Integrating Co-Generation for Renewable Fuel Production at the Catawba County, NC EcoComplex

Jeremy Ferrell, Jeff Ramsdell, Zack Hobbs
Appalachian State University

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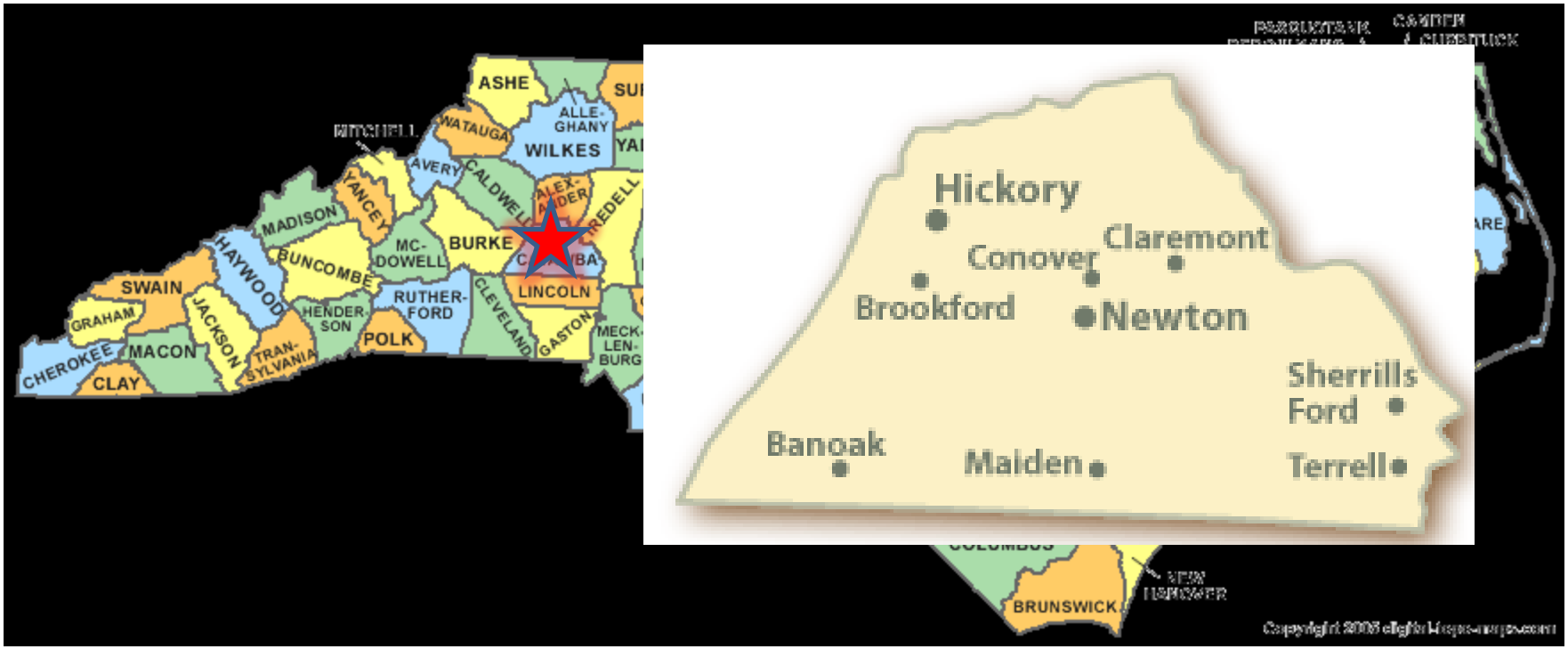
The Catawba County EcoComplex



Biodiesel Research, Testing, and Production Facility

Biodiesel Research, Testing, and Production Facility

- Partnership between Catawba County and Appalachian State University
- Funding for the facility :
  - Catawba County, ~$1.6mil for LEED Silver building
  - Appalachian State University, ~$1.6mil for equipment and staffing. Majority of this funding from the Golden LEAF Foundation, U.S. DOE, UNC General Administration, and the Biofuels Center of North Carolina.

