2010 SAE Clean Snowmobile Challenge

Parade lap on the objective handling course.
What is the CSC?

• The newest competition in the SAE International collegiate design series. Others include Formula SAE, Baja and others.
• Challenges engineering students to improve on existing snowmobiles to reduce emissions and noise and improve public perception.
• Events include: emissions bench test, in-service emissions, noise, handling, static display, cold start, endurance run, range, draw bar pull, acceleration.
• Hosted by Michigan Technological University, Keweenaw Research Center past eight years.
• I serve as a technical inspector, judge and sit on the rules committee.
CSC History

• Began in 1999 in response to conflicts over snowmobile use in Yellowstone N.P.. Held in Jackson Hole, Wyoming first four years.
• Moved to Michigan Tech/KRC in 2003
• NSF became a major sponsor in 2008
• In 2010, 17 teams competed (5 ZE)
• The winning ZE team is offered the chance to send one team member and their machine to Summit Station.
There are big teams
There are little teams
16 Teams Finished – That’s a lot of students!

Two teams from Canada this year. In 2011, a team from Sweden intends to compete.
Niche Applications for Zero Emissions

• Allows atmospheric and snow photochemistry scientists to access their sampling sites with ZE machines.

• Several spin-offs on the IC side, including catalytic exhaust after-treatment and oxygenated fuel.

• ZE machines may well fit the needs of Alaskan villages, where fuel prices are prohibitive.

• Other potential applications at ski areas – especially in Europe, where regular snowmobiles are becoming increasingly banned.

• Electric motors are unaffected by altitude.
Electric Snowmobile At Summit

Dramatic performance improvements over the years:
- Up to 20 mile range
- Up to 75 mph top speed (de-tuned for Summit)
- High availability
In Service Emissions Space Pod
In Service Emissions Testing
Sound Testing
Some of these machines are really fast! Pulling a trackie at the start of an acceleration run.
Objective Handling
Draw Bar Pull

Performed on grass this year. Gives objective numerical data to compare pulling power.
This was supposed to be a combined range + load + handling event. The lack of snow made us come up with creative ways to demonstrate the ZE machines great utility functions, while keeping it interesting and fun.
New Challenges Every Year

• 2008/E20: 20% Ethanol, an oxygenated biofuel
• 2009/Flex Fuel: Engine controls had to recognize the fuel and alter mapping.
• 2010/Fuel Efficiency: The winning machine got almost 23mpg in truly poor snowmobiling conditions.
• 2011 – Maybe wheels??????
A few challenges for organizers too!

Forecast: 60 degrees F and plenty of mud!!
U of Wisconsin – Madison: 1st Place ZE
Clarkson University: 2nd Place ZE
McGill University: 3rd Place ZE
South Dakota School of Mines and Technology
University of Alaska - Fairbanks
Innovation Award: SUNY-Buffalo

Bio-Diesel Powered Snowmobile!
University of Idaho: Best Handling

Snowcross: Huge suspension travel; lightweight 2-stroke
NSF Polar Programs & Summit Station

- Educational Outreach
- Meeting a need for ZE transportation
- Promoting appropriate technology solutions

Questions??