed in detail with him what we were going to do once we were there
- The group split into three teams, production, order releasing and scheduling, and plant management. Each group talked extensively with people in their respective group

Minor Assessment Findings

- Plant scheduling is very good
- Slight problems encountered with ordering
- Minor suggestion for plant processing
  - Light table, wire cutter, storage rack, etc…

Major Assessment Findings

- Limited, non-technical quality control (incoming or outgoing)
  - Incoming wire dirty
  - Major inconsistencies in raw material
  - Current quality control methods
- Wire was getting dirty from inside the plant

Major Assessment Recommendations

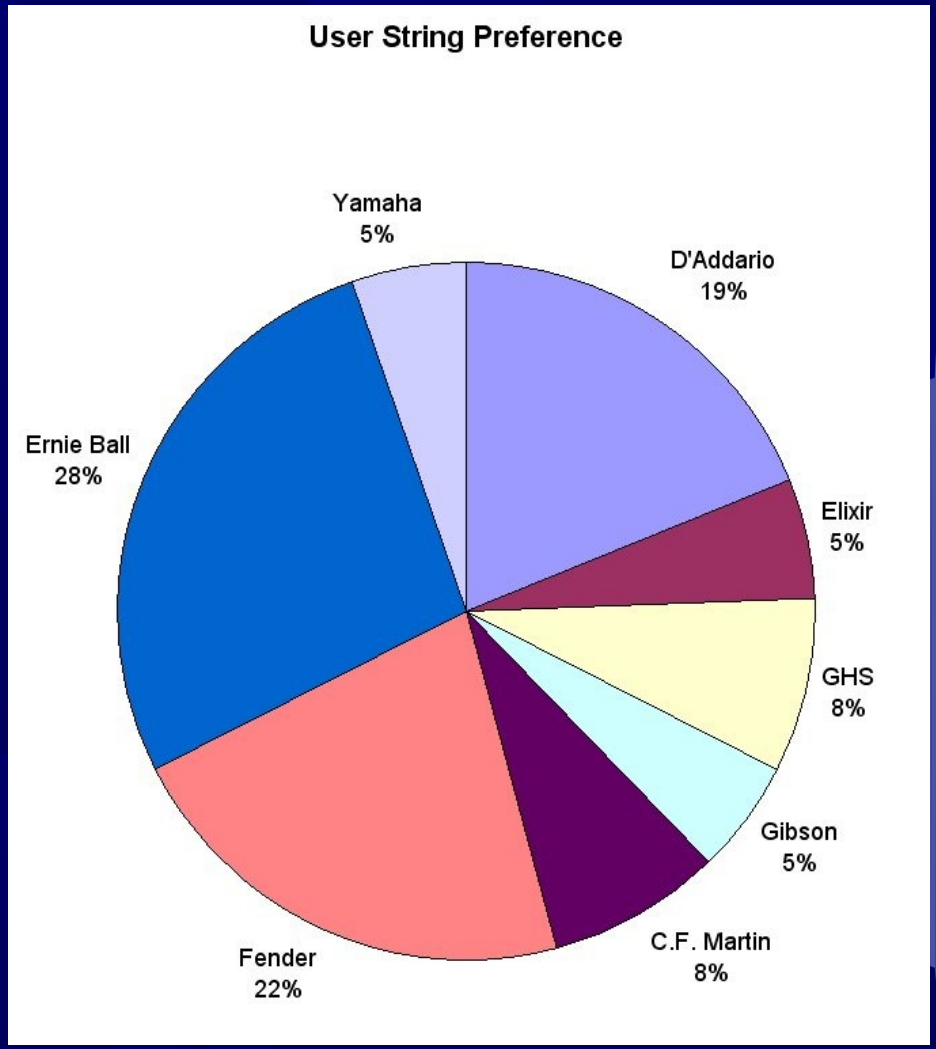
- Tighten up vender specifications
  - Provide cleaner, more consistent wire
- Provide vent near pick-making operation
  - To prevent dust from accumulation on wire
- Provide superior quality control methods
  - It was suggested that this be the focus of next years IPRO team

User Survey

- Created to gather data directly from consumers
- Distributed with set of Gibson guitar strings
- Users asked to complete survey as well as review the strings
- Information analyzed for possible marketing or production improvements

