

RUNNING THE TRACTOR ON SVO AND BIODIESEL FROM OIL CROPS

Oilseed Producers Meeting

March 26, 2012

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Penn State Experiences

- ▣ Biodiesel blends and B100
- ▣ Straight vegetable oil (SVO)

Biodiesel & SVO

Animal Fat or Vegetable Oil



Transesterification
using alcohol & catalyst



Biodiesel

Straight Vegetable Oil
(SVO)



Biofuels use

- ▣ In collaboration with New Holland, four new tractors ran 3 years on B100 – these have been returned to New Holland for evaluation.
- ▣ 2 new pieces of equipment running SVO; 1 has been returned to New Holland after using SVO for 3 years



Manufacturers skeptical

- ❑ In 2002 biodiesel discouraged by most equipment manufacturers
- ❑ Penn State College of Ag Sciences Farm Operations began using B20



B100 tractors

- ▣ Engine crankcase oil analysis
- ▣ Observe power and performance
- ▣ Note tasks performed and operator observations
- ▣ Dismantle engines and measure internal effects

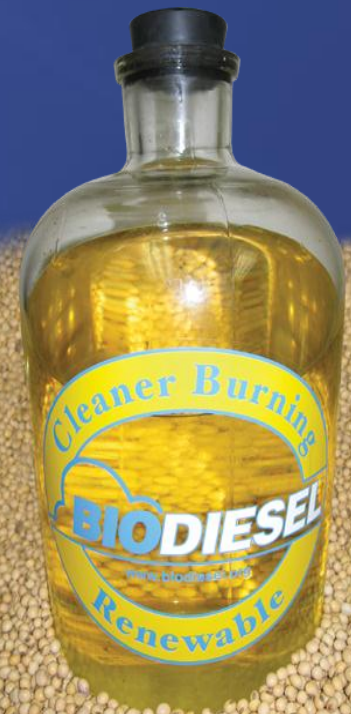


Biodiesel

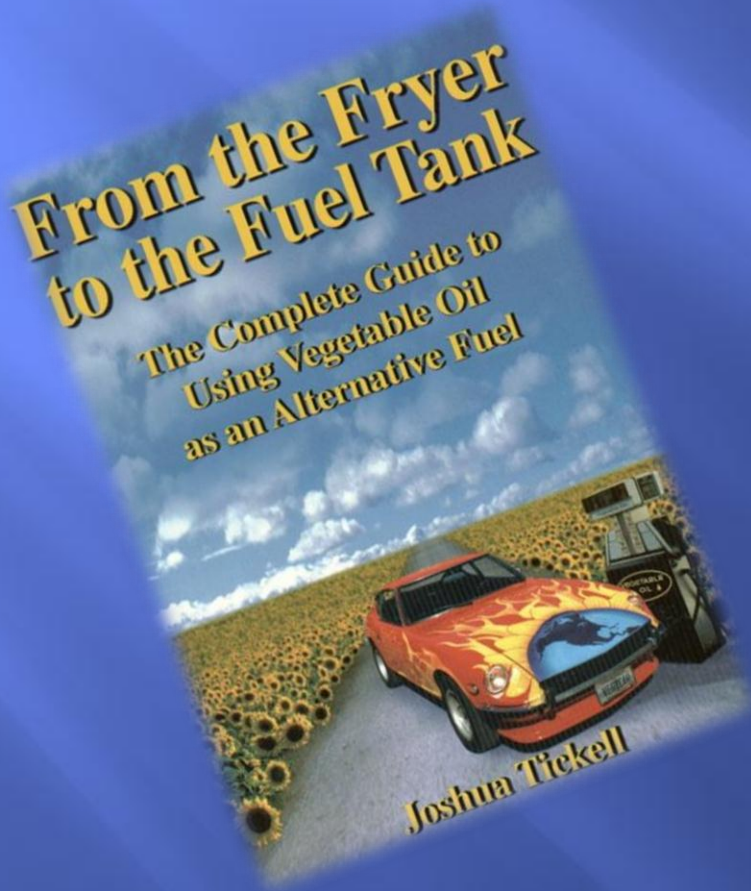
- ▣ Penn State University converted diesel fuel station for all diesel fuel to B20 in 2006

