

# UNIVERSITY OF MAINE

## 2009 SAE Clean Snowmobile Challenge

### Design Presentation



Presented By: Ben Luja & Mike Lovett

# Baseline Sled:

## 2007 Yamaha Phazer



- Two cylinder, four stroke
- Liquid-cooled
- High power-to-weight ratio (80 hp, 454 lb dry wt)
- 8.1 gallon fuel tank
- 87dB noise emissions level

# UMaine Design Strategy

- ◎ Flex fuel capable
- ◎ Improve exhaust emissions
  - Catalyst
  - Engine tuning
- ◎ Reduce noise emissions
  - Sound-deadening materials
  - Custom cowlings
  - Second muffler
  - Additional idler wheels



# Flex Fuel Components

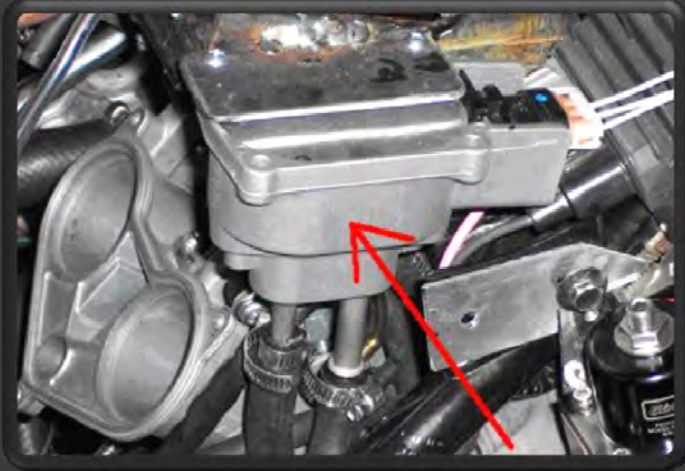


- ◉ Walbro Inline Fuel Pump and JEGS Inline Fuel Filter

- ◉ Edelbrock Fuel Pressure Regulator

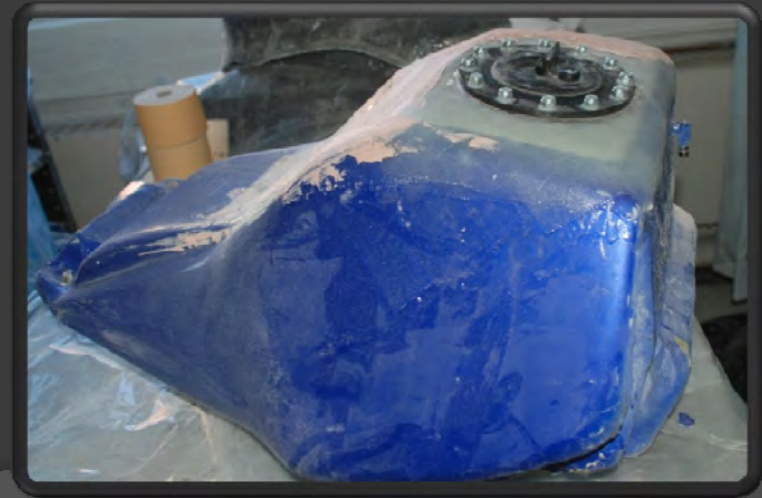


# Flex Fuel Components



- ◉ General Motors Flex Fuel Sensor

- ◉ 12-gal Composite Fuel Tank



# Improving Emissions

- ◎ Catalyst

- Walker Universal - \$120 value



# Aftermarket ECU

- ◎ Aftermarket Engine Control Unit (ECU)
  - Microsquirt by Bowling & Grippo
    - Compatible with coil-on-plug ignition and the stock sensors
    - Easy to program with a downloadable program (Megatune)
    - Allows complete control of fuel, spark and air
    - Comparable to the stock ECU price

