



2013 CLEAN SNOWMOBILE CHALLENGE

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BUFFALO

CLEAN SNOWMOBILE TEAM

OUTLINE

- **Customers and Their Requirements**
- **Engine Selection**
- **Engine Calibration and Testing**
- **Belt Drive Design**
- **Intake Design**
- **Exhaust Design**
- **Suspension Selection**
- **Snow Flap Design**
- **MSRP Summary**
- **Design Summary**



CUSTOMERS AND THEIR REQUIREMENTS



- ✓ **Environment**
 - ✓ **Low Emissions**
 - ✓ **Noise Reduction**



- ✓ **Operator**
 - ✓ **Performance**



- ✓ **Dealer**
 - ✓ **Cost**
 - ✓ **Durability**
 - ✓ **Resale Value**

ENGINE SELECTION

✓ Environment

- ✓ Low NOx output
- ✓ Variable soot output
- ✓ Quieter than most gas engines

✓ Operator

- ✓ High torque
- ✓ Increased towing power
- ✓ Good fuel economy
- ✓ Electric start

✓ Dealer

- ✓ Increased reliability
- ✓ Retains its value

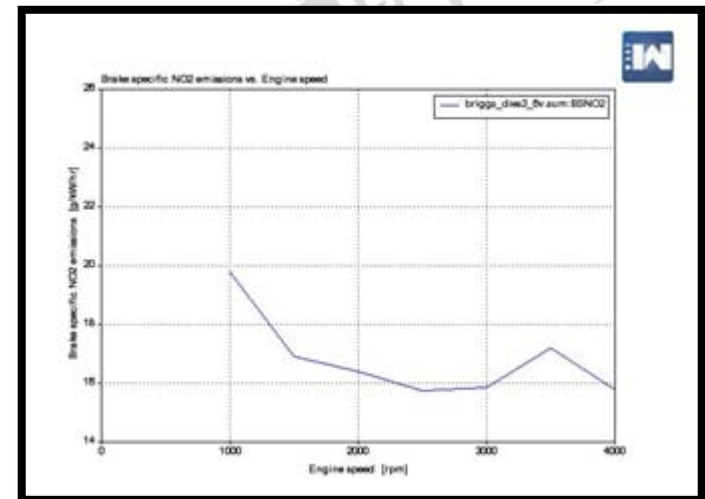
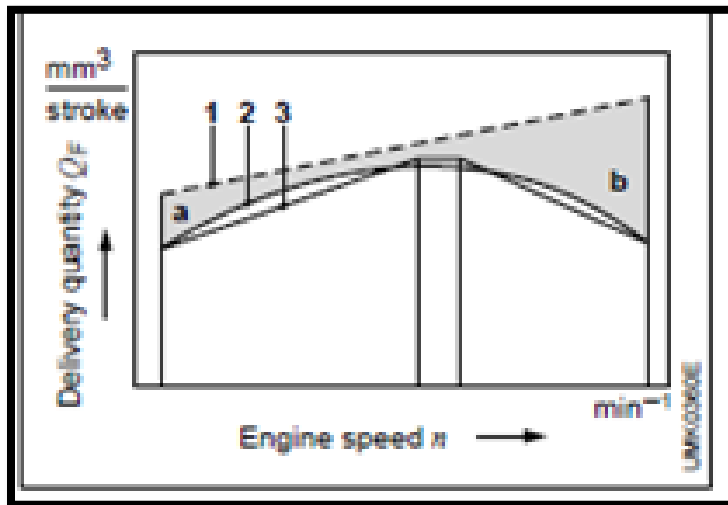
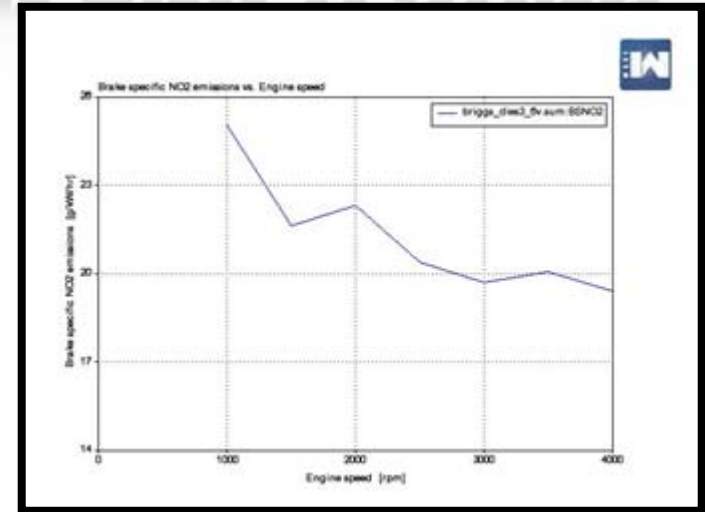


