SAE Oral Presentation

South Dakota School of Mines and Technology

Alternative Fuel Vehicle Team

Our History

- Solar Powered Vehicle
  - 1995-2004
  - Sunrayce Participants

- Hydrogen Powered Vehicle
  - Utilized Nexa Power Module by Ballard
  - Prototype created

Our Goals

- Create an electric snowmobile to compete in the Clean Snowmobile Competition for 2007
- Keep the snowmobile as close to stock as possible
- Have performance characteristics that are practical for the requirements of the competition
- Maintain safety throughout the entire project

Our Approach

- A decision matrix was used to base the design criteria
- After team discussions, range was considered to be ultimately unattainable with current budgetary restraints
- Snowmobile would be easily upgradeable for future competitions

Topics	Ranks
Safety	1
Performance	2
Range	3
Reliability	4
Weight	5
Cost	6
Availability	7
Appeal	8

Snowmobile Operator Perspective

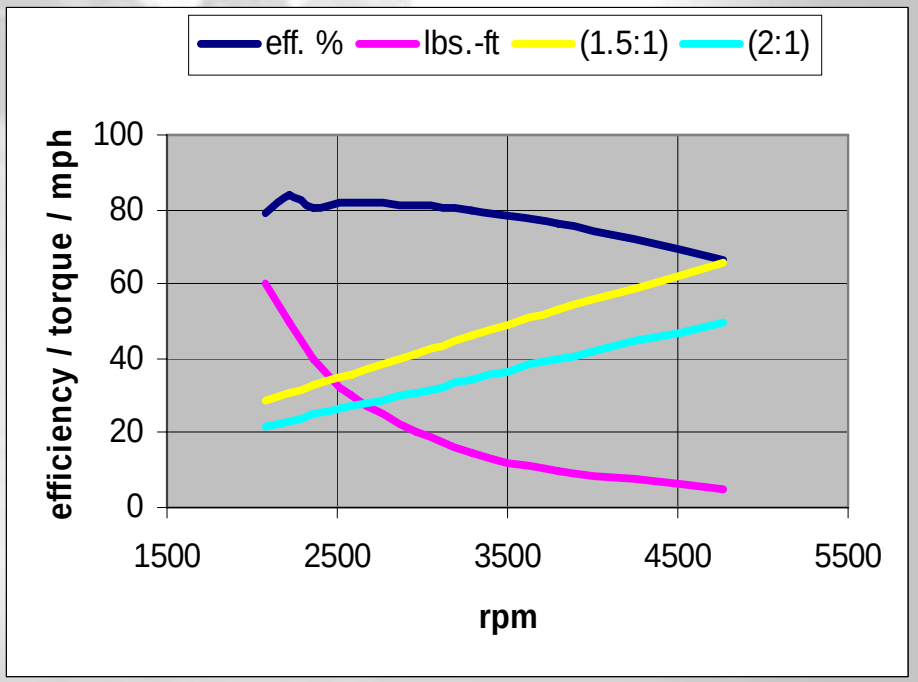
- Appeal
  - Appearance will be kept close to factory look
  - This gives a familiarity to the rider