# Aftermarket ECU





# Megatune

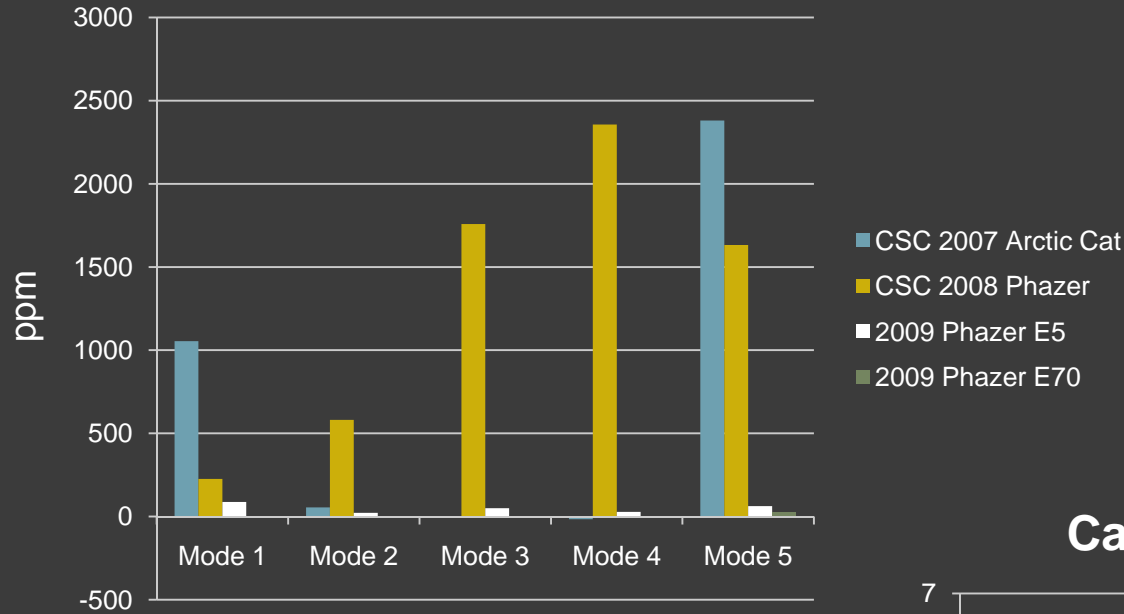
- ⦿ Allows complete user control of fuel, spark and air
- ⦿ Automatically adjusts fuel and spark based on ethanol percentage
- ⦿ Self-tunes volumetric efficiency table to specified air-fuel ratio table using signal from oxygen sensor
- ⦿ Provides an 8 gauge display on the dashboard

