

### University at Buffalo Clean Snowmobile Team

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Team Members: Kyle Barber, George Alessi, Ted Pitera, Mike Pelino, Ted Battesh

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### **UB Clean Snowmobile**

- Overview
  - 2005 Polaris Fusion Chassis
    - M-10 Air suspension
  - Daihatsu DM950DT diesel engine
    - Honeywell Garrett GT15V VNT Turbocharger
  - Team Industries Primary and Secondary clutches

## **Snowmobile Operator Perspective**

#### • Appeal

- This snowmobile is intended to reach operators in the fuel economy, alternative fuel, and diesel enthusiast fields.
  - The engine has a BSFC of 260 g-kw/h from 1600 rpm to 2400 rpm, then increasing to a max of 300 g-kw/h at 3600 rpm.
  - The Bosch VE type injection pump can handle biodiesel and even straight vegetable oil.
  - The last group is reached simply because it is an "Oil Burner"

## **Snowmobile Operator Perspective**

#### Handling

- At the current time handling is not improved on due to the cast iron engine, and dated chassis design.
- Performance
  - At the current time performance is not improved upon only held steady.

## **Snowmobile Operator Perspective**

#### • Ergonomics

- During the build of this snowmobile, ergonomics was not a design consideration.
- After the endurance run yesterday, ergonomics will be taken into concern.
- Primary concerns are heated hand grips, wind shield, and mirrors to make a comfortable trail snowmobile.

## **Snowmobile Dealer Perspective**

- Durability
  - The engine has a longer life than gas engines.
    - CARB rates the engine at 5000 useful hours, if average speed is equal to 30 mph, this is equal to 150,000 miles.
  - Parts do not need regular replacing unless showing signs of failure.
  - Service items such as filters are easily located on right side of engine bay.

## **Snowmobile Dealer Perspective**

#### • Dealer Attractiveness

- On initial release dealers would not be attracted due to the need to learn a new technology and service methods. This technology would be pulled through the dealers from consumer demand.
- Rider Comfort
  - As noted before, comfort was a minor consideration, now to be a larger consideration.

### **Environmental Perspective**

- Engine out emissions
  - In stock form with no after treatment based off of CARB emissions testing, the snowmobile would have an E-score of 205.
  - We can not analyze the engine with last years lab emissions tests because of oil in our exhaust and an improper catalyst setup.

### **Environmental Perspective**

#### • Noise

- Reduction of noise is not a major concern.
- Max engine RPM is 4500.
- On the subjective noise test, the majority of the noise is from the track, not the engine.
- Last year we passed the Objective sound test 3 dB lower than the next closest snowmobile.

### **Environmental Perspective**

#### • Smell

- The use of the Diesel Oxidation Catalyst removes almost all signs of a foul diesel smell.
- This smell is removed by the conversion of the un-burnt aromatic hydrocarbons.
- This was a concern of snowmobilers at a New York State Snowmobile Association convention.

## **Design Intentions**

- Boost Controller
  - We were planning on having a programmable boost controller on our turbo this year.
  - This would allow us to specify the amount of boost for a specific operation condition and allow us to get the catalyst operating at an optimal condition.
  - Electronics issues forced us back to a mechanical boost actuator.

# **Closing Thoughts**

- Engineering Analysis was small this year due to rebuilding of team from mass graduation.
- Current team members are a majority of junior mechanical engineering students intent on learning from this years competition and improving for next years competition.
- Our team is also looking for another engine and chassis.