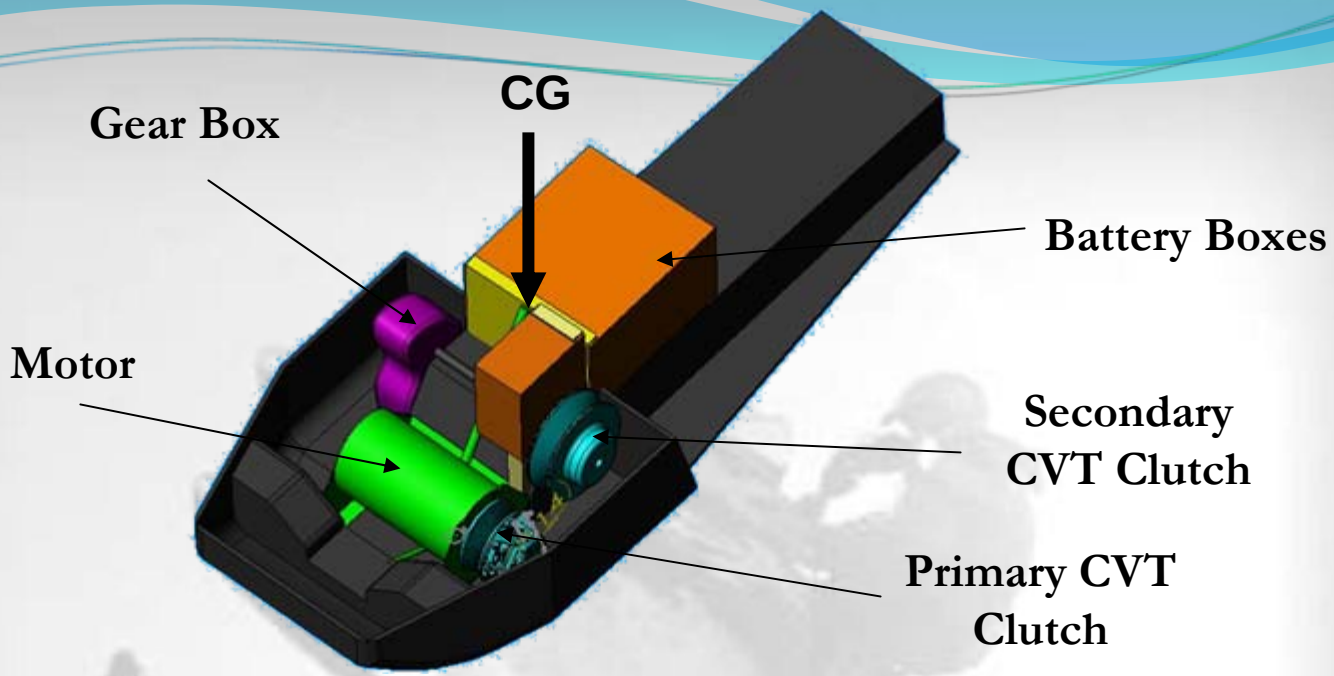
- Ergonomics
  - Original rider position was maintained
  - All controls are located in a similar position as stock

Snowmobile Operator Perspective

Performance

- Electric motor is capable of 72 ft-lbs of torque at 72 volts
  - This produces adequate acceleration
- Gear ratio of 1:1.8 in order to allow for a speed of 35 mph
- Motor controller is rated at 450 amps at 72 volts which is giving the full use of the battery pack potential





Handling

- Weight of the snowmobile is 803 lbs which still allows for maneuverability
- Center of gravity is located right behind the bulk head giving the driver expected handling results
- Rear Torsion Springs were given a tighter pretension to compensate for the weight of batteries

Dealer/Outfitter Perspective

- Cost
  - MSRP value was $10,600 to compete with IC snowmobiles
- Durable
  - Low maintenance
  - Electric equipment has a long life
- Simple Operation
  - A novice can use with little training
  - All controls are located in the typical position
- Rider Comfort
  - Ergonomics maintained to that of a stock snowmobile

Environmental Perspective

- Emissions cause the following
  - Acid Rain
  - Global Warming
  - Air Pollution
- Electric is the solution
  - Utilizes cleaner form of energy
    - Power Plants provide energy*
      - Power plants have vastly reduced air pollutants through stack scrubbers
  - Snowmobile has no emissions

*World Energy Council. 19 March 2007. http://www.worldenergy.org/wec-geis/publications/reports/pgp/environmental/switching.asp