# Megatune

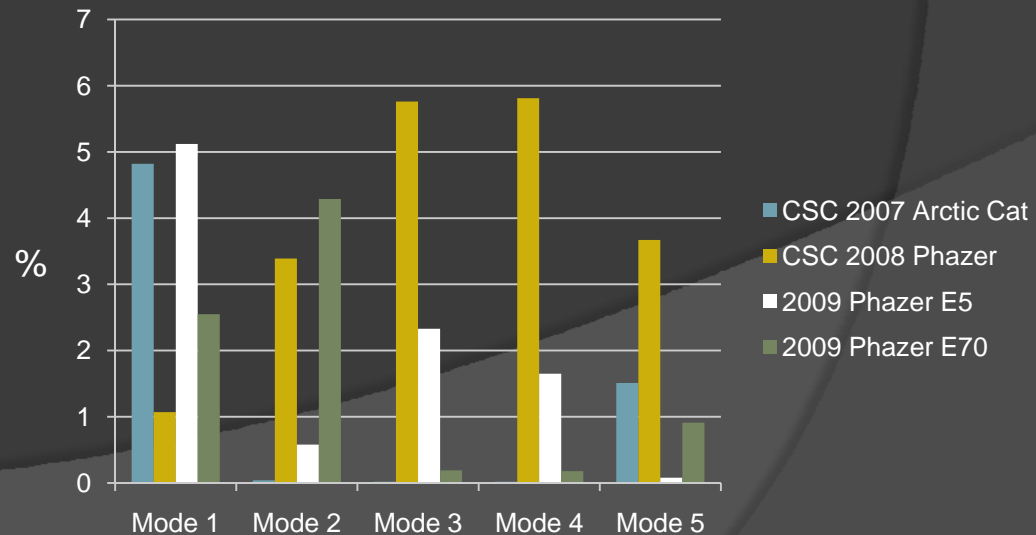


# Emissions Data

## Unburned Hydrocarbon Emissions

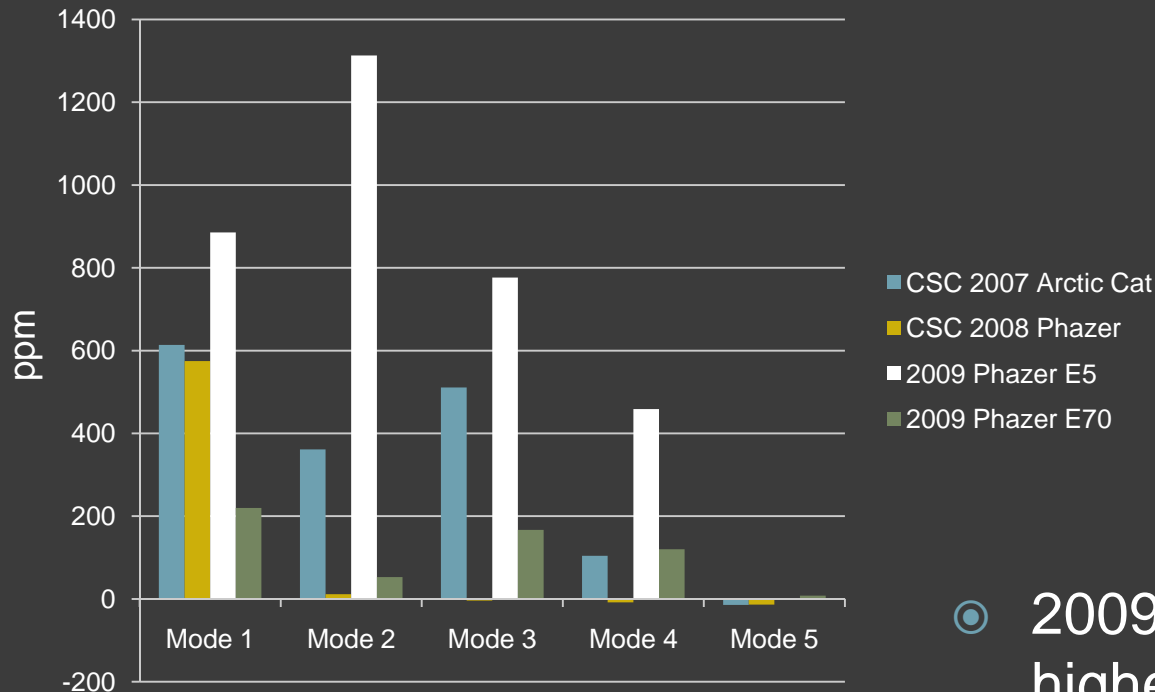


## Carbon Monoxide Emissions



# Emissions Data

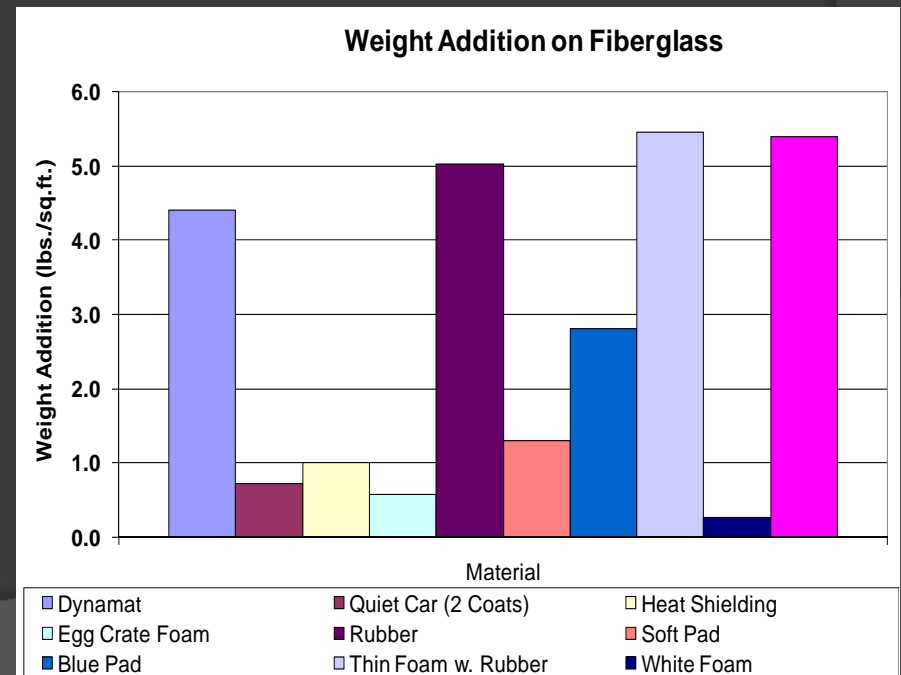
