

IPRO310

Conversion of a Commercial - Grade Riding Lawnmower to Hydrogen Fuel

:: Lab Safety ::

Safety Code Reviewed

- NASA
- OSHA
- ICC
- NFPA

General hydrogen Safety

- 4.7% by volume (LFL) in air to pose combustion hazard
- Involved personnel and tank must be grounded
- Monitor tank material for embrittlement
- Hydrogen quantity in lab controlled
- Welded fittings preferred over mechanical fittings
- Slight leakage unavoidable through seals and fittings
- Hydrogen detector triggered at 1% v/v
 - Must cause visual and audible warnings
 - Must enable ventilation system and cut off heat sources
- In case of emergency, cut off hydrogen supply

Hydrogen vs. Gasoline

	Hydrogen	Gasoline
LFL(Low Flammability Limit)	4.7% by volume	1.3% by volume
Energy per weight	120 MJ/kg	44 MJ/kg
Energy released upon combustion (Purdue Univ.)	140 MJ/kg	50 MJ/kg
1L cost / gall	\$0.30 / \$1.13	\$0.79 / \$3.00
Combustion byproducts	H ₂ O	CO, CO ₂ , NO _x , SO _x , Unburnt HCs, trace Hg, Pb
Possible Containers	Not porous materials (such as cast iron), only alloy or composite such as aluminum	No restrictions
If spark	Rapid burn	Rapid burn
Auto Ignition Temperature	560° C / 1090° F	246° C / 474.8° F