http://www.zenwaiter.com/photos/indexnew/smokin%207%20ft.jpg

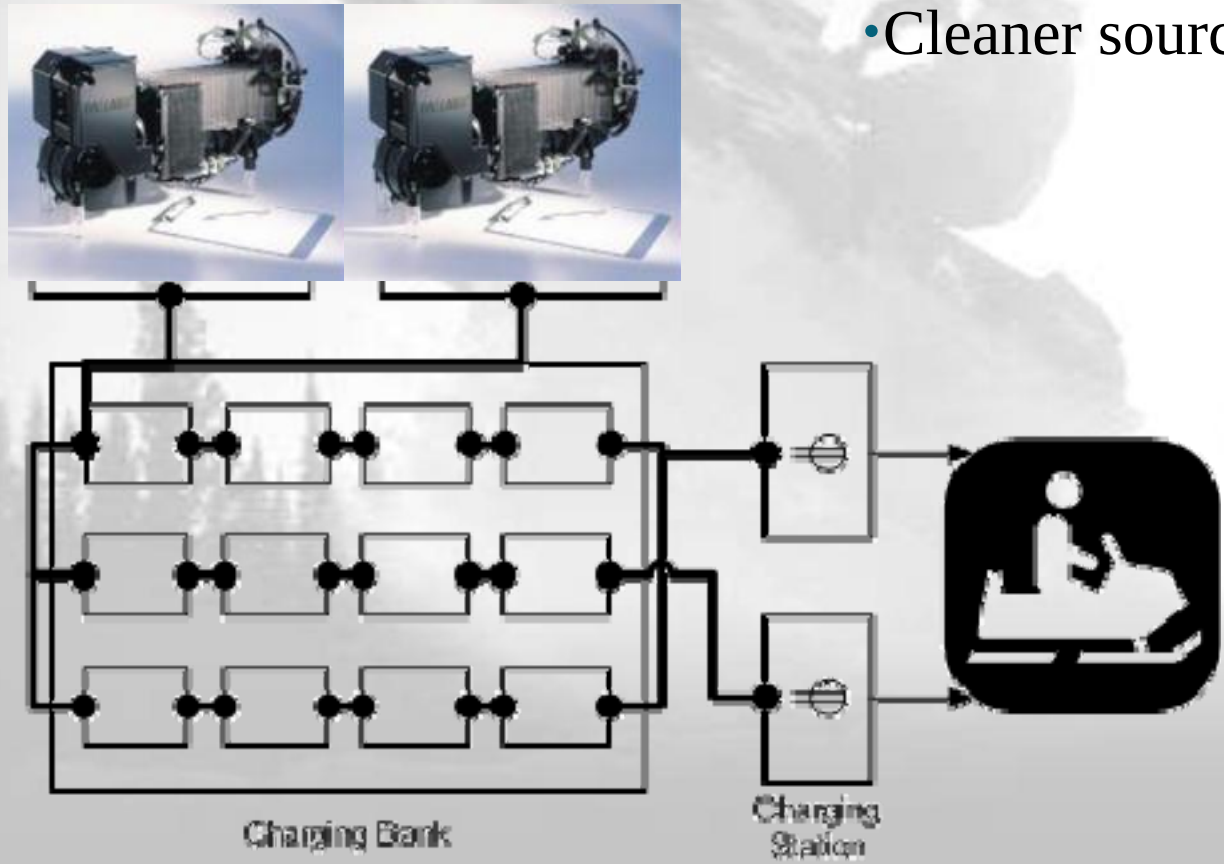
Environmental Perspective

- Noise is a major issue with snowmobiles
  - Common snowmobile produces 82dB at 50 ft*
  - Noise pollution is an annoyance to others utilizing the same wilderness areas
- Electric is virtually silent
  - The majority of the noise is emitted from the track
  - Electric motor noise is similar to a small household fan

*"A Guide to Noise Control in Minnesota." Minnesota Pollution Control Agency. 19,March 2oo7. http://www.nonoise.org/library/sndbasic/sndbasic.htm#7.4

Our Future

- Utilize hydrogen fuel
  - Allows for portable charging
  - Cleaner source of energy



Questions???

Thank-you

The SDSM&T AFV team would like to acknowledge the many sponsors who helped to make this project a reality. A special thanks for the resources found in the Center for Advanced Manufacturing and Production (CAMP) and in the Composite and Polymer Engineering (CAPE) Laboratory. Also to the teams advisors, Dr. Batchelder and Dr. Dolan, and to the many other faculty who offered expertise. The team also thanks Net Gain Technologies and Alltrax for their top of the line technologies and expertise. Thanks also to other local sponsors:

Gold Level Sponsors ($1000+)
- SDSM&T
- Sport Shack

Silver Level Sponsors ($250-$999)
- Art's Body Shop
- Interstate Batteries
- Big Sky Upholstery

Bronze Level Sponsors ($0-$249)
- Auto Body Crafters
- Rushmore Honda