New Holland endorses B100 in 2007

- NH Tier IV engines required in 2011 in over 175 HP off road equipment no longer endorsing B100 use; allowing B7



Straight Vegetable Oil (SVO) Use at Penn State Farm Operations



SVO Straight Vegetable Oil

- ▣ May require engine modifications
- ▣ Heated to change the viscosity
- ▣ Start engine on petro-diesel fuel
- ▣ Shut down on petro-diesel fuel



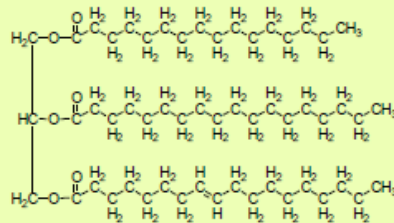


Engine deposit buildups after running on straight soybean oil

Kinematic Viscosity of Rapeseed Oil and Diesel Fuel

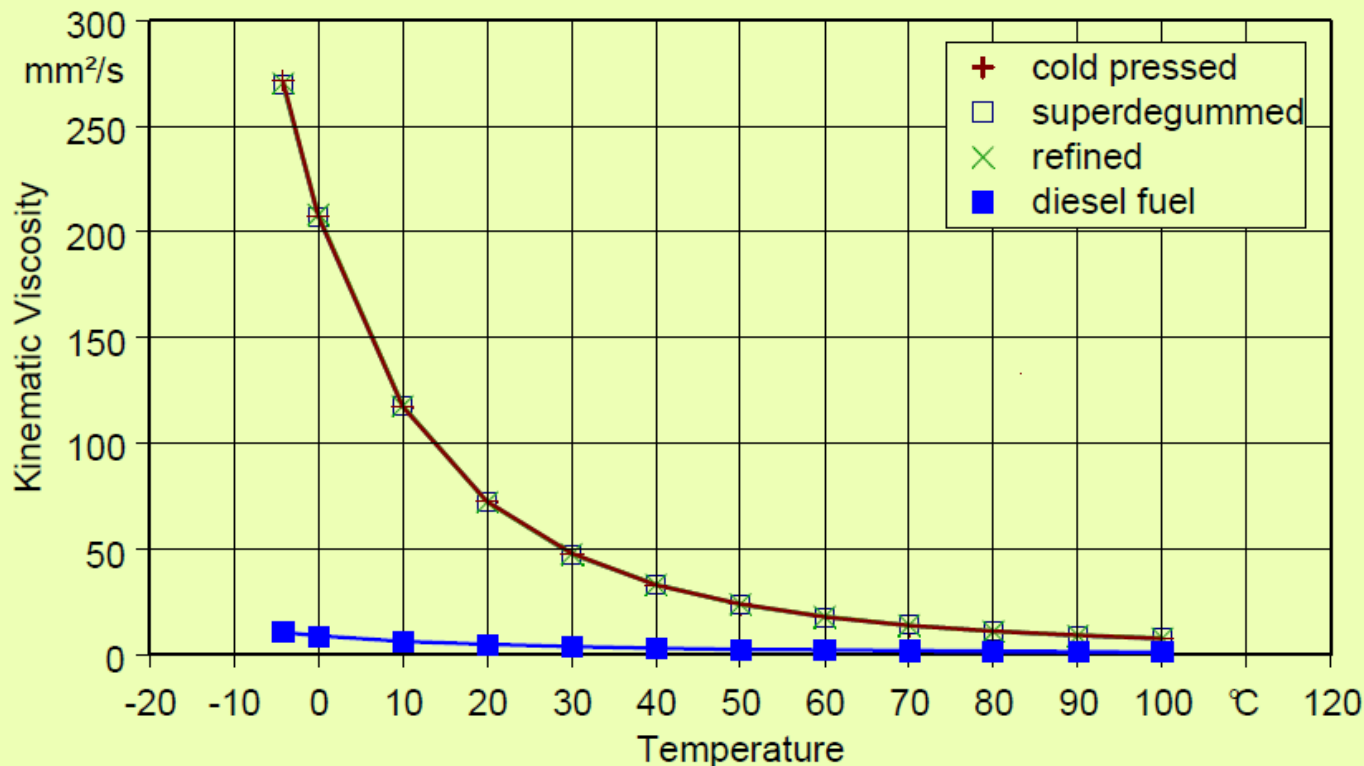
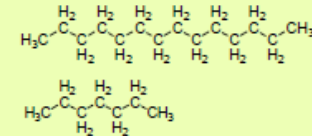
Rapeseed Oil