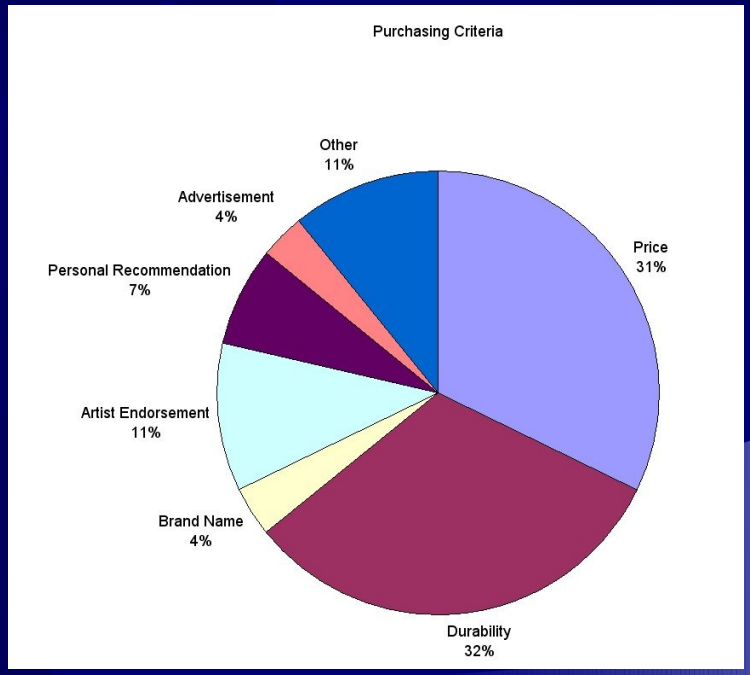
String Preference

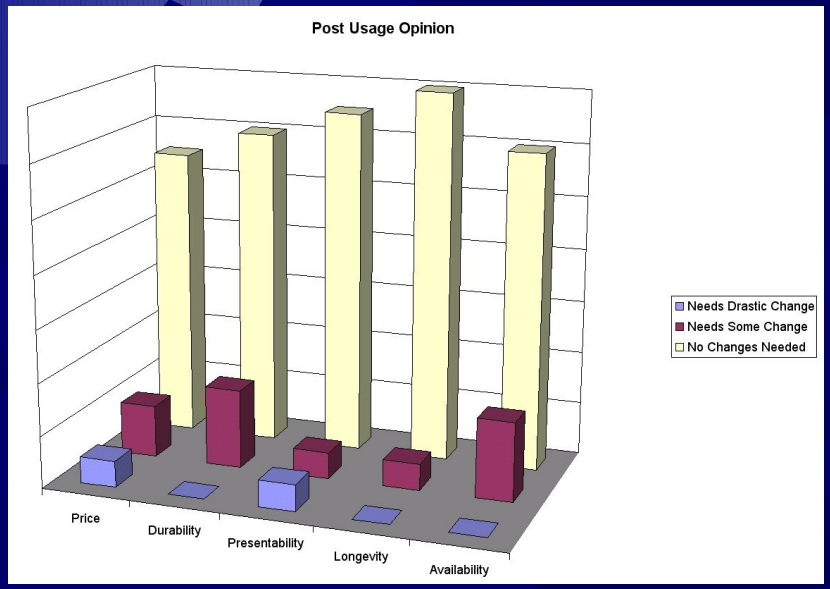
- Preference follows market trend
- Market leaders: Ernie Ball, Fender, D'Addario...
- Small percentage of users use Gibson