Biodiesel Research, Testing, and Production Facility

- For Catawba County benefits include an economical renewable fuel source for landfill equipment and an onsite university partner for collaboration on EcoComplex development and optimization projects.
- For Appalachian State University benefits include a pilot scale facility for biodiesel production process research, laboratory facilities for feedstock and fuel quality analysis, chassis dynamometer for emissions analysis, and a “real-world” learning environment for student development.

Definitely a WIN-WIN

Biodiesel Research, Testing, and Production Facility

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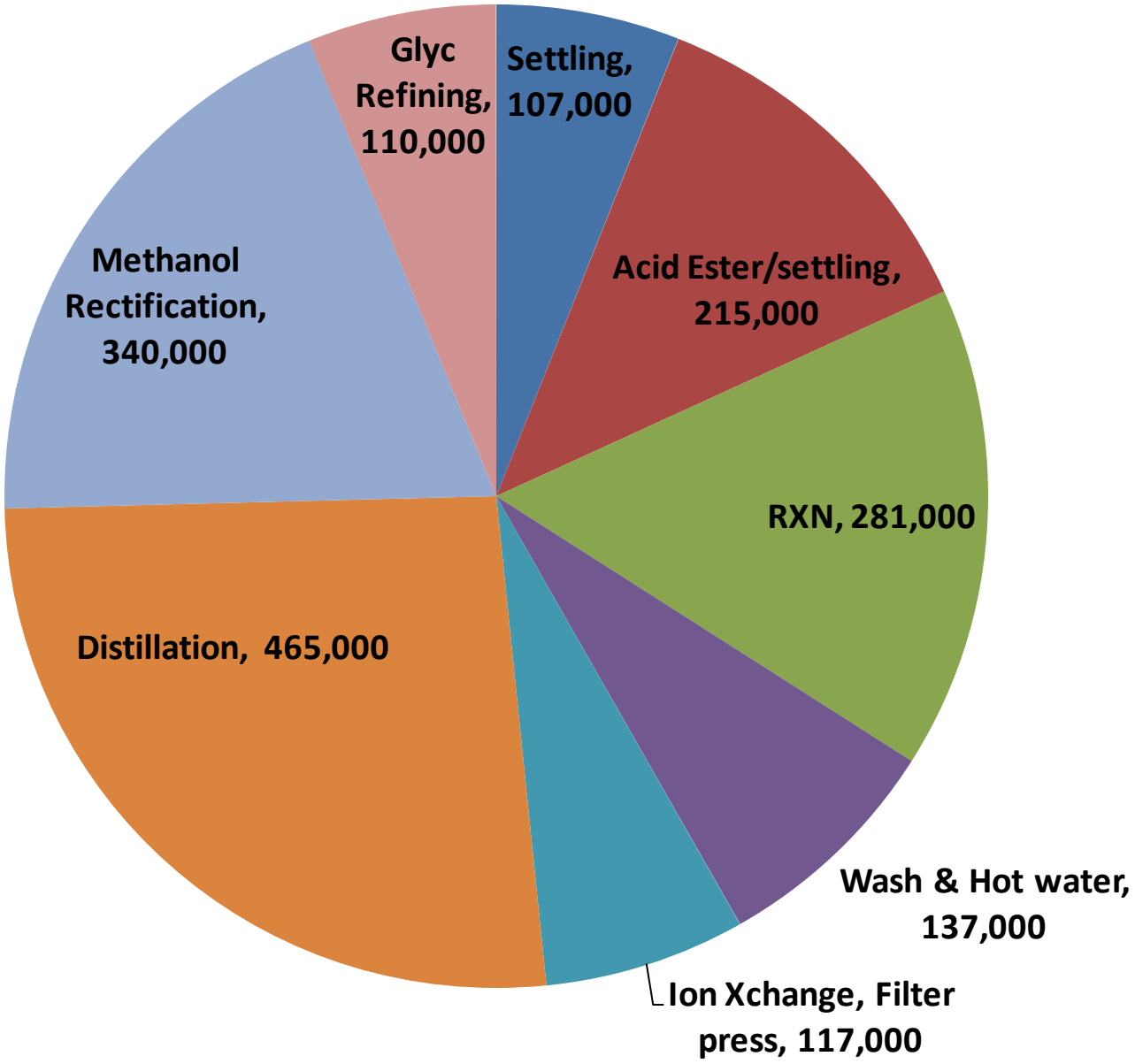
DANGER

