DEPARTMENT OF NATURAL RESOURCES

Environmental **E**mergency **R**esponse

Belle Fountain Ditch Glycerin Release

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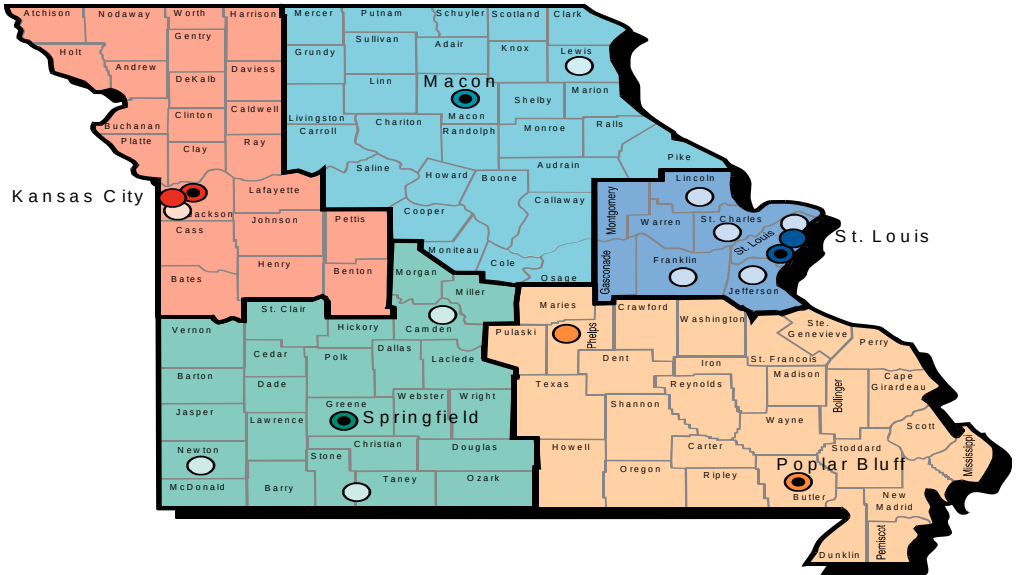
Overview

- Biodiesel Industry (Process, ingredients, products, proper disposal)
- Belle Fountain Ditch Incident
- Site Cleanup, Permitting Process
- Biodiesel Industry Inspections
- Improvements: Biodiesel Compliance Manual

Biodiesel

- Biodegradable, combustible fuel derived from vegetable oil/animal fat
- B100; Blends of B5, B20
- Industries throughout regional area
- Homebrewers are common