Purchasing Criteria and Customer Opinion

- Top criteria for string purchases are price and durability

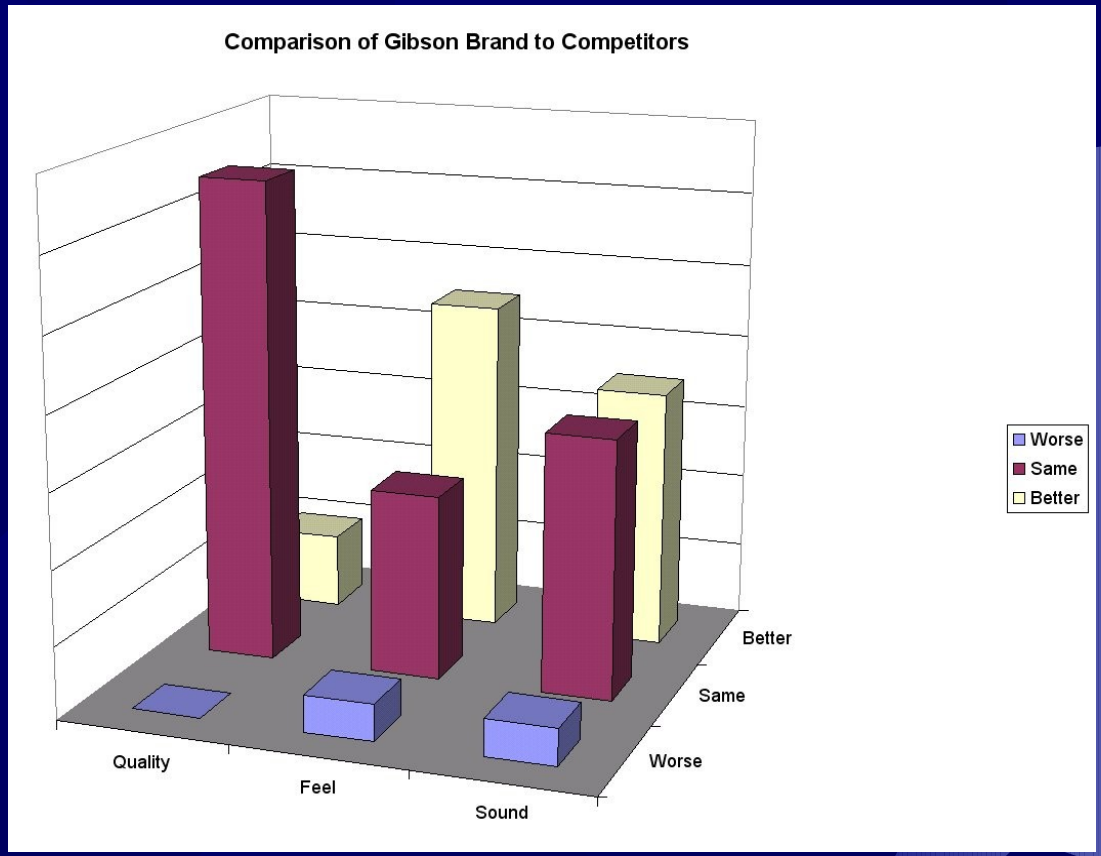




- Gibson received very high ratings from users
- Needs little improvement
- High quality/durability