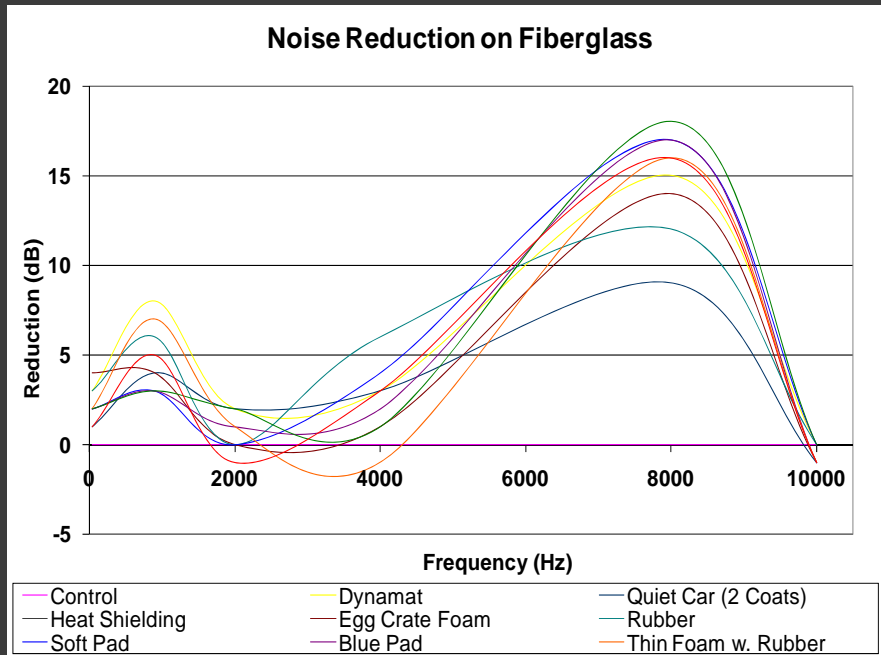
## NO<sub>x</sub> Emissions



- 2009 design runs 2000 RPM higher than 2008 design, altering mode states
- NO<sub>x</sub> emissions slightly higher than CSC 2008 data, but HC and CO vastly improved