„Triglyceride“



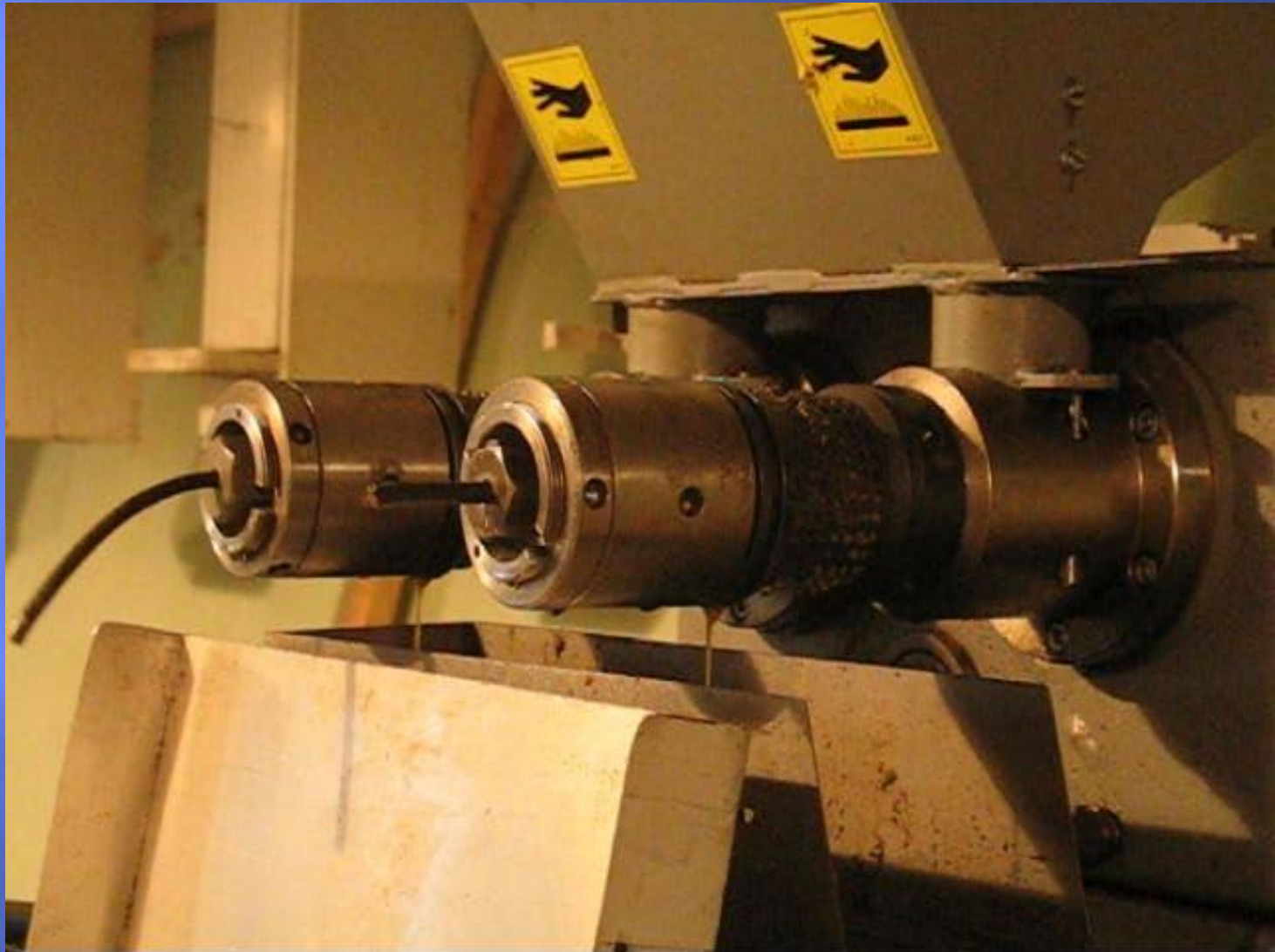
Diesel Fuel

„Hydrocarbon Chains“