How Gibson Compares

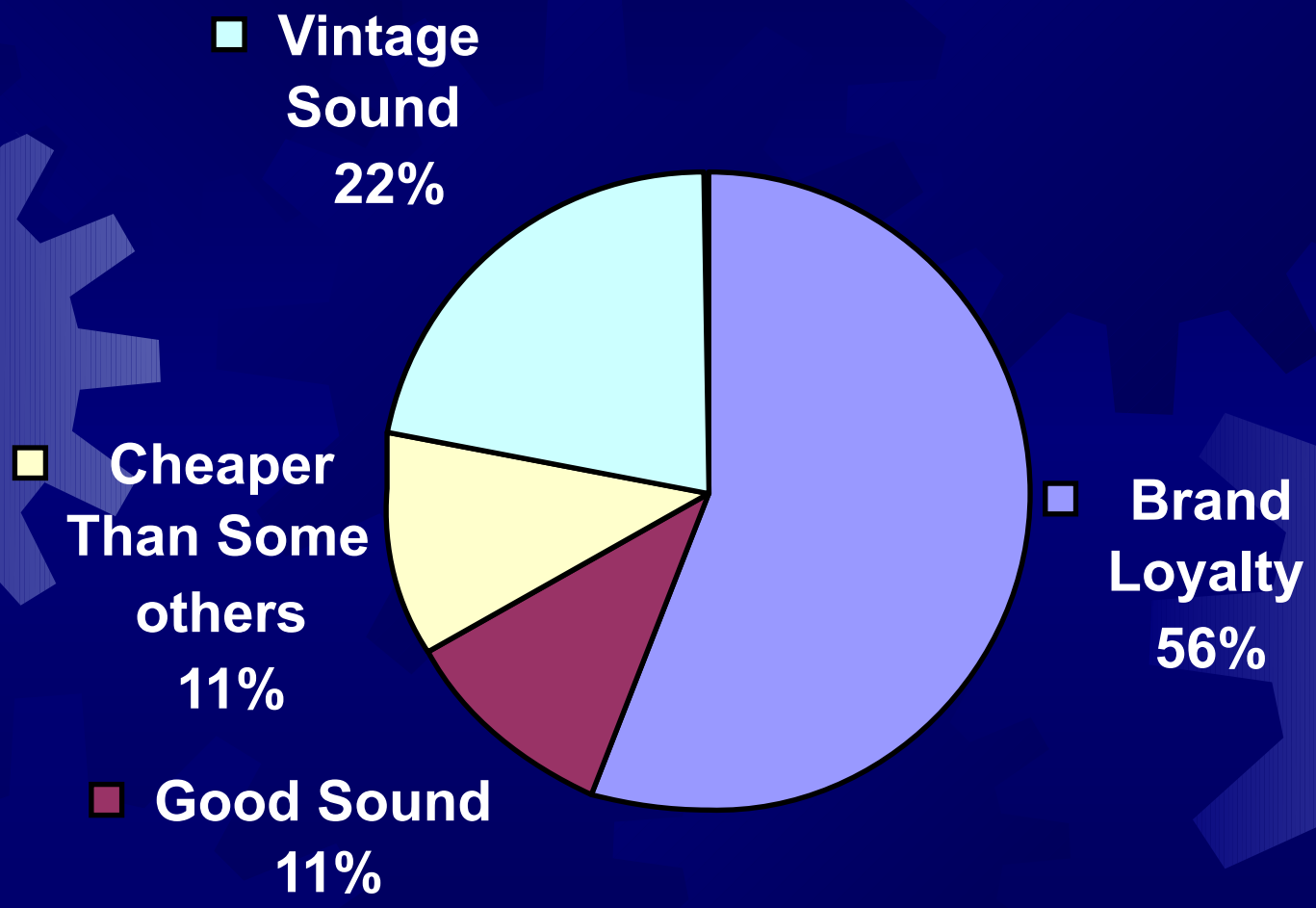
- Gibson strings found comparable to competitor strings
- "Feel" and "sound" better in most cases
- Low string sales not due to quality of strings



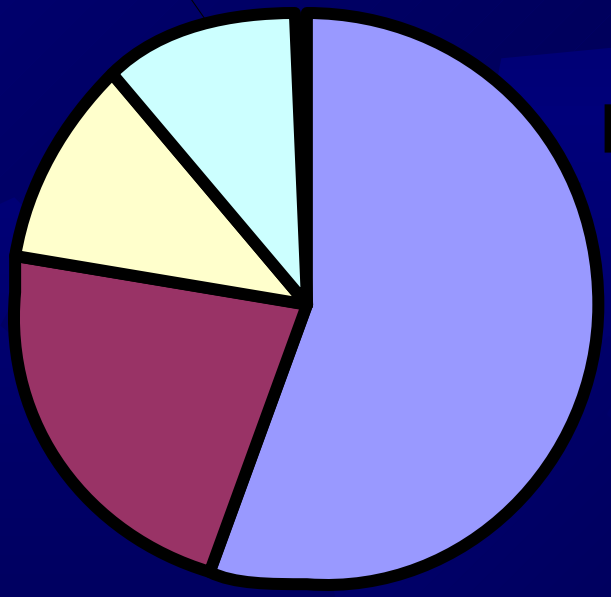
Retailer's survey

- We preformed this task to obtain a broader opinion of general customer opinions regarding Gibson
- A questionnaire was administered through one-on-one contact with distributors of Gibson strings and products
  - 23 distributors in the Chicagoland area
  - 4 in Indiana
- This survey was conducted through three different methods
  - Over the phone
  - Store Visit
  - Internet (email)

Results – why do customers buy them?



Results – why do customers NOT buy them?