JOEL



MINSUK



MINJOONG



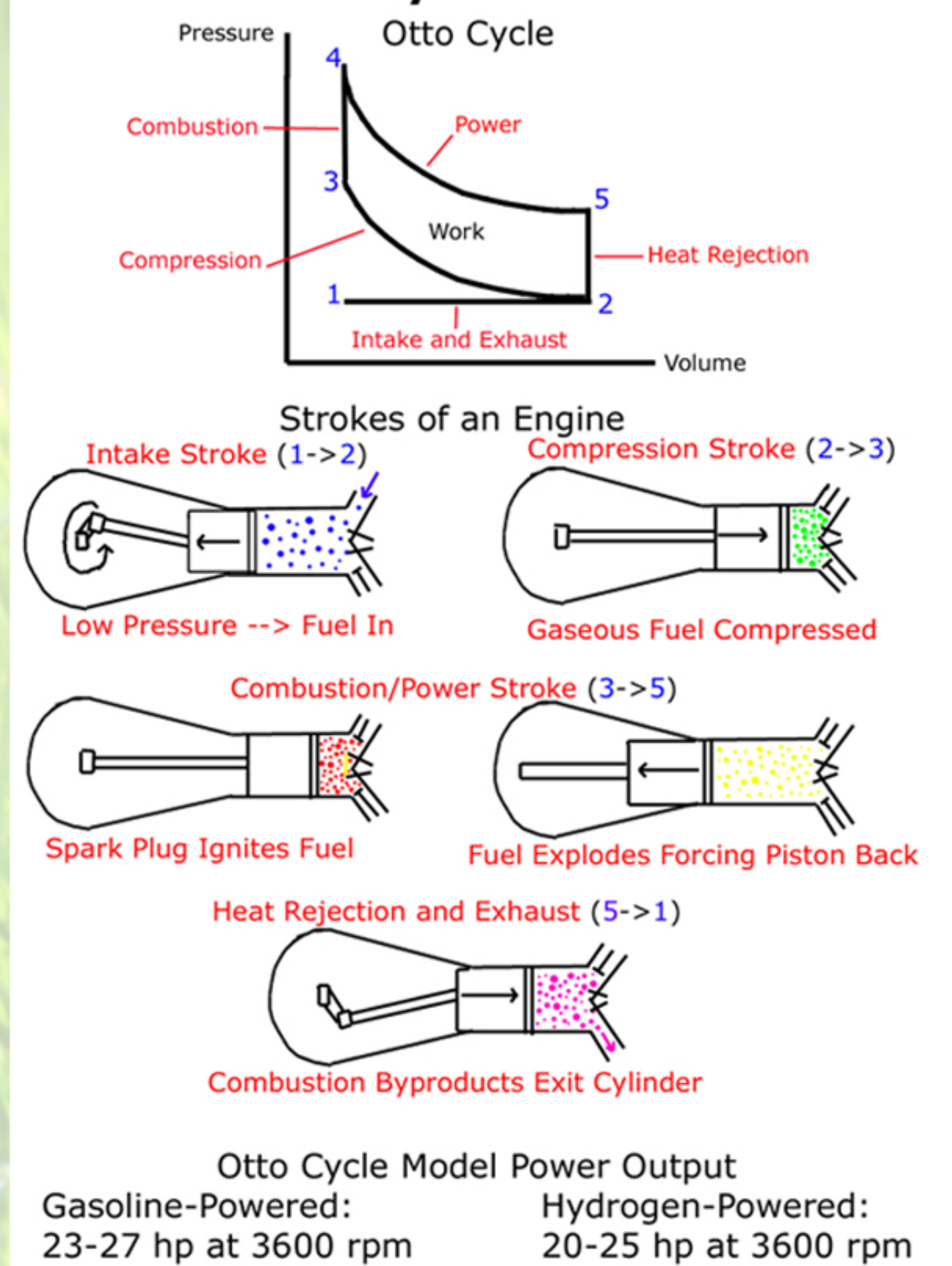
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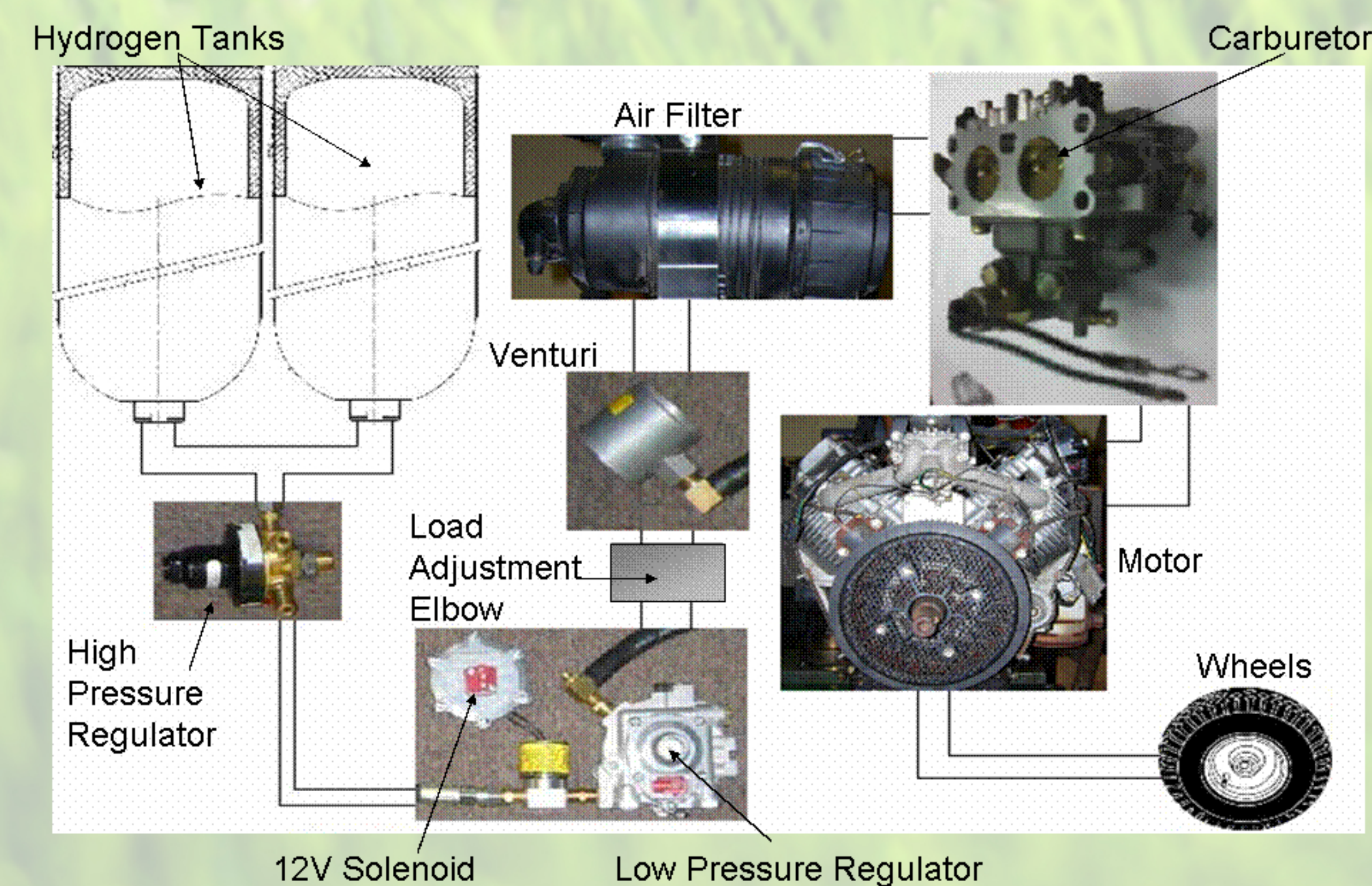
CHUNGYUN