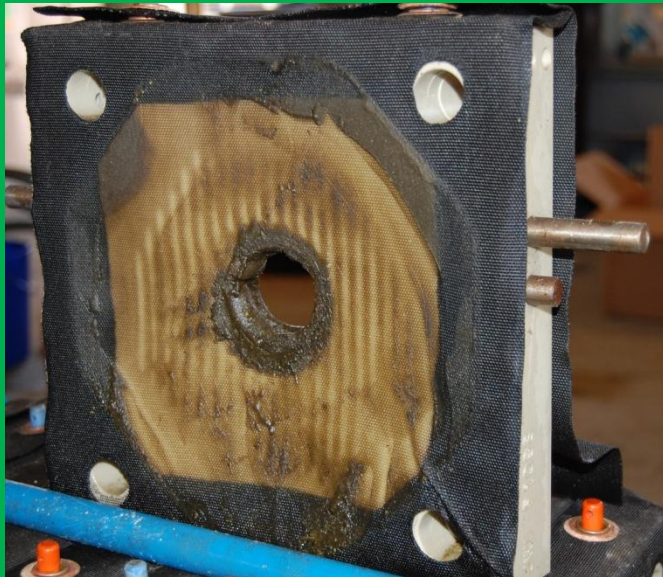
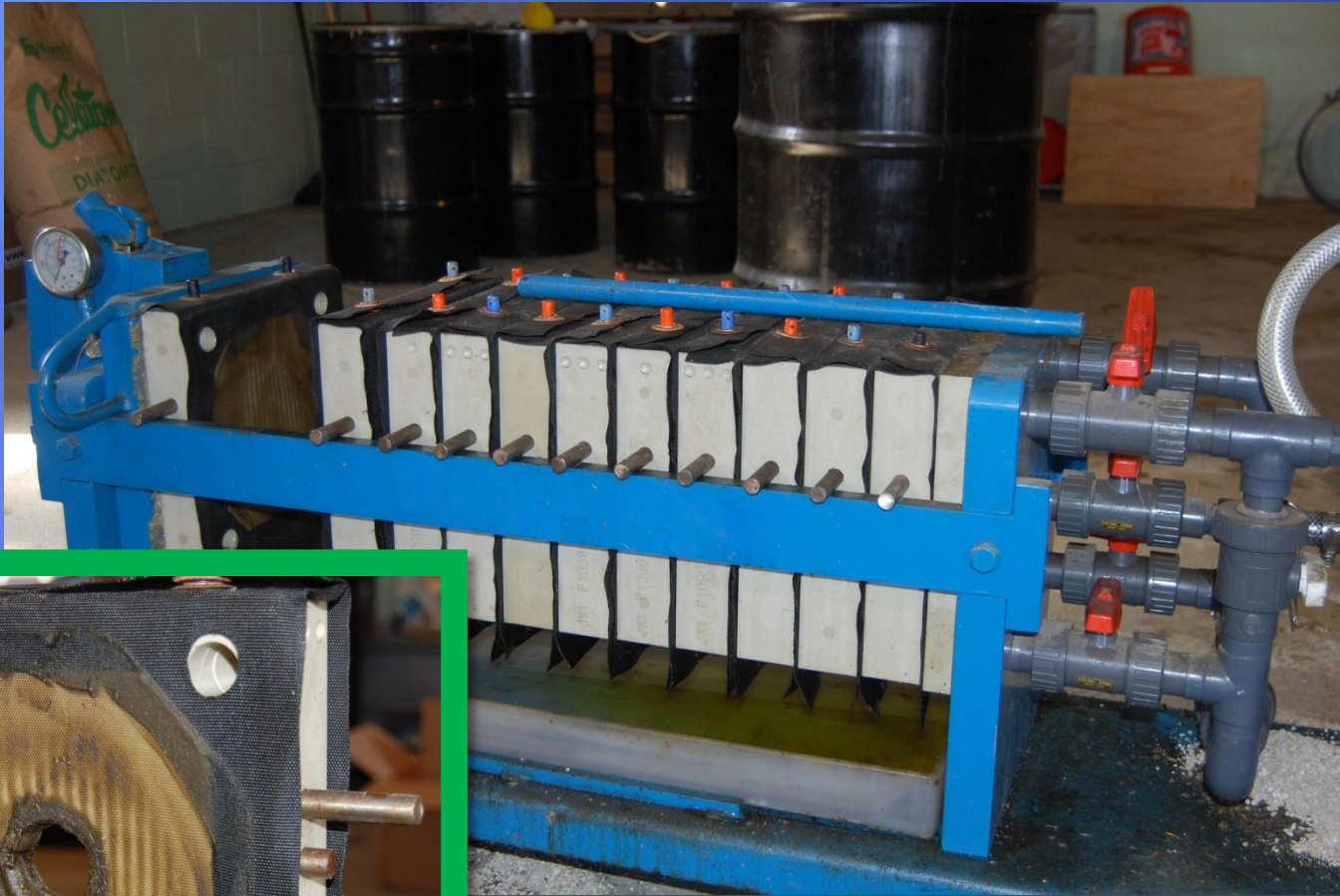