Combustion Emissions Analysis

Returns Emissions in g/km, g/kg fuel, g/s, or g/bhp-hr: CO_2, CO, SOx, NOx, THC, Particulate Matter

Heat Requirements per 500 gal Biodiesel (Btu)



Landfill Gas to Energy

Energy Output per Engine:

1MW e & 6.5 MMBtus/hr Waste Thermal Heat

RADIATOR SUPPLY

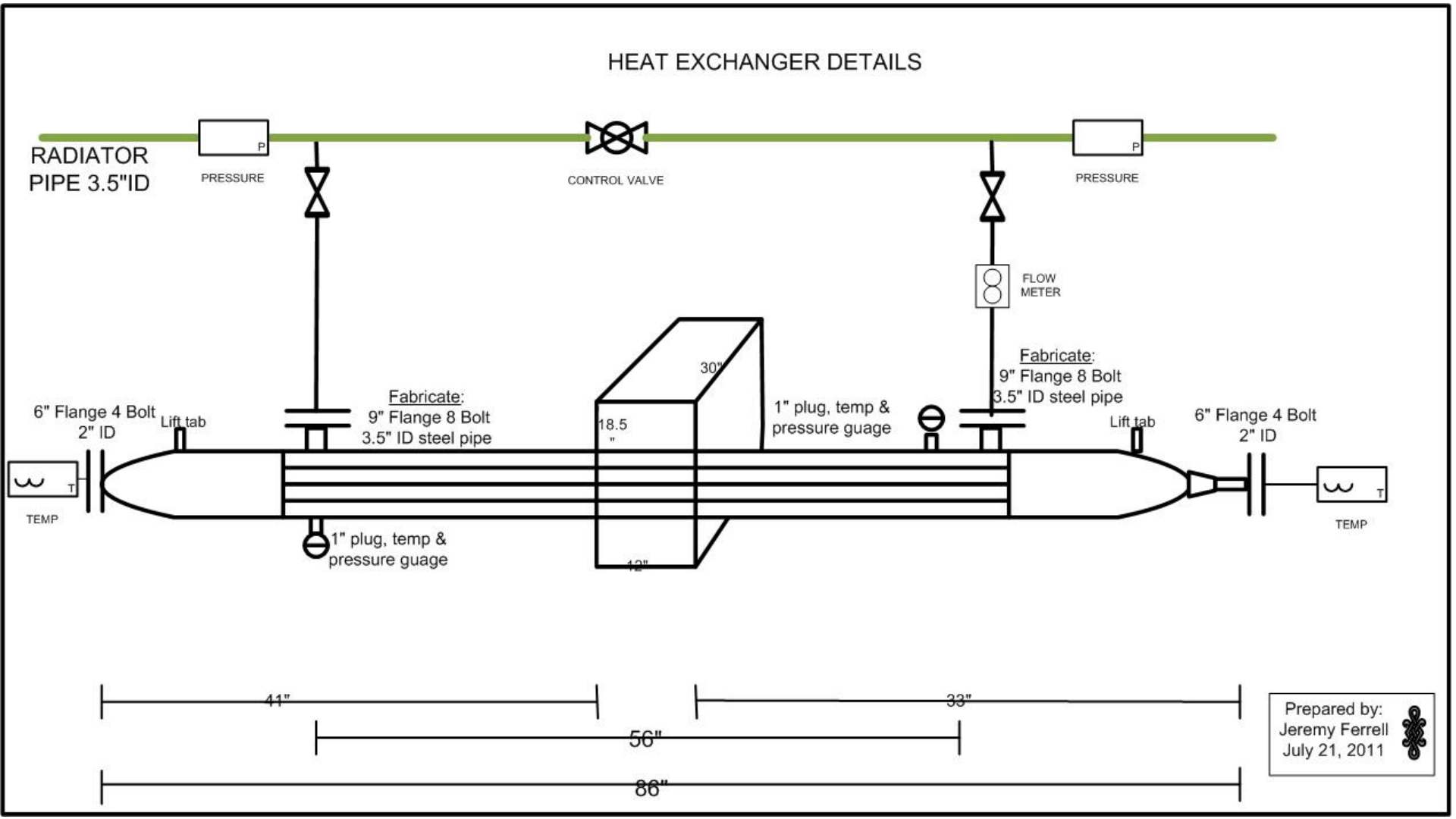
GIVEN PARAMETERS (from Nixon):