- Daihatsu DM950DTH Turbo Diesel
- Three cylinder
- 34HP (stock) 44HP (current)
- Liquid cooled
- Indirect fuel injection

ENGINE CALIBRATION AND TESTING

Environment

- ✓ Turbocharger selection lowered NO_x by 20%
- ✓ Injection pump selection reduced unburned hydrocarbons and soot



ENGINE CALIBRATION AND TESTING

✓ Environment

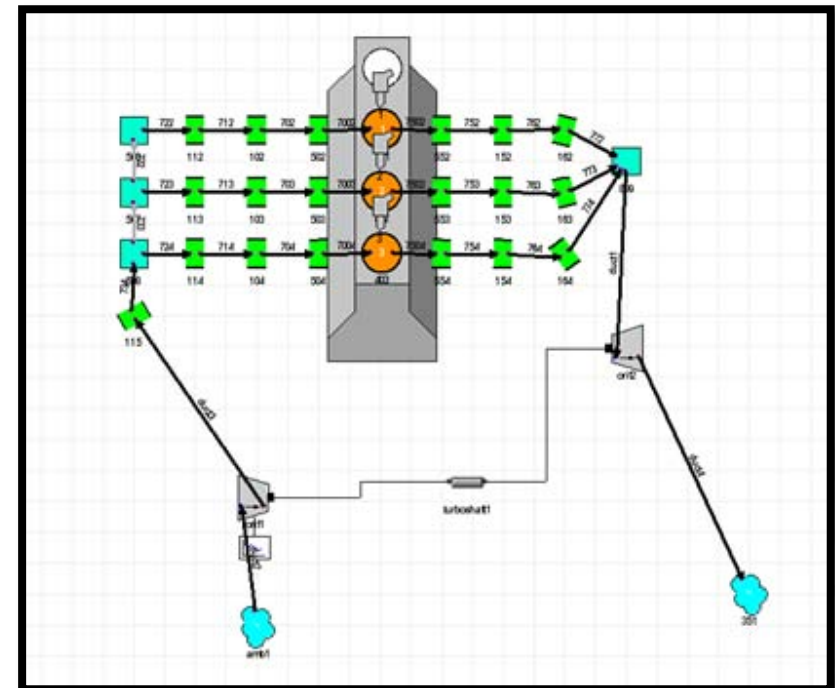
- ✓ Optimized soot vs. NOx output
- ✓ Decreased unburned HC

✓ Operator

- ✓ Improved power output
- ✓ Transient response improved

✓ Dealer

- ✓ Improved engine life by reduced temperatures





BELT DRIVE DESIGN

✓ Environment

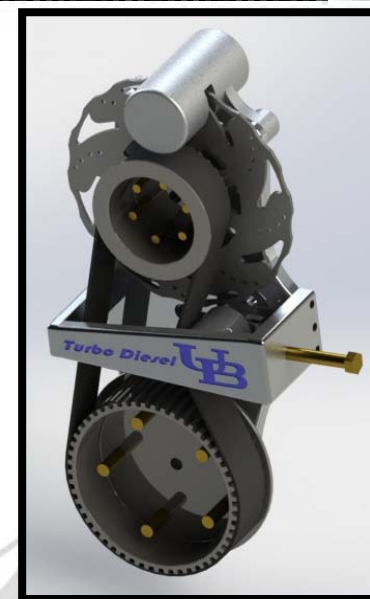
- ✓ Eliminates lubrication- no oil bath
- ✓ Quieter operation -nylon teeth