Retail Survey Results

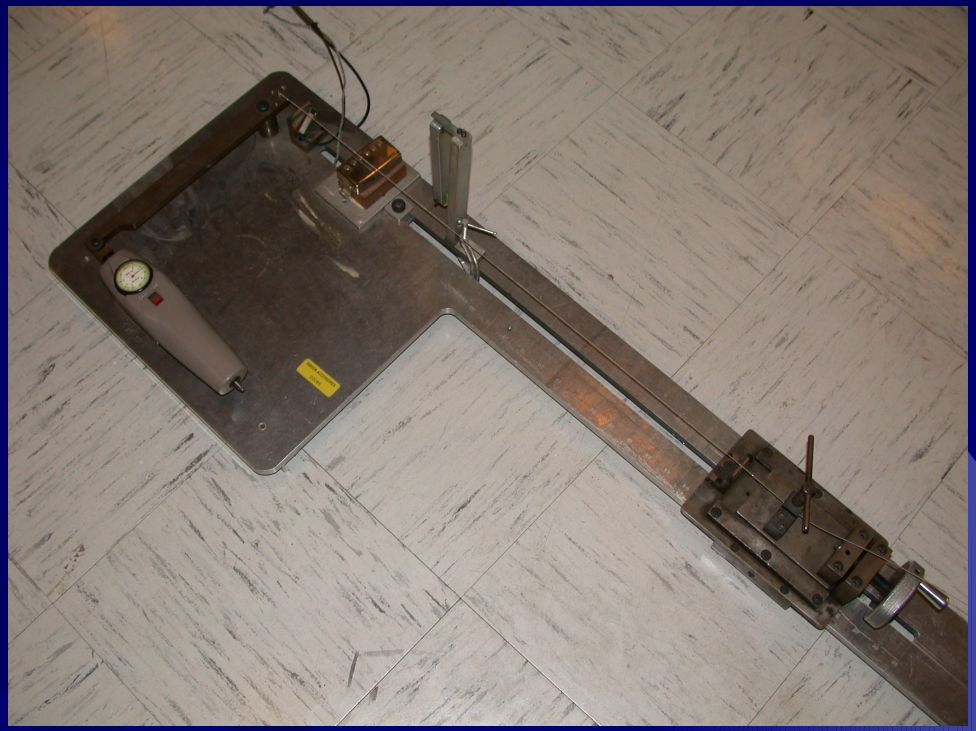
- Gibson owns a relatively small percentage of guitar string market
- Only a small percentage (%15) of retailers had bad experiences with Gibson
- The majority of people who buy Gibson strings own Gibson guitars
- Retailers believe that Gibson strings are not popular among customers due to lack of marketing

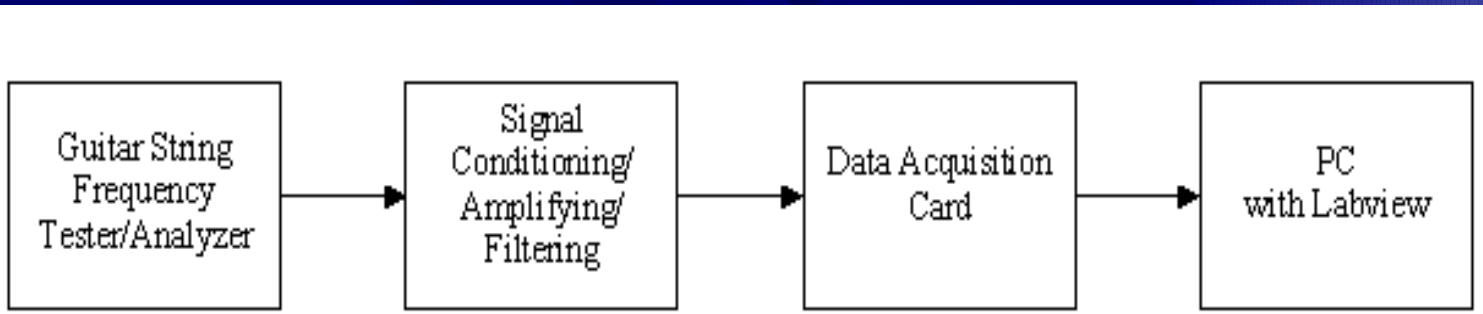
Technical Analysis

- The main objective of performing this analysis was to establish a experimental method by which we could compare strings from different manufacturers.
- When a guitar string is plucked, it vibrates producing a time dependent transient frequency response.
- This response can be captured by using a magnetic pickup similar to the one used on electric guitars.