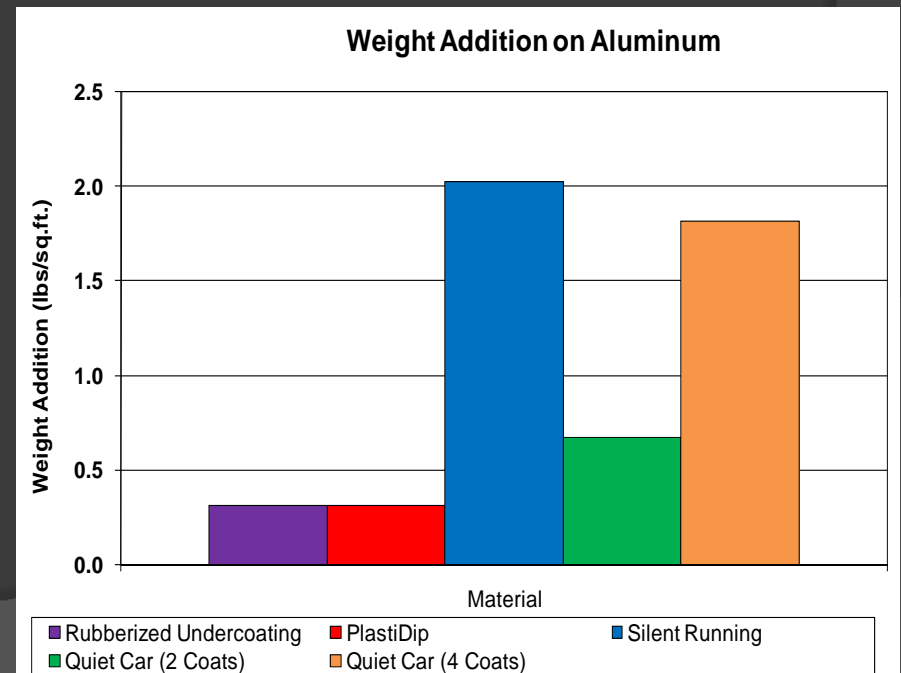
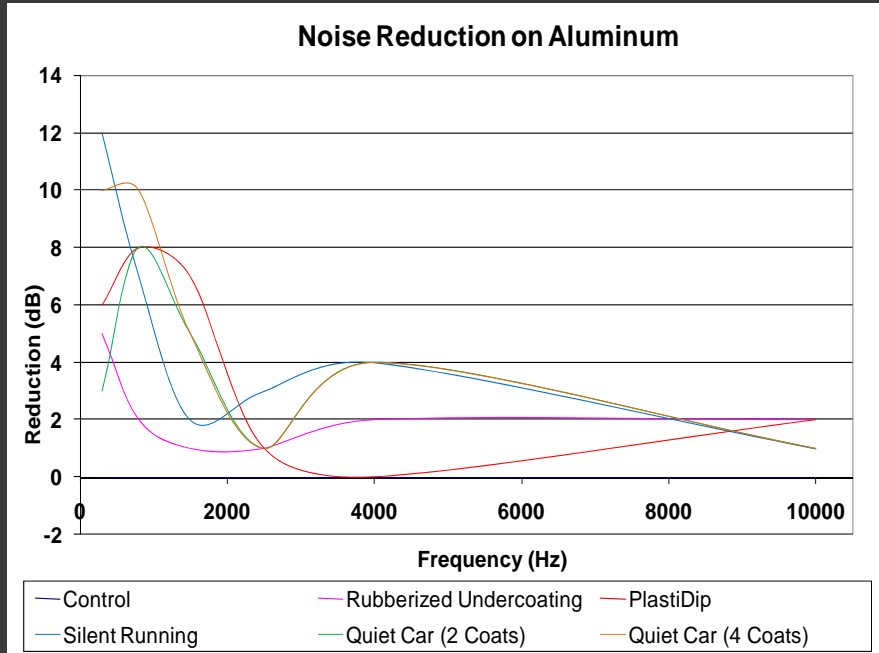
# Sound Dampening Product Choice

