



PROCESSING AND ENVIRONMENTAL CATALYSIS

CLEAN ENERGY TECHNOLOGIES

AVRO DIESEL™: CLEAN DIESEL FUEL FROM CONVERSION OF WASTE FATS AND RESTAURANT RESIDUES

Background

North Americans produce 5 to 6 kg/person/year of trap grease, a mixture of soap, bacteria and cooking fat that is removed from the drains of commercial cooking operations. Combined with relatively clean, used cooking oils, these wastes amount to 8 to 10 kg/person/year.

Currently trap grease is sent to landfills at the restaurant owner's expense. Converting recovered waste cooking oils and trap greases to clean AVRO Diesel™ in Canada and the USA could produce 2.475 billion L/year of clean diesel fuel (worth an est. \$2 billion Cdn dollars).

What are the issues associated with existing conventional bio-diesel processes?

- Require clean feedstocks that are expensive, normally in the range of \$400 to \$600/ton.
- Bio-diesel has poor cold flow properties.
- Existing processes don't work well with waste fats and greases with high free fatty acids.

What are the issues associated with waste fats and greases?

- They are often contaminated with bacteria and inorganics such as calcium and phosphorus.

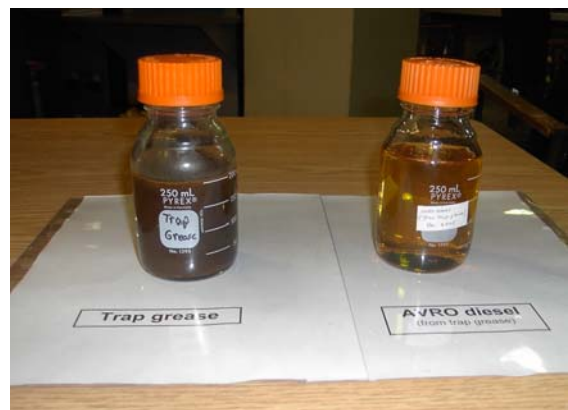
- Some wastes are land-filled at a cost, typically in the range of \$30-\$60/ton [in 2006 Cdn dollars].

AVRO Diesel™ Process

It converts waste grease to high Cetane diesel fuel with improved cold flow properties. See photos below.

How does AVRO Diesel™ process work?

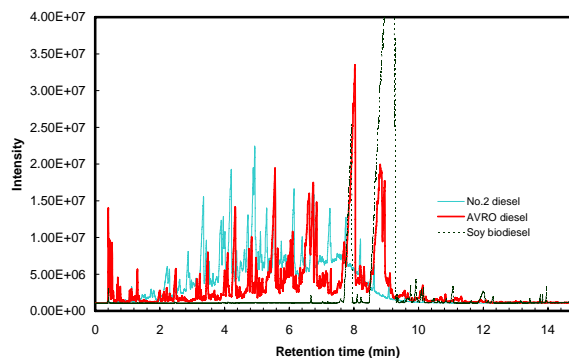
- The process combines mild thermal cracking with esterification. This process is being patented by the CANMET Energy



Waste grease (left)

AVRO Diesel™ sample (right)

- Technology Centre – Ottawa.
- The integrated process thermally destroys bacteria and removes inorganic contaminants. It treats waste animal fats, cooking greases, and trap grease that are 'too contaminated' for a conventional trans-esterification process, and produces clean diesel fuel.
- The process yields 65 to 75 wt% hydrocarbons/methyl-esters mixtures suitable for diesel fuel blending.



AVRO Diesel™ chromatogram (red) compared with soy biodiesel and commercial No. 2 diesel

Analysis	ASTM method	AVRO diesel from trap grease	EN14214: 2003 Spec.
C, wt %	D5291-96	82.50	
H, wt %	D5291-96	13.47	
N, wt %	D5291-96	0.22	
S, ppm	D1552-95	140	10
Cl, ppm	Neutron activation	5	
O by diff., wt %		3.81	
Density (g/cm ³) at 15°C	D4052-96	0.821	0.860 ~ 0.900
Kinematic viscosity @ 40°C, cSt	D445-97	2.3	3.5 ~ 5.0
Acid number, mg KOH/g	D664	0.038	0.5
Cloud point	D5773	-10.2	
Pour point, °C	D5949	-12.0	
Flash point, °C, Pensky-Marten closed cup	D93	130.2	Above 101

Your Invitation to Work with Us

CANMET Energy Technology Centre is seeking interested parties to commercialize this process. Please contact our Business Development Office to discuss your particular needs:

Roy Prokopuk, Principal Officer Business Development

(613) 996-8693

prokopuk@nrcan.gc.ca

For Further Technical Information Please Contact:

Michio Ikura, PhD, PEng,
Senior Research Scientist

(613) 996-0505

mikura@nrcan.gc.ca

CANMET Energy Technology Centre - Ottawa
Natural Resources Canada

1 Haanel Drive

Ottawa, Ontario, K1A 1M1

Canada

cetc.nrcan.gc.ca