✓ Operator

- ✓ Instant power transfer
- ✓ Pulley interchangeability

✓ Dealer

- ✓ Easily maintained
- ✓ Outlasts roller chains 3:1
- ✓ Resistant to grime, oil, and moisture



- Replaces stock chain drive
- Uses Poly Chain GT Belt – industry leading
- Mechanical tension adjustment
- 10.90 lb – previously 17.31 lb
- 96% - 98% efficient

INTAKE DESIGN

✓ Environment

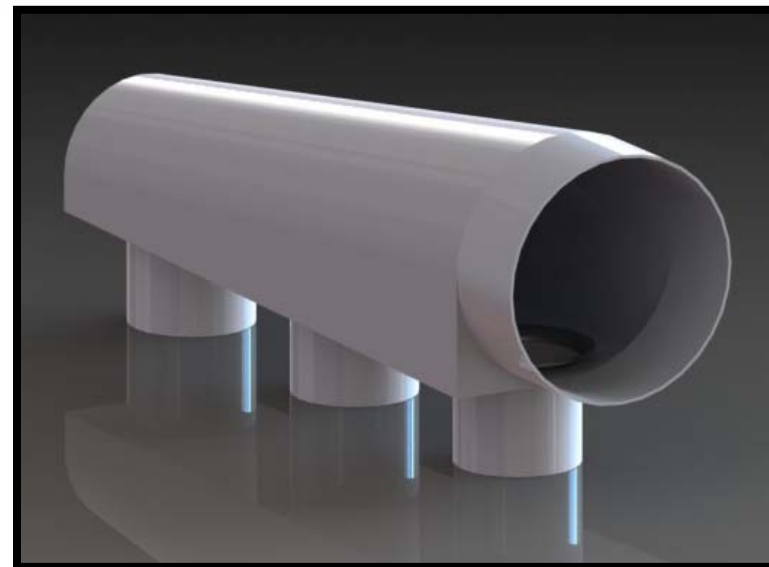
- ✓ More complete combustion
- ✓ Less soot output
- ✓ Less material

✓ Operator

- ✓ Aids in increasing power

✓ Dealer

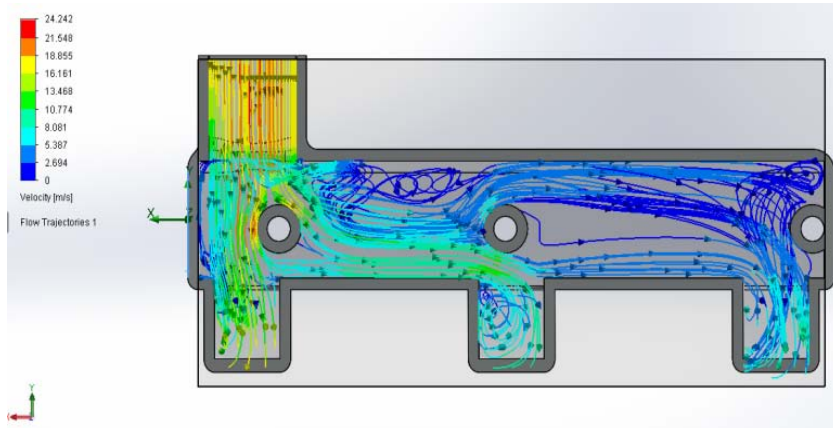
- ✓ Higher engine performance
- ✓ Cheaper to manufacture



- Custom Plenum
- 0.063" aluminum sheet metal
- Bent to desired shape
- Addition of velocity stacks