## Product performance on fiberglass



# Sound Dampening Product Choice

## Product performance on aluminum



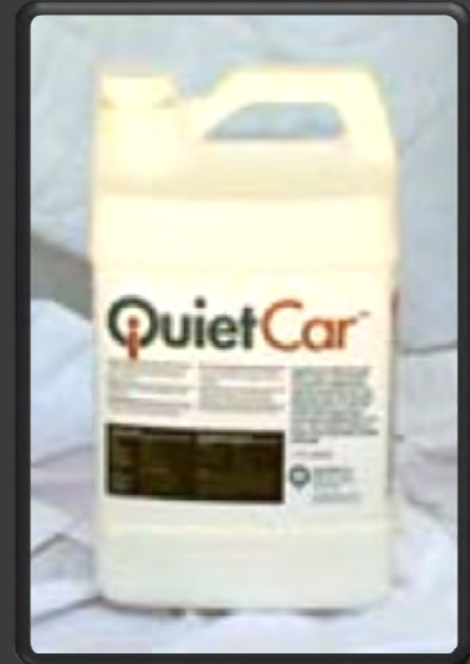
# Engine Compartment Sound Dampening

- ◎ Custom cowlings adapted from Yamaha Venture Lite
  - Reshaped for improved seal and sound containment



# Engine Compartment Sound Dampening

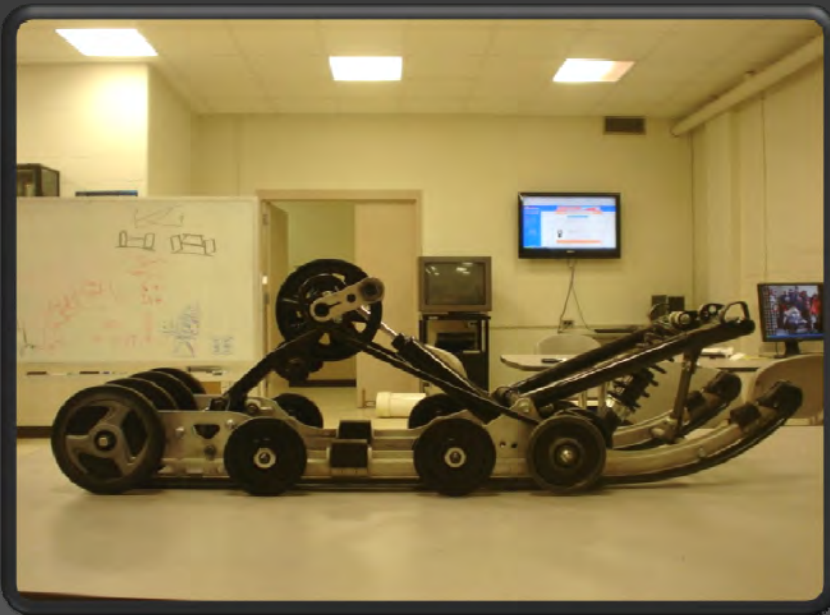
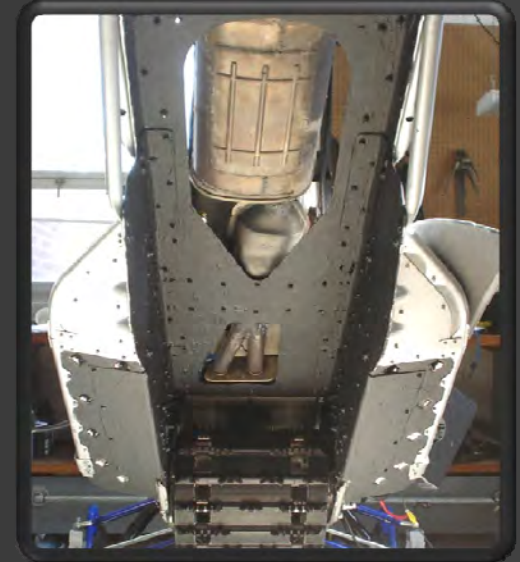
- ◉ Lined with Dynamat Xtreme and QuietCar to reduce noise emissions through the cowlings