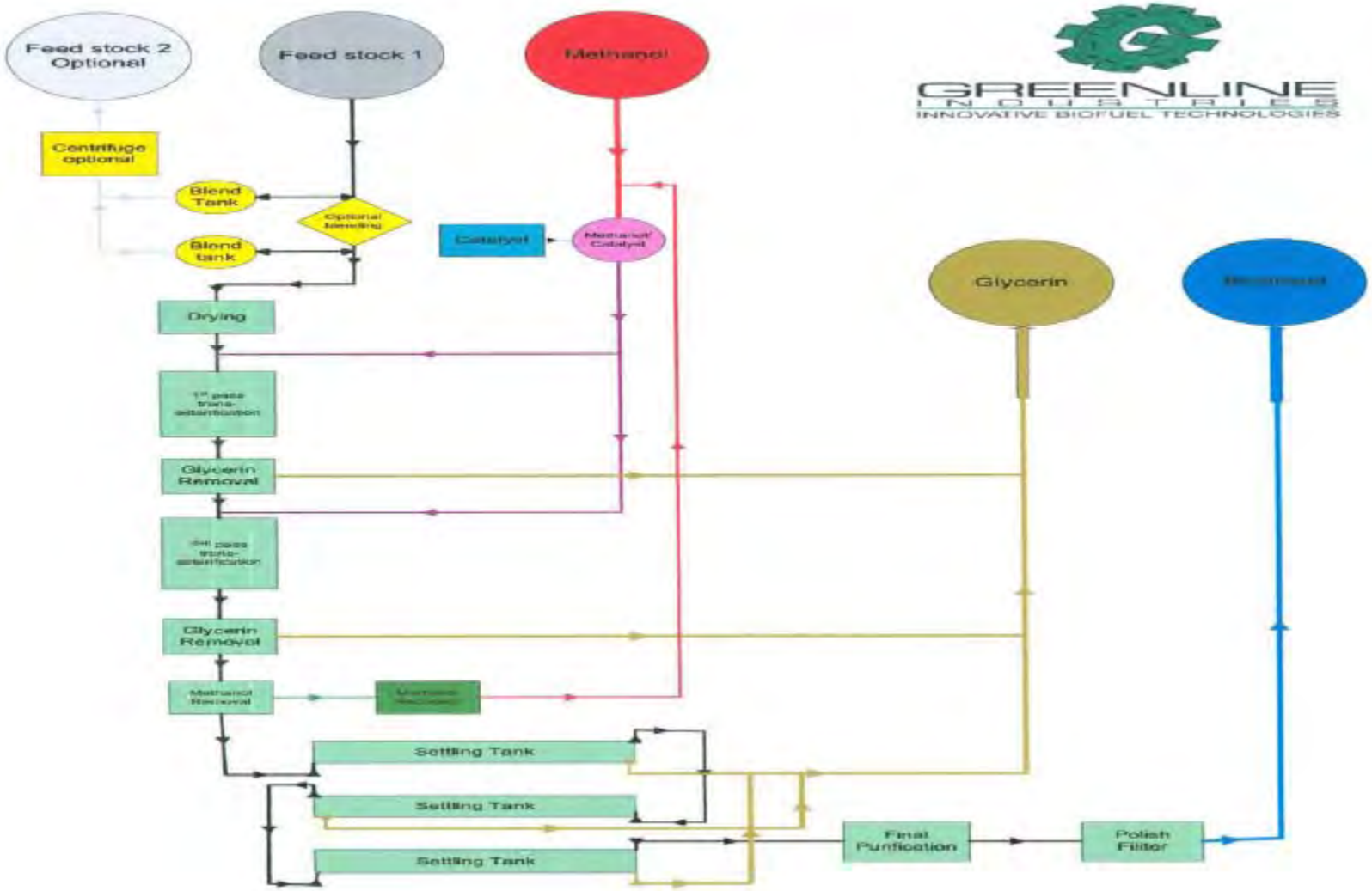


Biodiesel

- Commercial biodiesel production is usually done by base-catalyzed transesterification of fats/oils.
- Fats/oils are reacted with alcohol (methanol), using a strong alkaline catalyst.
- This yields mono-alkyl methyl esters (biodiesel) and glycerin.
- Glycerin is a sugar and by-product of the process.

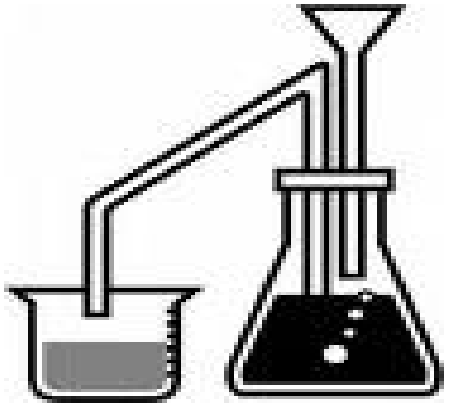
100 pounds Triglyceride (Soy Oil)	+	10 pounds Alcohol (Methanol)	=	10 pounds Glycerin	+	100 pounds Mono-Alkyl Esters (Biodiesel)

Biodiesel Process



Biodiesel

- Feedstock
- Methanol
- Catalyst
- Glycerin Waste
- Finished Biodiesel



Hazards

- Methanol
  - Highly Flammable
  - Health Hazard (toxic)
- Sodium/Potassium Hydroxide, Sodium Methylate
  - Corrosive (Alkaline)
- Glycerin
  - High Oxygen Demand

Glycerin by-product

- Approximately 10 gallons of glycerin is created for every 100 gallons of biodiesel produced.
- Glycerin is commonly contaminated with unused alkaline catalyst and excess methanol. Glycerin would require processing to elevate the purity to 99% or more for marketability.