:: Conversion ::

Thermodynamic Model



Hydrogen Storage and Delivery



DAN



STEFFANY



YEWON



PREETI

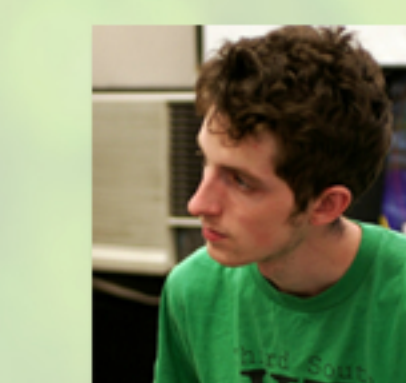
:: Testing ::

Achievements

- Redesigned Engine Mount
- Mounted Vibration Damper to Engine
- Fabricated Shaft Shield
- Repaired Data Acquisition System
- Designed Bellhousing Stabilizer
- Repaired Engine and Dyno Electrical System



- Built Mass Air Flow Meter
- Fixed Load Servo
- Rerouted Exhaust
- Designed New Throttle Linkage



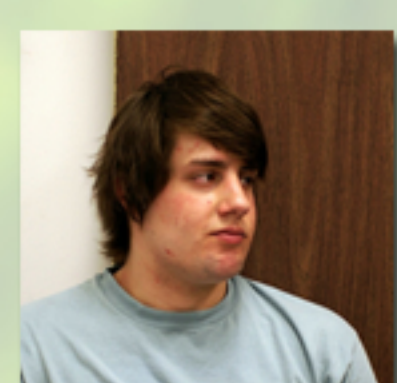
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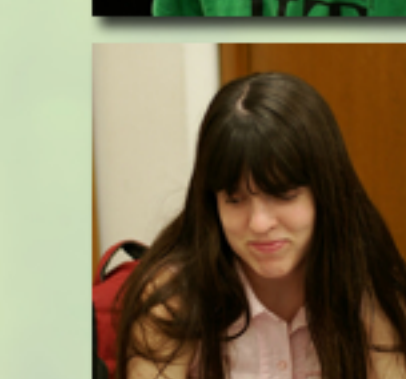
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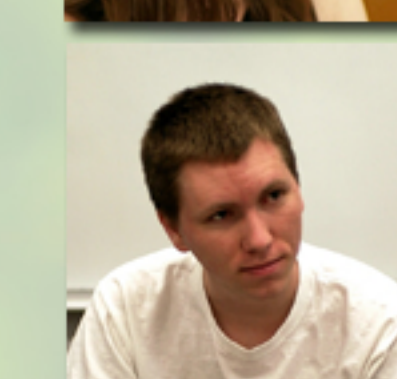
KRIS



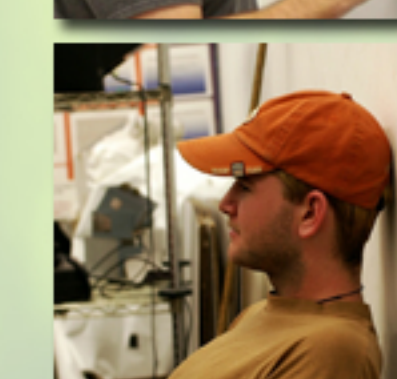
FRANK



MELISSA



NATHAN



BRETT



JAMES