

University of Wisconsin Platteville 2013 Clean Snowmobile Team



Presenters
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Design Objectives

- ▶ Create Efficient Snowmobile Fueled by E-40 to E-85
- ▶ Emissions Reductions
 - ▶ Noise
 - ▶ Exhaust
- ▶ Maintain Stock Riding Qualities
 - ▶ Performance
 - ▶ Comfort

Consumer Appeal

- ▶ Comfort
- ▶ Weight
- ▶ Reliability
- ▶ High Performance
- ▶ Low Maintenance
- ▶ Low Operating Cost
 - ▶ Fuel Mileage
 - ▶ Oil Consumption
- ▶ Ergonomics

Dealer Appeal

▶ Sales

- ▶ Marketable to consumers (Aesthetics)

▶ Service

- ▶ Readily available of parts
- ▶ Ease of Maintenance

Snowmobile Choice

- ▶ Chassis: 2013 Ski-Doo Rev-XP
- ▶ Model: MXZ TNT 600 E-TEC

Engine Type	Two-Stroke
Engine Details	Liquid-cooled, eR.A.V.E.
Cylinders	2
Displacement	594.4 cc
Bore x Stroke (mm)	71 x 74
Exhaust	Single
Fueling	Electronic DI

Design Strategy

▶ Efficiency

- ▶ Engine Management
- ▶ Driveline Improvements

▶ Clean

- ▶ Engine Selection
- ▶ Exhaust

▶ Quiet

- ▶ Sound Deadening Material

▶ Flex Fuel

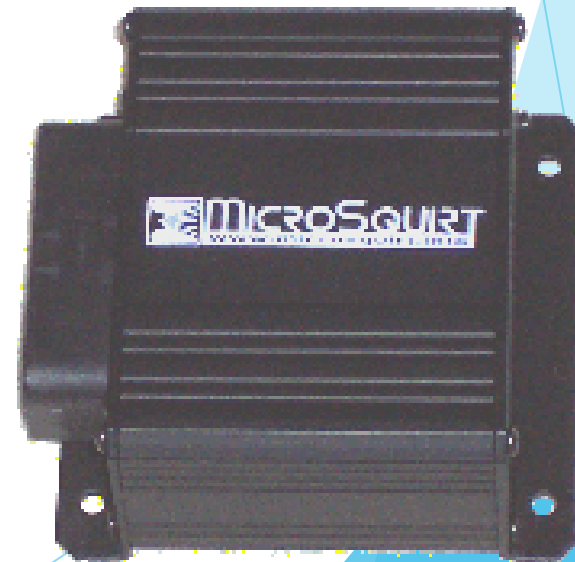
- ▶ E-40 to E-85

▶ User Friendly

- ▶ Ergonomic Rider Position
- ▶ Trail Performance Related
- ▶ Simple Display and Controls
- ▶ Easy Starting
- ▶ Suspension

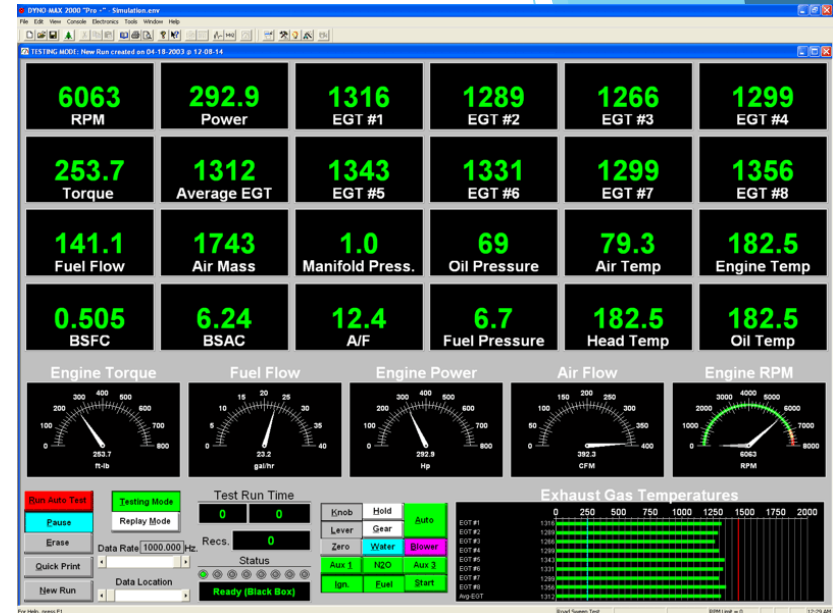
Engine Management

- ▶ Stock EMM with DI Injection System
- ▶ Microsquirt Supplementary ECU and Modified Injection System



