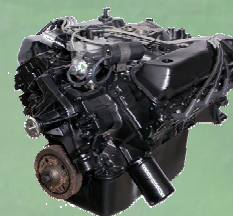


HEC



Hydrogen Engine Center, Inc.

www.hydrogenenginecenter.com

AMMONIA – FUELED ENGINES

Update and New Technology

Ted Hollinger

September 29, 2008

HEC



Field Trial Update

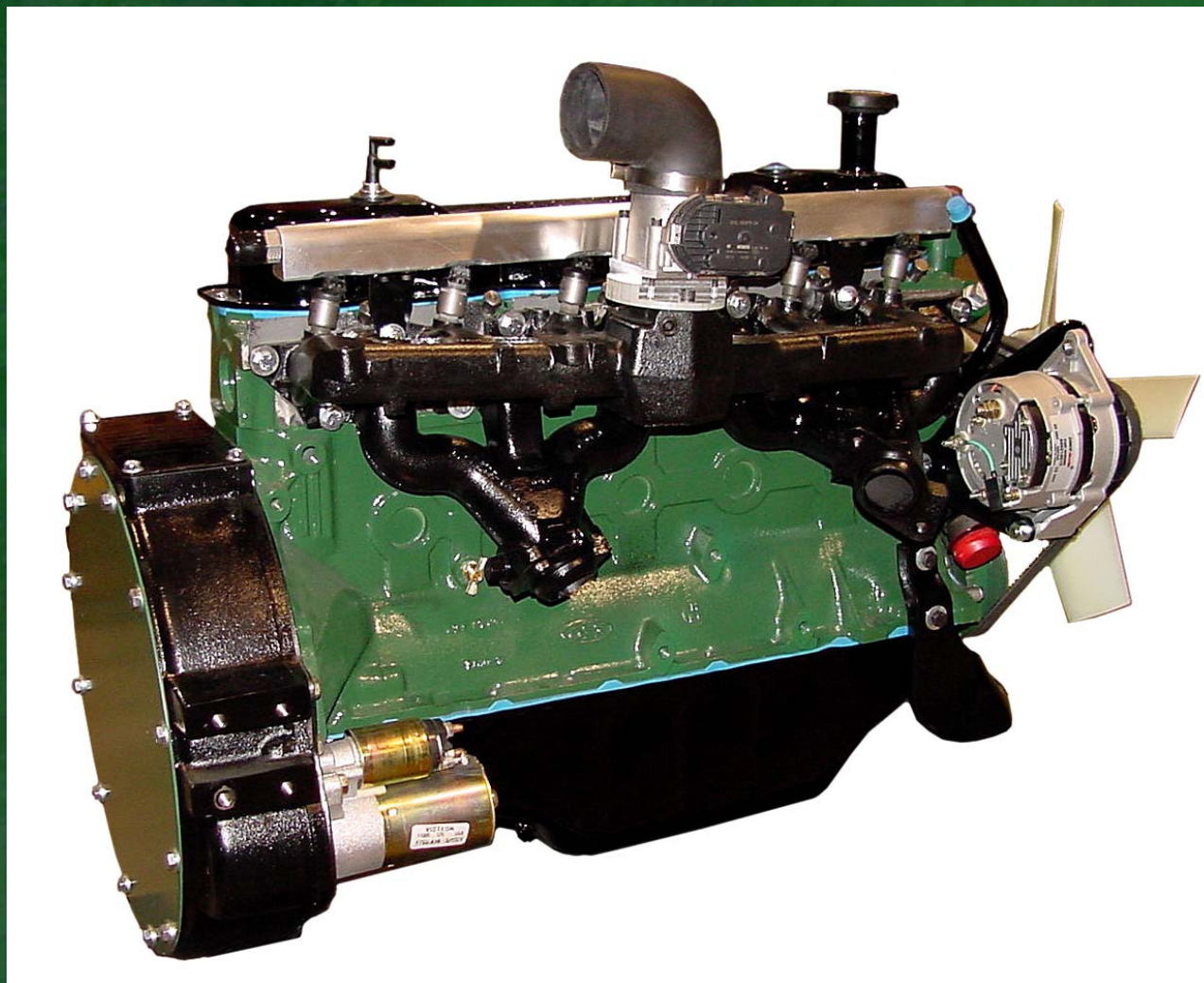


- Irrigation and Livestock watering application
- Location: [Visalia, California](#)
- Specifications – Pump System
 - Flow Rate: Up to 2000 gallons per minute
 - Running ~ 550 gallons per minute
 - Speed 1800 – 2200 RPM
 - Power Requirements: 35 HP
- Start up date: September 20, 2007