KernKraft Oilseed Press



KernKraft Oilseed Press



Filter Press



Straight Vegetable Oil Fuel



New Holland T7060
(180 PTO HP)
(134 PTO kW)

Case 621E Loader
(146 net HP)
(109 net kW)

Fuel type (diesel or SVO) criteria

Sensors

Engine coolant temperature sensor

Exhaust temperature sensor

Logic

Engine cold – runs on petroleum diesel

Engine warmed up

Below 25% engine load – runs on petroleum diesel

Above 25% engine load – runs on SVO

Our challenges with the SVO systems

NH T7060

- SVO too hot from heat exchanger – engine depowering
- SVO filter clogging
- Low temperatures – mix with petroleum diesel

Case 621E

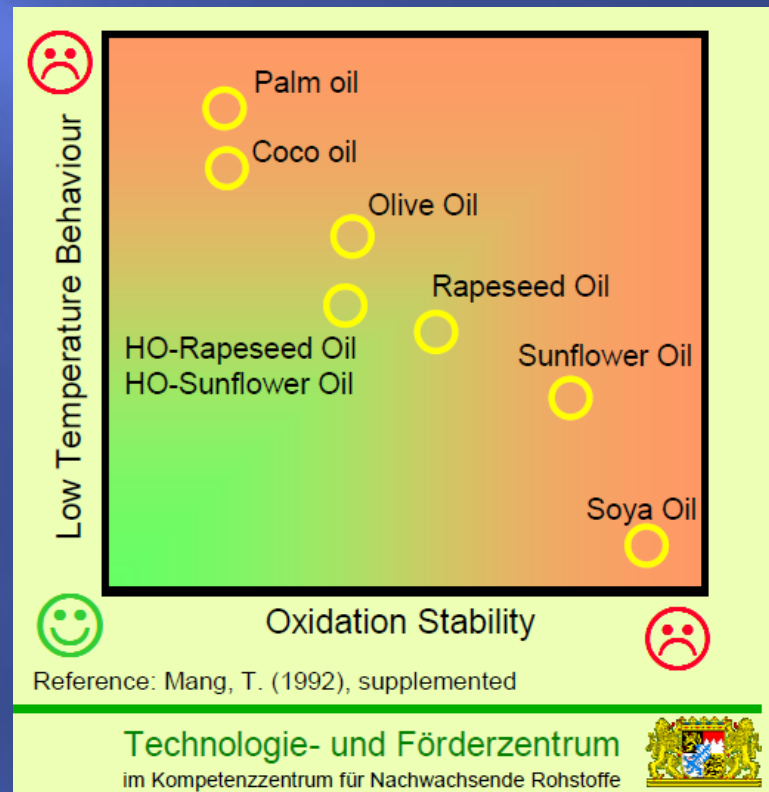
- Engine coolant not reaching operating temperature
- SVO filter clogging
- Low temperatures – mix with petroleum diesel
- Power supply – 12V vs. 24V
- Fuse location in control box

Types of vegetable oils (per Elsbett)