Experimental Setup

- Guitar String Frequency Tester (G.S.F.T.)





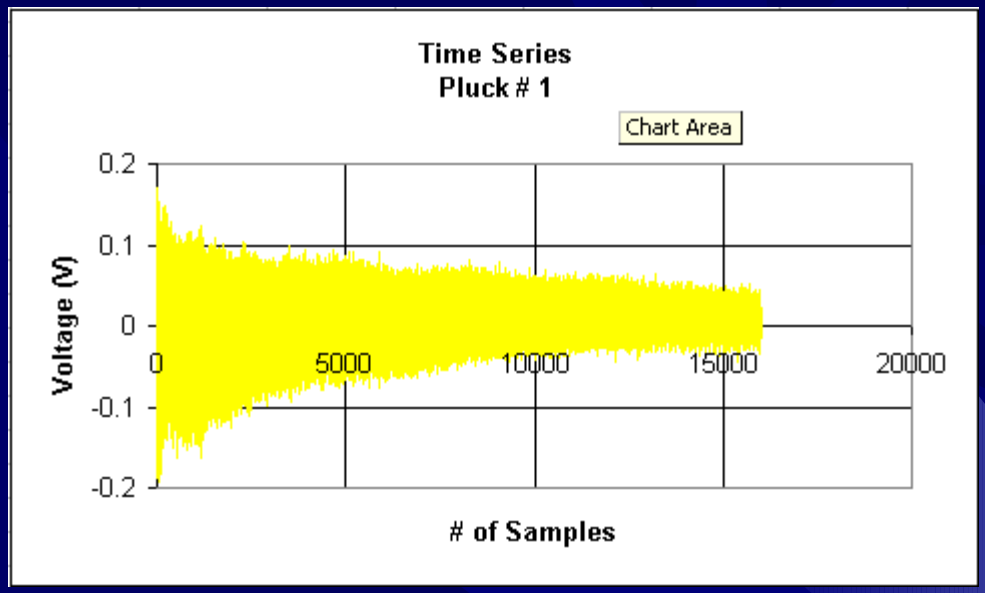
Schematic representation of the experimental setup

Test Matrix

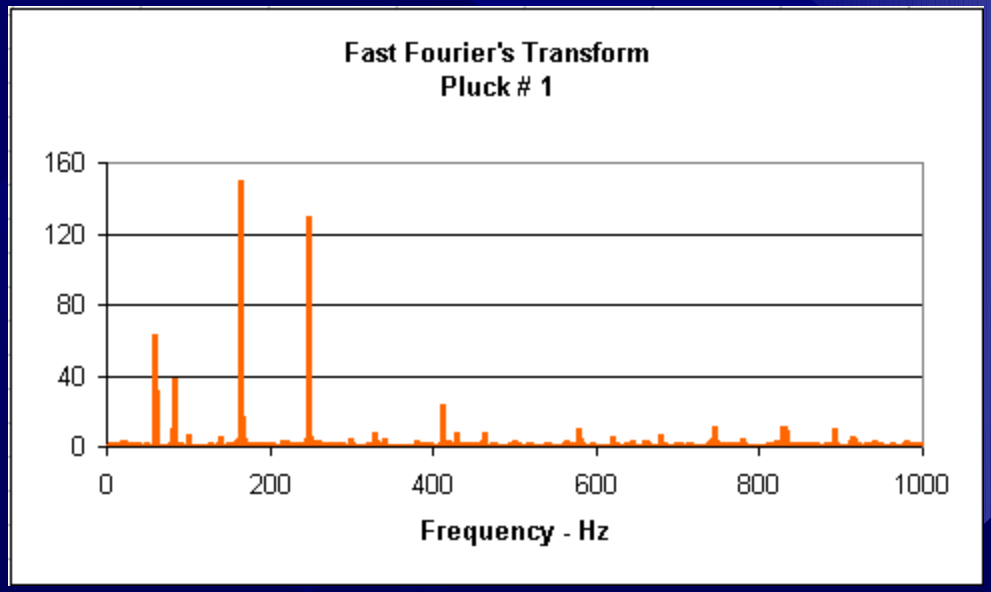
- Guitar strings from 3 manufacturers were analyzed
  - Gibson, Ernie Ball, and D'Addarios
- Test 1: Analysis of the frequency spectrum over time of complete sets of strings (6 strings per set per manufacturer).
- Test 2: Durability and repeatability testing over extended number of plucks (1-2 strings per set per manufacturer).