HEC - Update



HEC Oxx Power™ 4.9L Engine



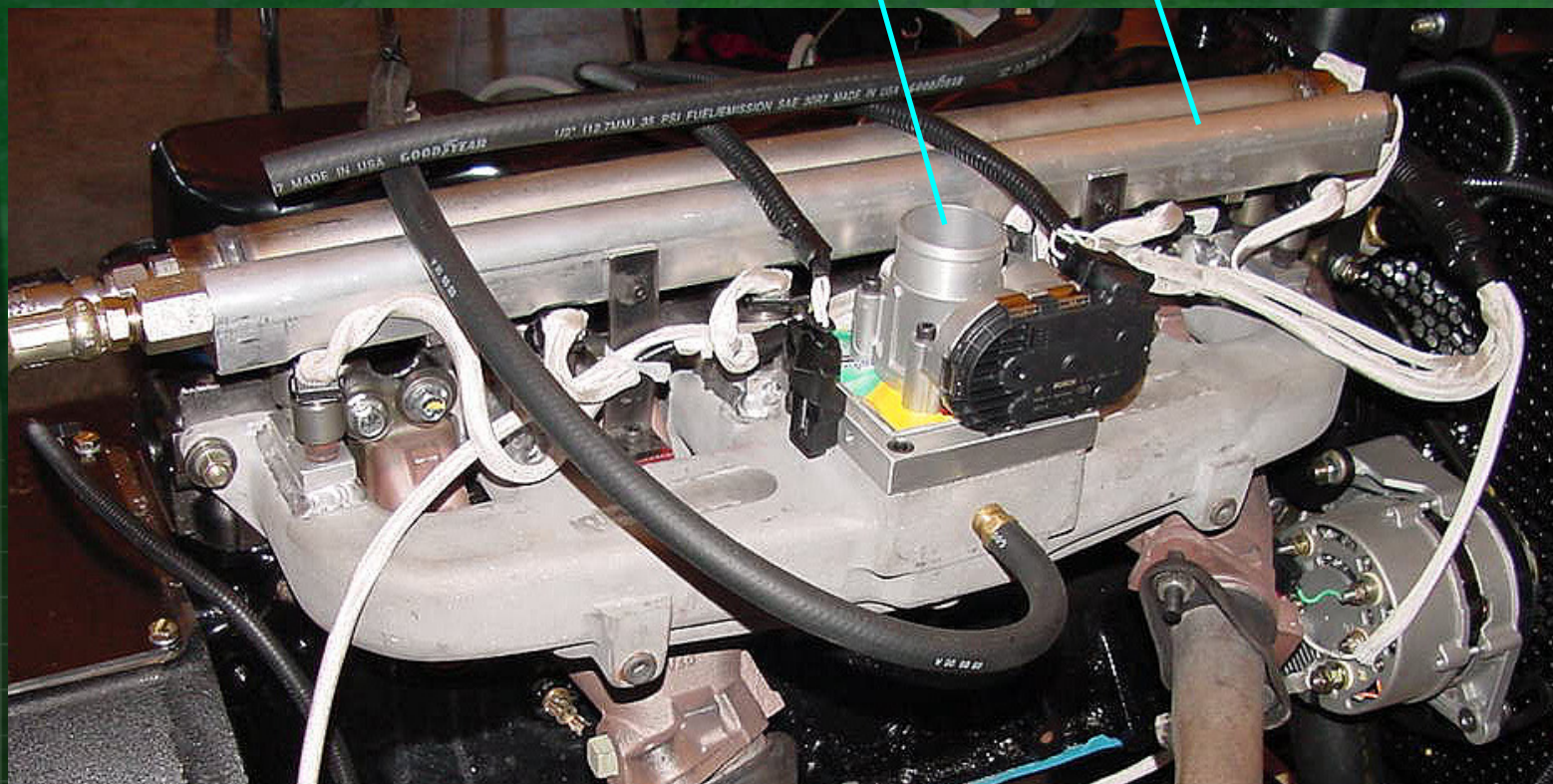
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HEC NH3 Oxx Power™ Engine



Dual gaseous injector rails

Electronic Throttle Body



Control is Key



- Controls fuel mix for starting and stopping
- Controls equivalence ratio
- Performs engine diagnostics
- Controls spark timing for best performance
- GPS is being added 1st quarter 2009
- Wireless telemetry also available in 1st quarter 2009



Results to Date



- Well over 1000 hours and still running
 - 1108.3 hours as of 8/13/08
 - running at 20.5 hours/day
- No problems to date
- Fuel injection of gaseous ammonia is successful
- Dual fuel injection (ammonia/propane) can be done with the Oxx Boxx engine controller system