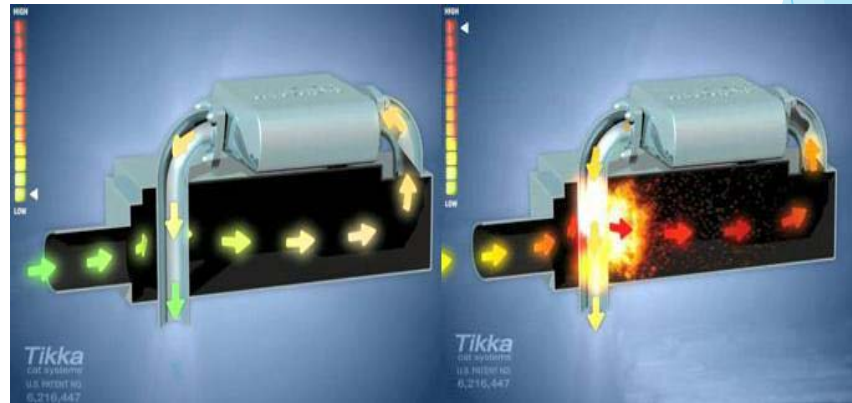
Engine Tuning and Calibration

- ▶ DYNOMite Water-Brake Dynamometer
- ▶ ProSPORT Wide Band AFR Monitor
- ▶ Exhaust Gas Temperatures
- ▶ EMS Emissions Analyzer



Environmental Benefits

- ▶ Reducing Emmissions
- ▶ Tikka Race
- ▶ Pre-Burn Catalytic System



Environmental Benefits

Emissions (ppm)					
Mode Point	Speed (RPM)	Untreated		With Pre Burn Catalyst System	
		HC	NO _x	HC	NO _x
1	8000	3000	530	25	34
5	1200	1000	58	7	0

▶ Advantages

- ▶ Maintains Stock Back-Pressure
- ▶ Replaces Previous Muffler
- ▶ No Maintenance

Driveline Improvements

- ▶ Primary Clutch
 - ▶ CVTech Powerbloc 80
- ▶ Secondary Clutch
 - ▶ Team TSS04
- ▶ Jackshaft
 - ▶ Team Hollow Splined Jackshaft
- ▶ Belt Drive System
 - ▶ C3 Powersports



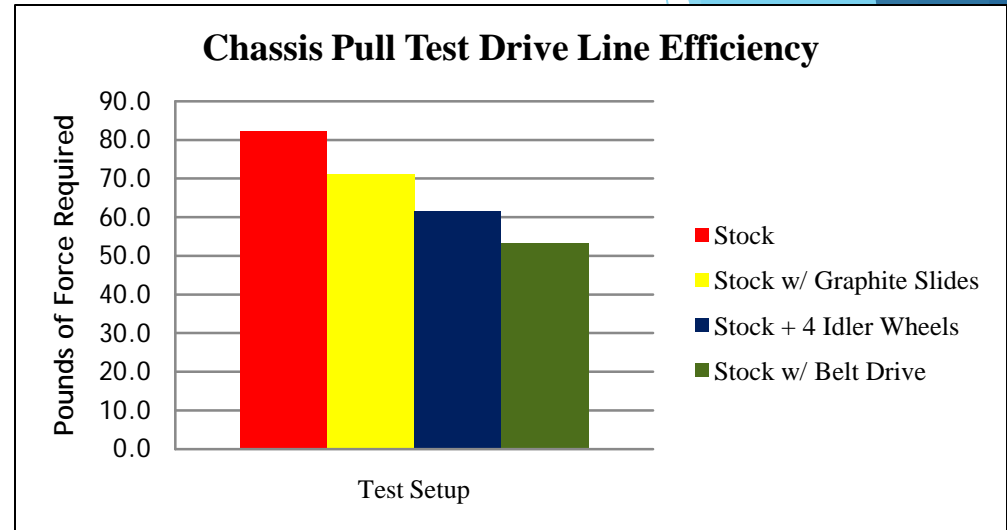
Driveline Improvements

- ▶ Replaced Drivers
 - ▶ 8 Tooth to 10 Tooth
- ▶ Replaced Stock Rear Idler Wheel with 10 Inch Diameter Billet Wheels
- ▶ Added Idler Wheels (8)
- ▶ Graphite Hyfax Slides
- ▶ Track
 - ▶ Camoplast Ice Attak XT



Driveline Improvement Results

- ▶ Varying Driveline Configurations
- ▶ Drill Test (Previous Year)
 - ▶ $\text{Hp lost} = (115 \text{ Volts}) * (\text{Amps}) * (0.001341 \text{ Hp/W})$
 - ▶ 33% More Efficient
- ▶ Pull Test (Previous Year)
- ▶ Throttle Position Test
 - ▶ 15% Reduction of Throttle Position at Same Speed and Conditions