Data Acquisition (6th-E2)

- Plot showing transient decay

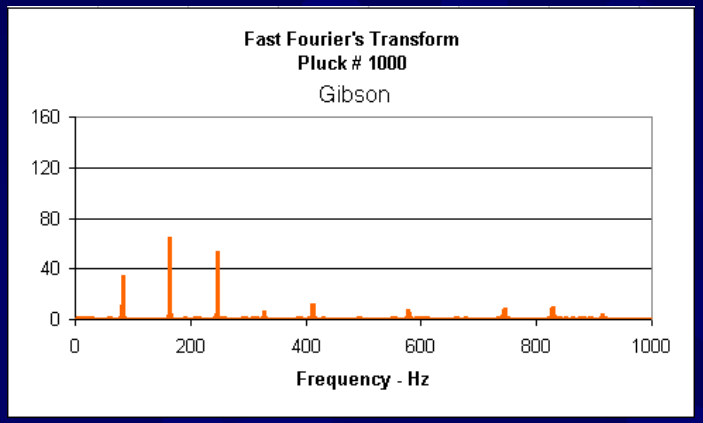


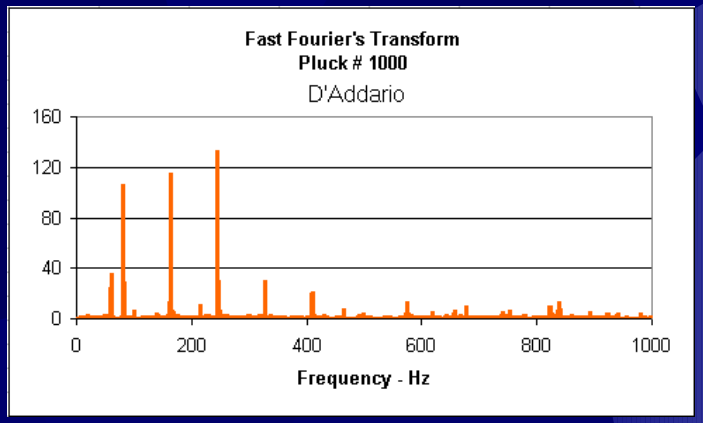
- Plot showing Fast Fourier's Transform (FFT)

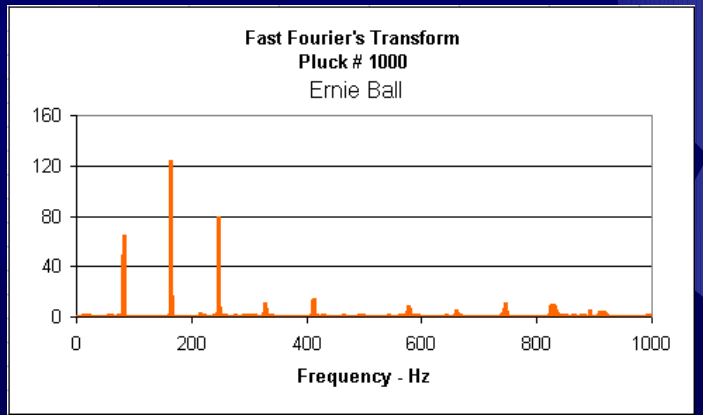


FFT for Durability Analysis

- The analysis performed using the FFT provided a method for comparing the various string types







Results

- The fundamental frequency for Gibson and Ernie Ball's 6th string was found to be 82 Hz corresponding to note E2 and 60 Hz (B1) for D'Addario.
- More secondary harmonics for D'Addario as compared to Gibson and Ernie Ball

Comments and Conclusions

- Through each of these methods, we were able to make pertinent recommendations to Gibson
- Fulfilled client's expectations
- Learned a lot about working in a team

Acknowledgements

- Professor Keith McKee
  - Industrial Assessment
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- Larry Hall
  - Production Manager at Gibson