



Université du Québec

**École de technologie supérieure**



# CHASSIS SELECTION

## BRP XP-REV TNT 2009

Light –weight

Good handling

Good Modifications  
opportunities

Reflects newest technology



# ENGINE SELECTION

## 2 STROKES vs 4 STROKES

Combustion gas chemical composition<sup>1</sup>

	grams/HP-Hour			
Engine	HC	CO	NOx	MP
2 stroke	111	298	0.86	2,7
4 stroke	1.40	28.33	0.245	N/A

## DIRECT INJECTION

Combustion gas chemical composition<sup>2</sup>

	grams/HP/Hour			
Engine	HC	CO	NOx	MP
2 stroke	111	296	1	2,7
2stroke DI	22	90	3	0,6



<sup>1</sup> <http://www.epa.gov/otaq/regs/nonroad/2002/r02022.pdf>

<sup>2</sup> [www.epa.gov/otaq/regs/nonroad/2002/f02040.pdf](http://www.epa.gov/otaq/regs/nonroad/2002/f02040.pdf)

# INJECTION SYSTEM

- FIRST WANTED TO MAKE A CUSTOM MADE DIRECT INJECTION SYSTEM
- PARTS AVAILABILITY AND CONCEPTUAL PROBLEM MADE US CHANGE TO SDI
- REASONS:
  - GOOD FUEL EFFICIENCY
  - GOOD POLUTANTS EMISSION
  - SIMPLICITY
  - SPARE PARTS
  - KNOWLEDGE AND EXPERIENCE



# ENGINE MODIFICATIONS

## EMISSIONS CONTROL

- EGT CONTROL FOR EMISSIONS
- 3 FUEL MAPS BASED ON ETHANOL CONTENT
- OIL VOLUMETRIC RATIO MAP



# HARDWARE SELECTION

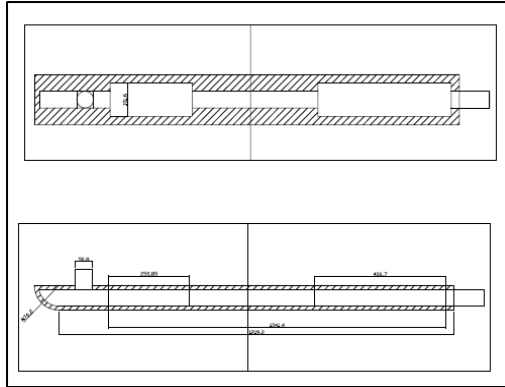
- MOTOTRON ECU
  - MatLab SIMULINK MODEL BASED
- GM FLEX FUEL SENSOR
- SOLENOID OIL PUMP
  - CONTROLS AMOUNT OF OIL INJECTED
- ROTAX AJUSTABLE VARIABLE EXHAUST (RAVE)



# NOISE REDUCTION

- EXHAUST

EXPANSIONS  
CHAMBER  
&  
HELMHOLTZ



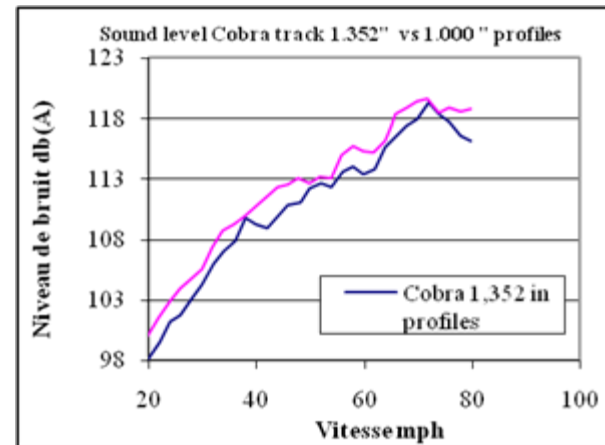
- SOUND PROOFING

Silence source  
HushfoamFireFlex



- TRACK

CAMOPLAST  
CABRA 1 IN



# BUDGET

Subsystem	Subtotal
Engine	\$ 1 500,00
Exhaust	\$ 408,00
Electronics	\$ 1 550,00
Noise Treatment	\$ 596,50
Sled modifications	\$ 285,00
<b>Technology Implementation Total Cost</b>	<b>\$ 4 339,00</b>





# ECU FAILURE

**CAN CONTROLLER FAILED FORCING US TO USE LAST YEAR'S ECU**

**NO FLEX FUEL SENSOR HANDLING**



# QUESTIONS ?