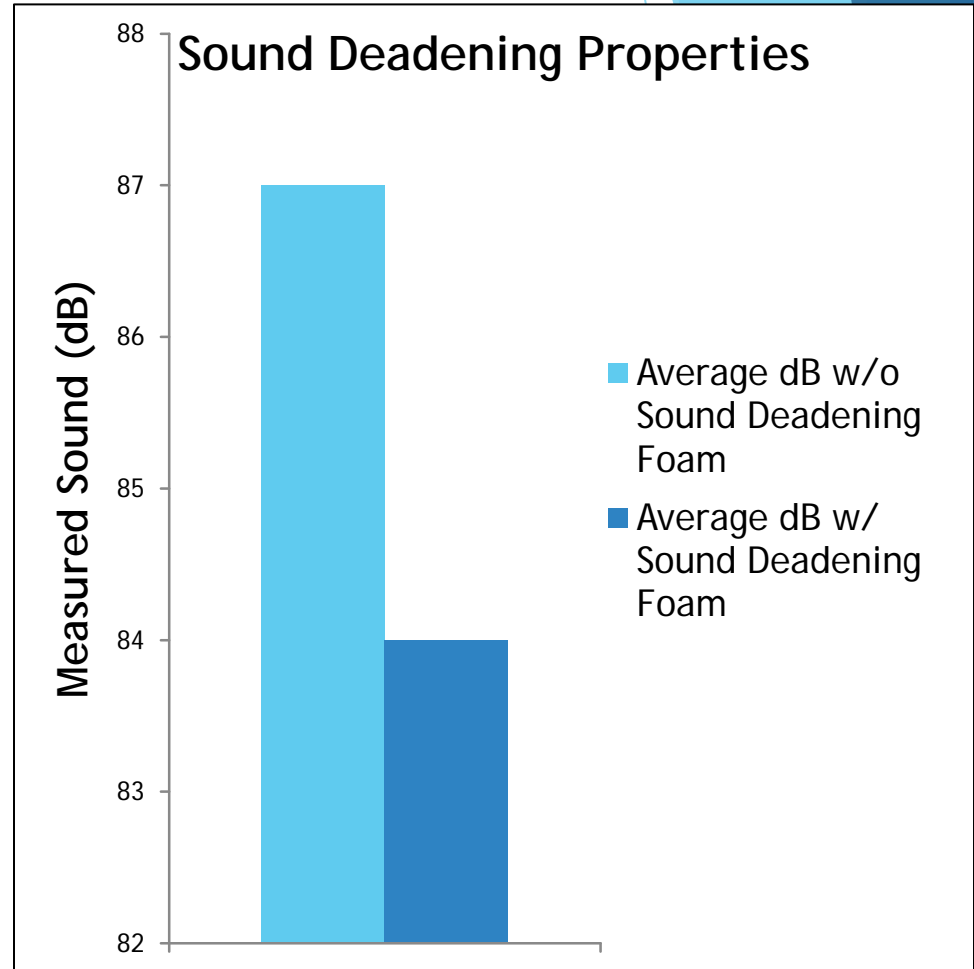
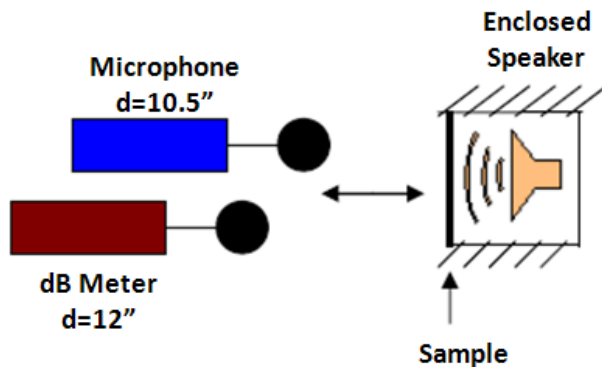


Modification	% Reduction of TPS
Belt Drive System	6.14
Big Wheel Kit	4.93
Extra Idler Wheels	1.39
CVTech Primary Clutch	2.90
All Modifications Combined	15.36

Sound Deadening

▶ Engine Compartment

- ▶ XR Panels
- ▶ Polymer Technologies Acoustical Barrier with Absorber



Suspension

- ▶ Easily Adjustable Front and Rear Suspension
 - ▶ Capable of being tuned for various riding styles
- ▶ HyGear Dual Rate Springs
 - ▶ Improved Control in Small and Large Bumps



Summary

▶ Consumer Benefits

- ▶ Comfortable / Ergonomic
 - ▶ Lightweight
 - ▶ Easy and fun to ride
- ▶ Reliable
- ▶ Competitive Cost
 - ▶ \$14,696.17 USD MSRP

▶ Dealer Benefits

- ▶ Easy to Sell
- ▶ Easy to Service

▶ Environmental Benefits

- ▶ Low Emissions
- ▶ Quiet

Thank You



Questions?