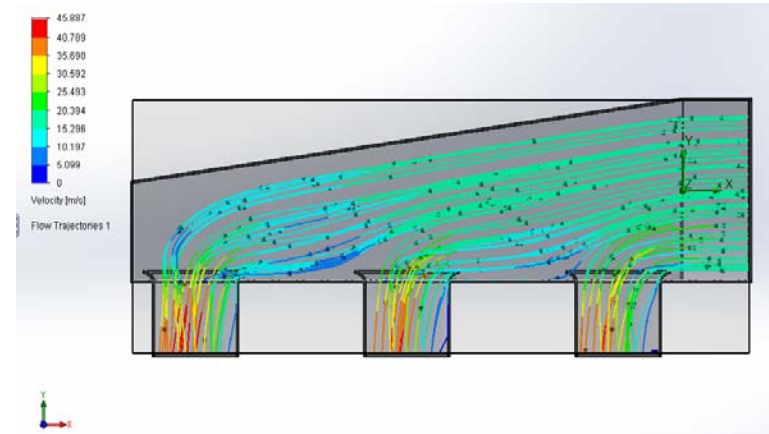
INTAKE DESIGN TESTING

Stock Intake Manifold



- **Bolt holes impeding flow**
- **Numerous vortices**
- **Flow not consistent to all runners**

Optimized Intake Manifold



- **Bolt holes are eliminated**
- **More laminar flow**
- **More even flow to all runners**
- **Taper design allows increase in flow**

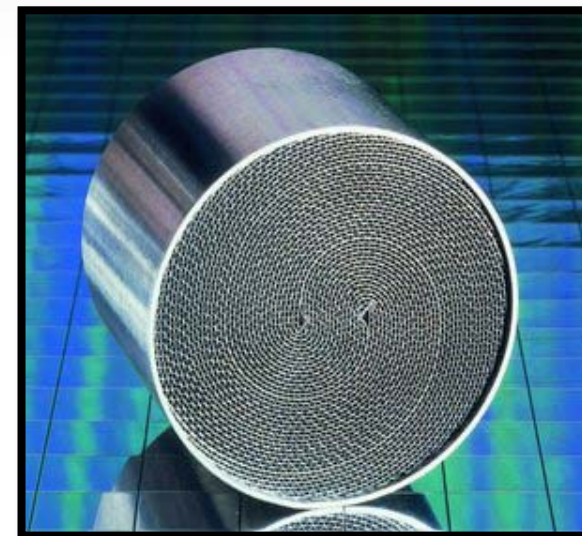
EXHAUST DESIGN

✓ Environment

- ✓ Reduced soot, NO_x, HC and CO emissions
- ✓ Isolated noise inside of tunnel

✓ Dealer

- ✓ Compact design, easily manufactured
- ✓ Regenerating DPF has high product life



- Aristo Diesel Oxidation Catalyst and Diesel Particulate Filter
- Exhaust exits inside of tunnel

SUSPENSION

✓ Environment

- ✓ No oil in shocks
- ✓ Light weight – less fuel consumption



✓ Operator

- ✓ More comfortable ride
- ✓ Increased vertical travel-
- ✓ Easily adjustable

- M-10 Airwave
- 121" Track Length
- Air Shocks- instead of steel springs
- 50 lb

✓ Dealer

- ✓ Comparable price to stock setup
- ✓ Less parts to wear out- increases resale value

SNOW FLAP DESIGN

✓ Environment

- ✓ Dampens track noise



✓ Operator

- ✓ Less noisy ride
- ✓ Light weight

✓ Dealer

- ✓ 3x Cheaper than polyethylene
- ✓ Does not degrade

- Closed cell neoprene snow flap
- High density
- Great sound dampening
- Waterproof
- Ozone resistance

MSRP SUMMARY

UB's Sled

- **Engine - \$4700**
- **Belt Drive - \$350**
- **Battery - \$265**
- **Intercooler - \$100**
- **Track suspension - \$1572**
- **Fuel Cell - \$185**

Stock Sled

- **\$5940**
- **\$565**
- **\$111.51**
- **\$0**
- **\$1300**
- **\$433.77**

- **Base sled price – Polaris turbo IQ- \$11,299**
- **Our sled Price – \$13,200**
- **With our improvements on the sled's durability, fuel economy, performance, and environmental impact, our team believes that the increased base price will benefit all customers throughout the life of the sled**

SLED SUMMARY

✓ Environment

- ✓ More environmentally friendly
- ✓ Less material for production
- ✓ Low noise output
- ✓ High MPG

✓ Dealer

- ✓ Higher engine durability
- ✓ Improved resale value
- ✓ Slightly higher initial cost, greatly reduced lifetime cost

✓ Operator

- ✓ Great for trail riding
- ✓ Reduced weight
- ✓ Great utility sled



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REFERENCES

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THANK YOU!