PARAMETERS: Jenbacher HX	
16	psi allowable pressure drop
270	gal/min coolant flow
15	C max temp drop
85	C coolant in temp
3.5	inch pipe supply
7	ft max length
200,000	BTU/hr needed

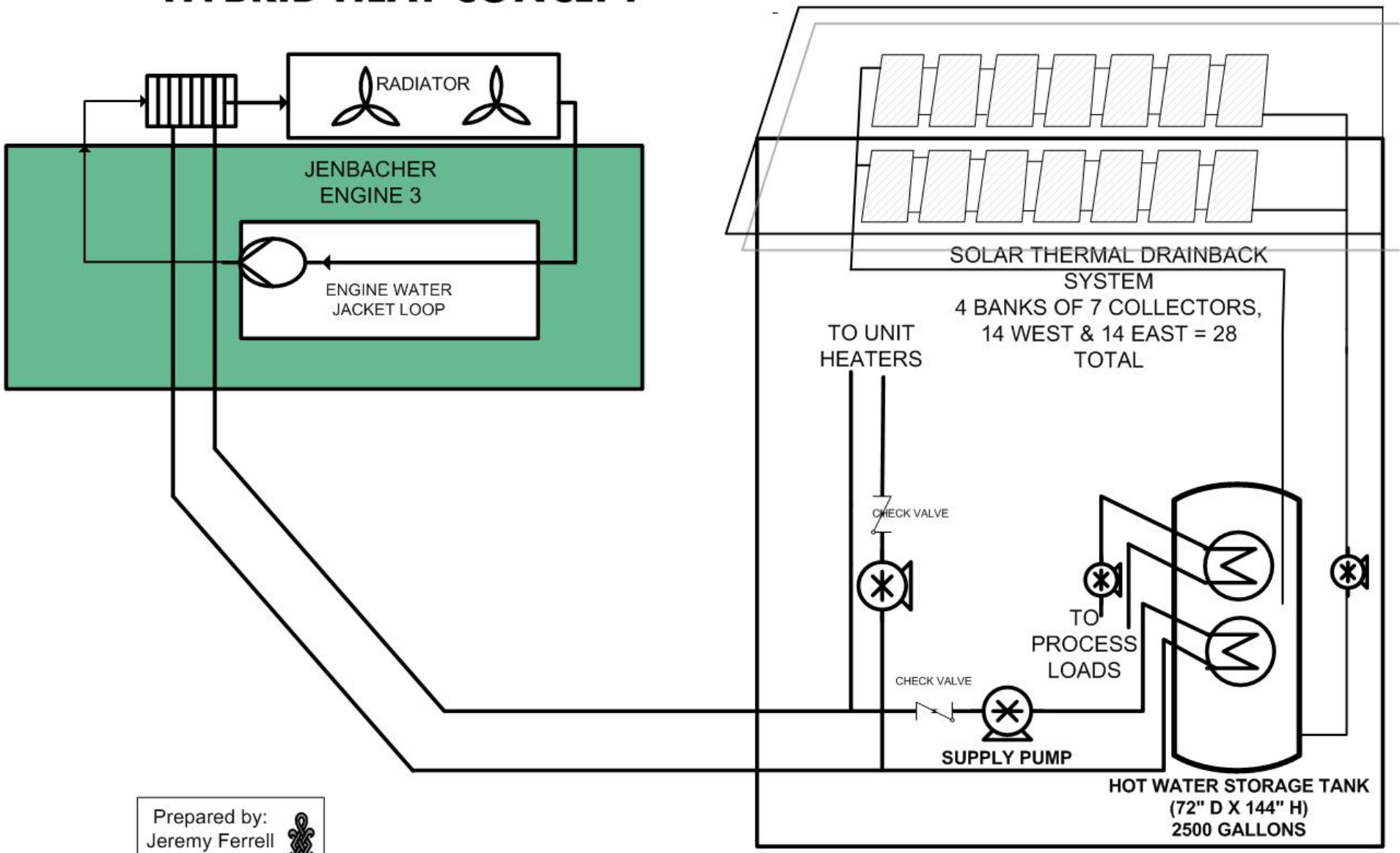
PRELIMINARY HEAT EXCHANGE CALCS.