Canola or rapeseed..... Ok

Sunflower..... Ok if degummed

Soybean..... Not ok in direct injection engines

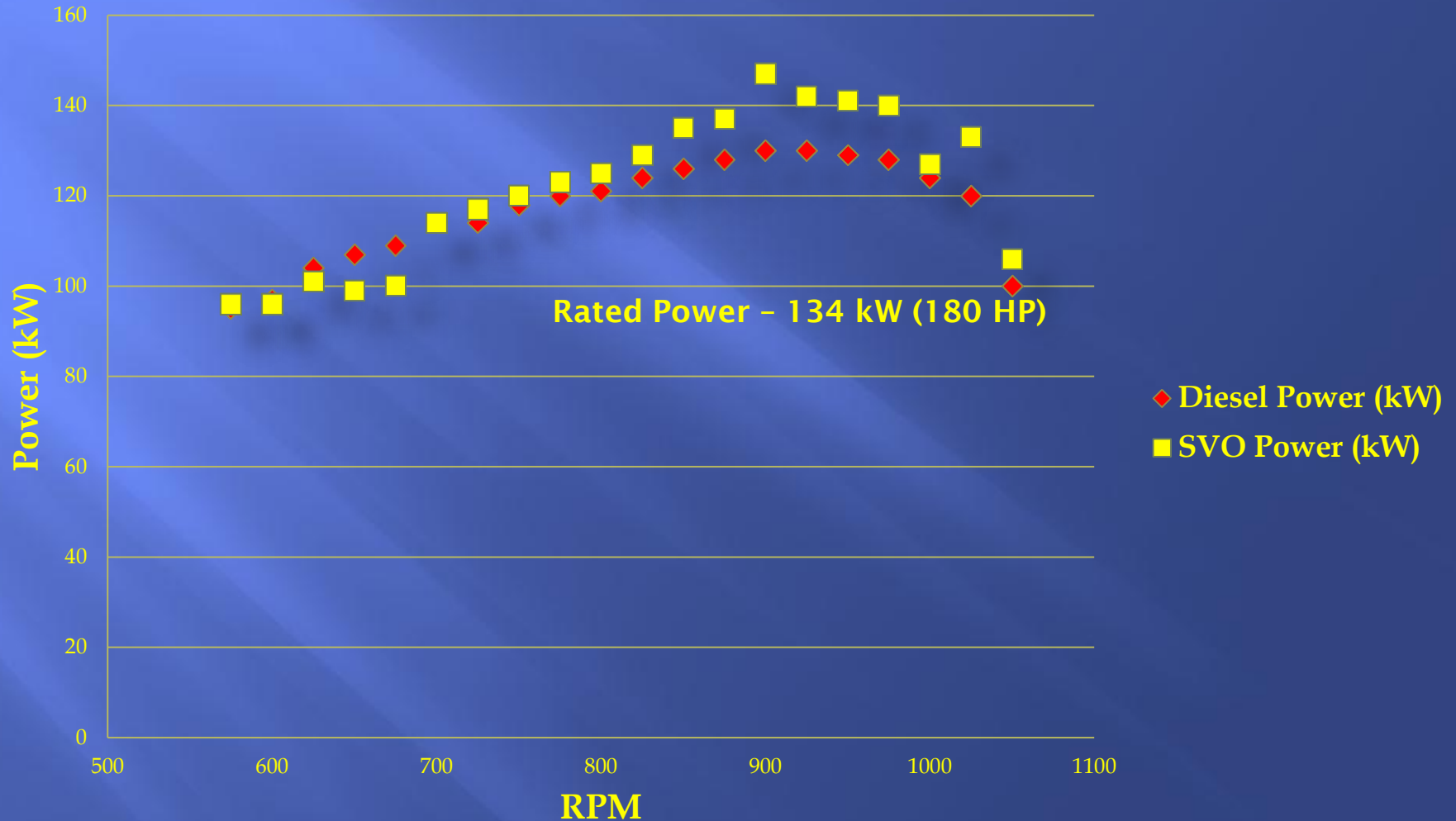


Overall SVO vs. Petro-diesel usage at Penn State

	NH T7060 (1370 hours)	Case 621E (1118 hours)
% SVO used of total fuel use	85%	53%
Total SVO used	3428 gallons	796 gallons
Total diesel used	628 gallons	701 gallons

NH 7060: Power vs. RPM for Diesel and SVO

December, 2011



Penn State Canola Oil Cycle