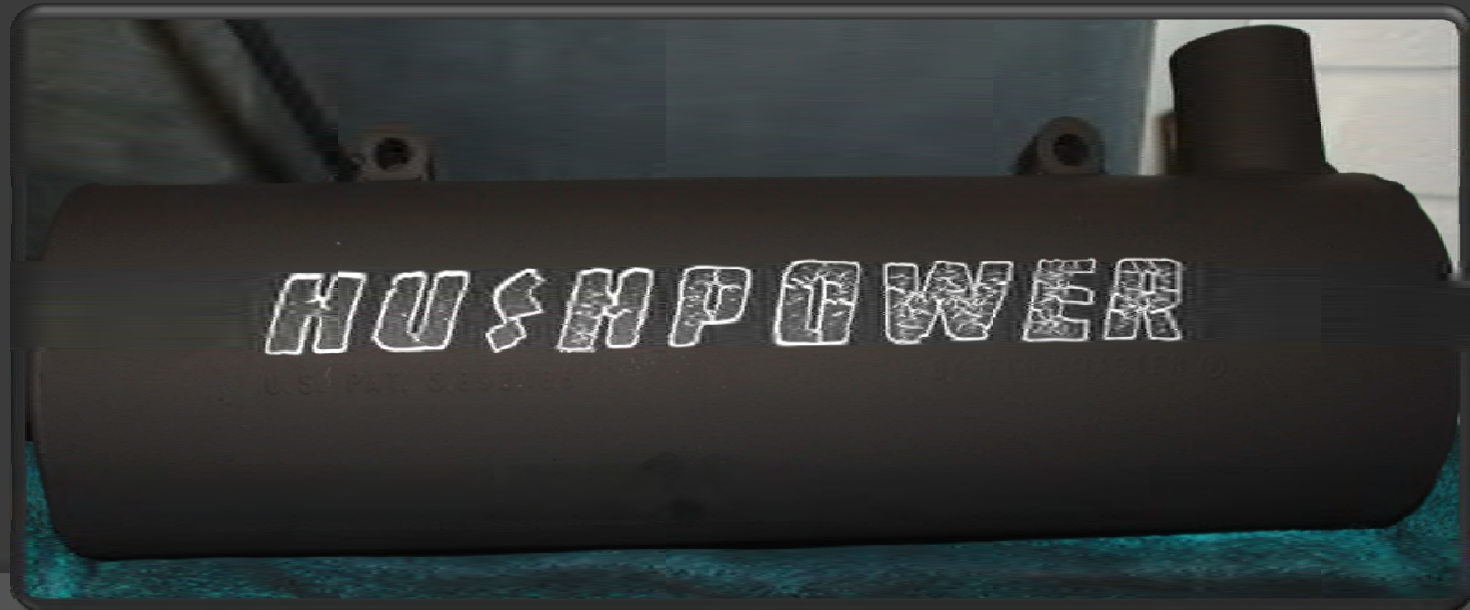
# Tunnel Sound Dampening

- ◉ Added QuietCar to the tunnel to reduce noise echo from rear of snowmobile
- ◉ Additional idler wheels to dampen high speed track vibration



# Auxiliary Muffler Apparatus

- ⦿ Auxiliary muffler to reduce exhaust noise
  - Hushpower by Flowmaster
  - Decibel reduction without power loss



# Marketing the Phazer

- Marketable to a wide range of riding styles



- Clean, quiet alternative to stock snowmobiles
- Moderate cost (MSRP \$9,810)

# Summary

- ⦿ Noise reduction of 10 dB at exhaust exit
- ⦿ Noise level of 73 dB at idle
- ⦿ Vastly improved exhaust emissions over CSC 2008 Phazer with winter blend E85
- ⦿ Added an on-board computer to provide additional tuning capabilities for more advanced users
- ⦿ Windows XP operating system allows the possibility of additional applications

# Questions?