Heat Exchange Calculations		
Area	20	ft^2
U	144	Btu/(ft hr F)
Cp water	1	Btu/lbF
Cp coolant	0.8	Btu/lbF
mdot water	20,000	lb/hr
mdot coolant	134,000	lb/hr
Calculated Effectiveness	0.193	
Q dot to cold side	232,000	Btu/hr

HEAT EXCHANGER DETAILS

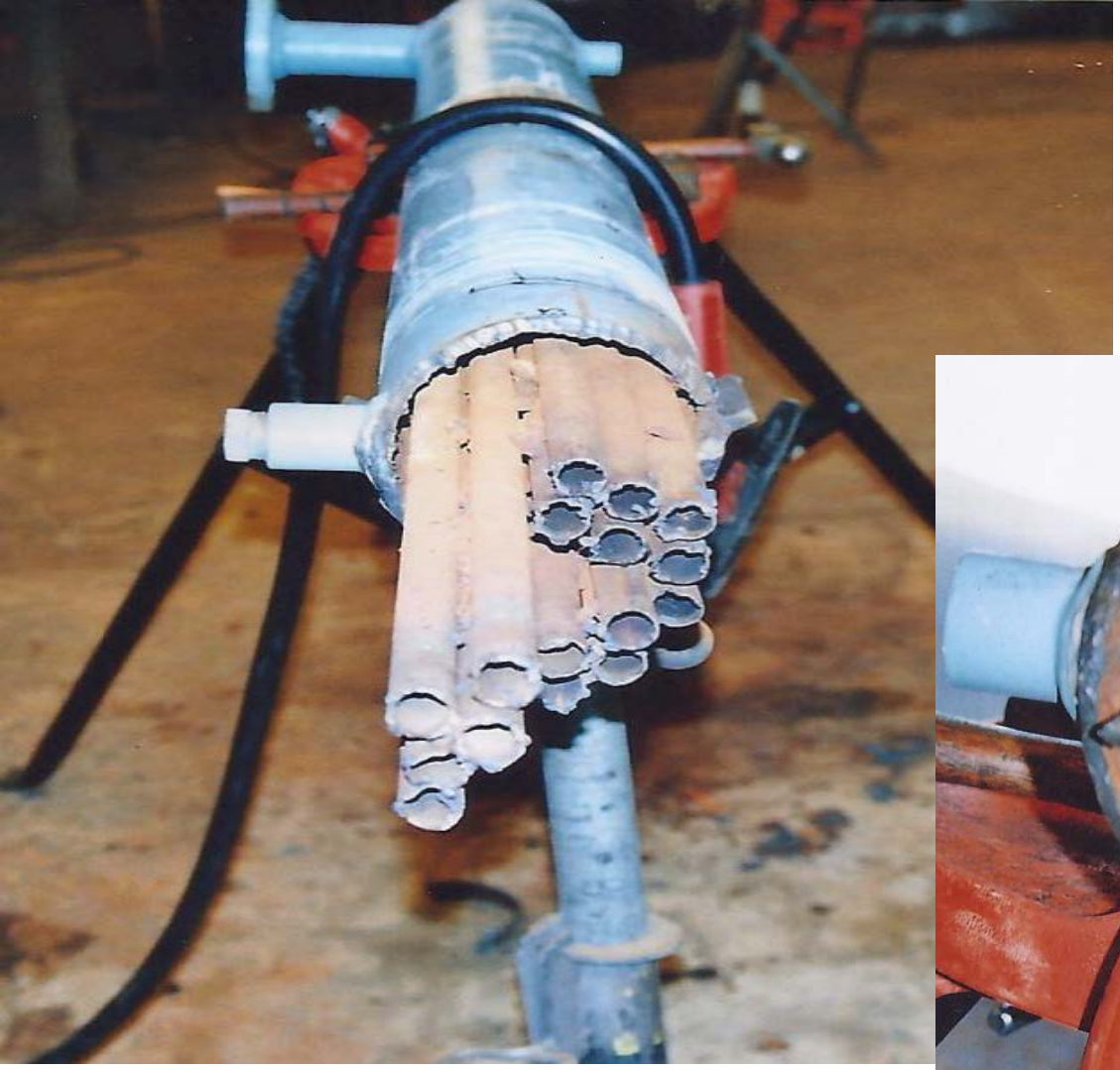


ECOCOMPLEX BIODIESEL FACILITY
HYBRID HEAT CONCEPT



Prepared by:
Jeremy Ferrell
Nov. 30, 2011


Used heat exchanger

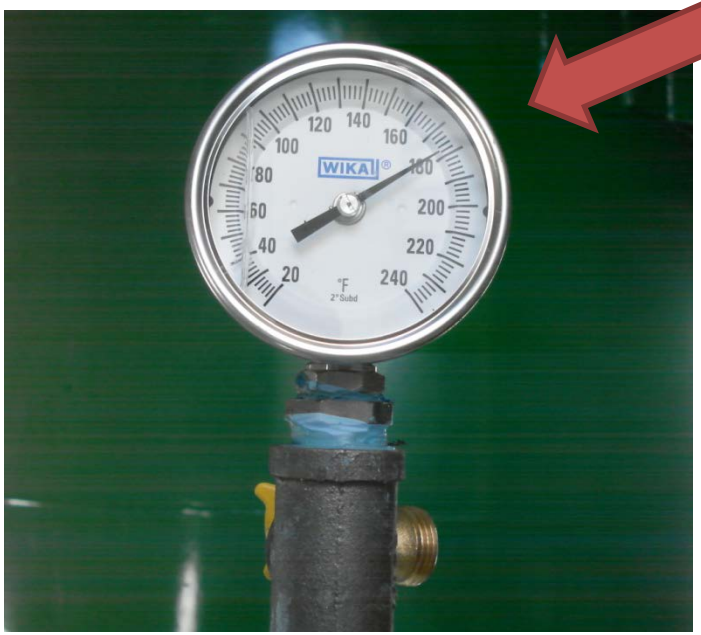



STOWES WELDING &


JENBACHER

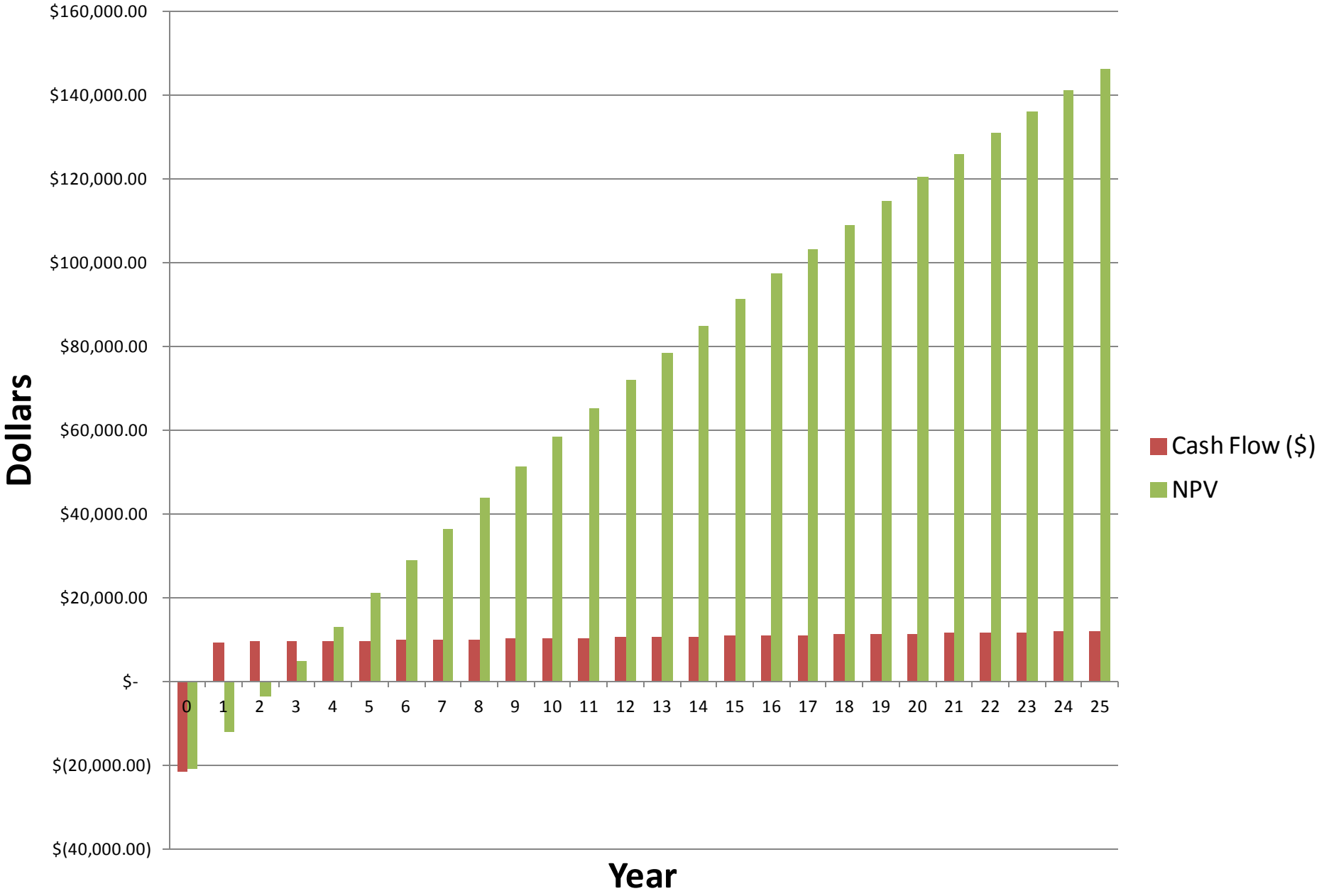

JENBACHER
ENERGIE

Heat Recovery



Economic Analysis

- Heat Exchanger System
  - Installed Cost $21,663
  - Annual Avoided cost of $9,500 per year (based on 50,000 gal/yr and $1.19/therm nat. gas)
  - 3 year payback (based on 3.5% cost of capital and 1% inflation)
  - 39.7% IRR (based on savings)


Co-Gen Savings (Nat. Gas Comp)
$160,000.00
$140,000.00
$120,000.00
$100,000.00
$80,000.00
$60,000.00
$40,000.00
$20,000.00
$-
$(20,000.00)
$(40,000.00)
Dollars
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Year
Cash Flow ($)
NPV

Thank you