Newest Product Development



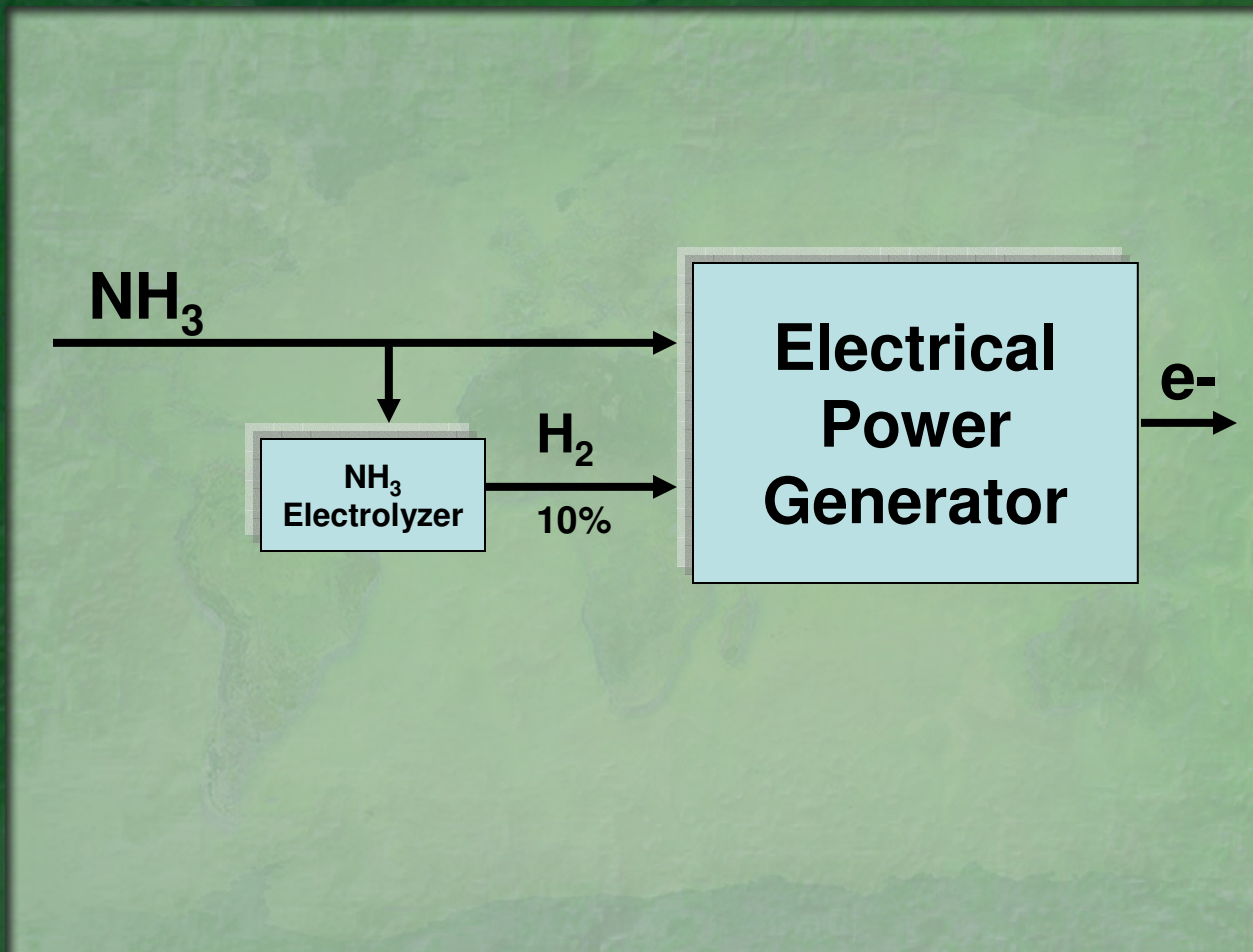
- NH₃ Electrolyser
- Two patents filed
 - Continuous Generation of Hydrogen via Electrolysis of Ammonia
 - Ammonia Electrolysis Process and Apparatus
- Being developed at Quebec University
 - UQTR laboratory

Video Clip of NH₃ Electrolyser



- Last work done by Tapan Bose at UQTR

NH₃ Electrolyser Application



Patent #1



- Continuous Generation of Hydrogen via Electrolysis of Ammonia

Patent #2



- Ammonia Electrolysis Process and Apparatus

Summary



- IC engines can run reliably and cost effectively @ near zero emissions
- Ammonia can be a hydrogen enabler
- Hydrogen and NH₃ can be run successfully in SI engines
- Ammonia properties similar to LP
- HEC system can be implemented on other engines



Thank You!

Hydrogen Engine Center, Inc.
2502 E Poplar St
Algona, IA 50511
www.hydrogenenginecenter.com
Phone: 515-295-3178
Fax: 515-395-1877