NO STRAIN NO GAIN...

IPRO 324: Power measurement for road bicycles

The Powertap SL 2.4 shown here for example is priced from $1500 up to $2000. And as we can see, it is not adaptable to a general crankset as the one shown above.

Objectives

- Miniaturize existing electrical system
- Update existing code for the power calculation program
- Obtain strain gauge coefficients
- Create a housing and mounting system
- Perform dynamic testing
- Minimize costs and power consumption

Background

Current available systems on the market:
- Crankset (strain in crankset)
- Free hub (strain in rear wheel)
- Chain (vibration and speed of chain)
- Opposing force (gravity, drag, acceleration, & wind velocity)

Pricing of these systems runs anywhere from sev-
**Methodology**

**Electrical Team**
- Replace chip components with smaller and more efficient ones
- Remove redundant components
- Update code to automatically power down the system and adjust the torque formula upon startup

**Mechanical Team**
- Modify the test fixture containing the crankset to be perpendicular to its initial position
- Recalculate torque coefficients
- Create a universal housing and mounting system for the chip
- Perform road testing of the system

**Obstacles**

**Electrical Team**
- Miniaturization of the board to fit on the crankset
- Source code needs to take into consideration the change of angle to compute power output accordingly
- Ways to increase power efficiency

**Mechanical Team**
- Attachment of all components to crank
- Finding a way to obtain a bicycle
- Integration of mechanical and electrical designs
- Performing road testing in a short amount of time

**Electrical design**

**Results/Conclusions**

**Electrical Team**
- Power efficiency and size have been improved
- Circuit virtually laid out on a PCB board.
- PCB board manufactured and electrical components integrated onto board.
- Coefficients uploaded to the program and power calculations written for one over 8 angles.

**Mechanical Team**
- New testing procedure used to test crank set at proper chain orientation.
- New crank attachment procedure developed to eliminate testing errors
- Coefficients for weight-strain relationship calculated.
- Circuit housing designed and integrated onto crank set

**Housing design**

**Bike purchased at:**

Blue City Cycles

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Chicago, IL 60616

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