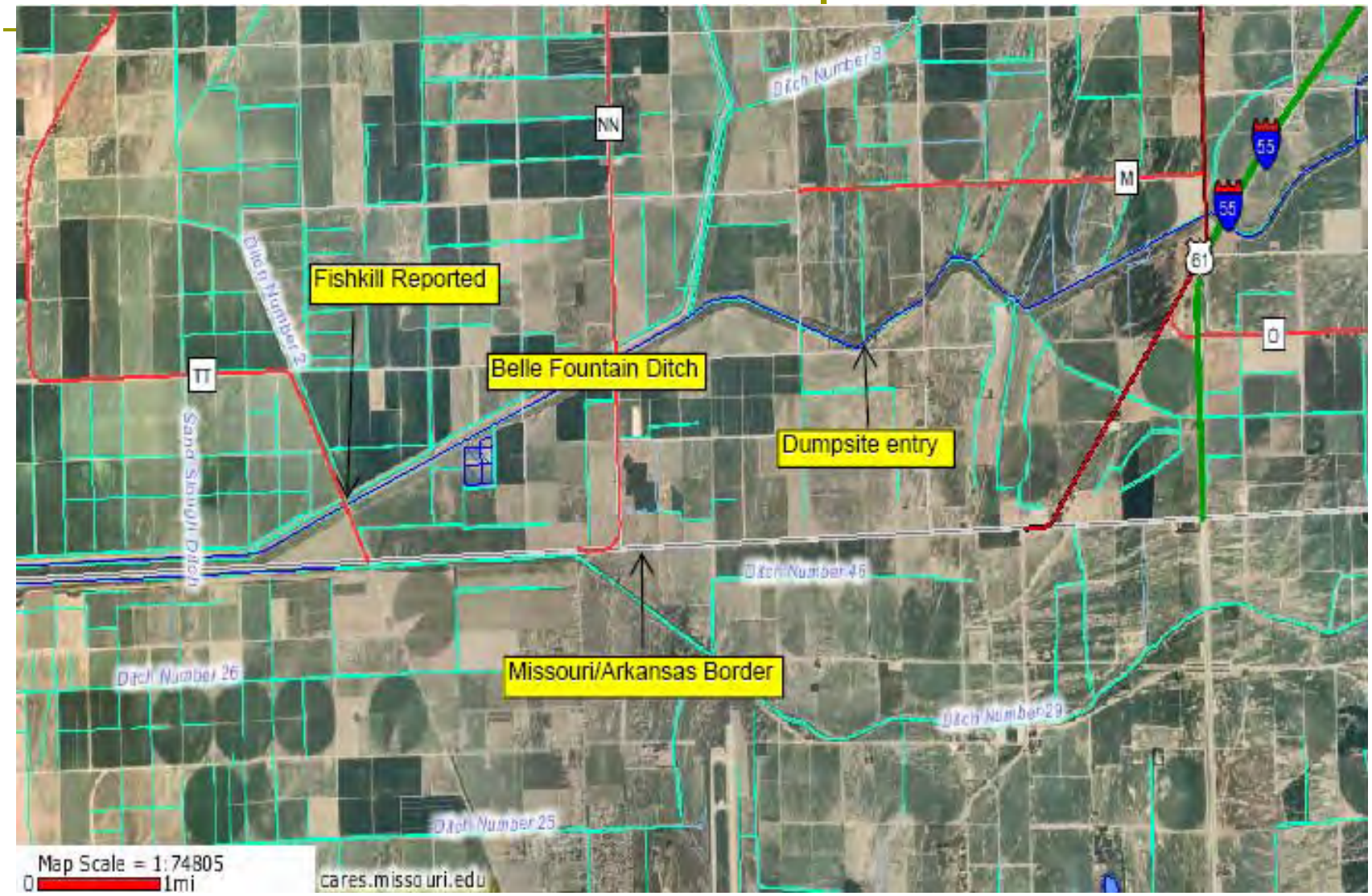
Glycerin-Haz Waste?

- Methanol contamination could elevate the glycerin to an ignitable haz waste due to flashpoint <140°F.
- Alkaline catalyst contamination could produce a corrosive haz waste.

Belle Fountain Ditch

- EER Spill Line notified of large fish kill on 9/30/07
- Additional calls and investigation led to finding unrefined waste glycerin in agricultural field ditch.
- Field ditch was tributary to Waters of the State.
- Runoff from waste entered the stream.
- RP was in the Biodiesel Production Industry.
- Land application of glycerin was conducted, along with an additional dumpsite found.

Site Map


Fishkill Reported
Belle Fountain Ditch
Dumpsite entry
Missouri/Arkansas Border
NN
M
TT
O
55
61
Ditch Number 8
Ditch Number 2
Sand Slough Ditch
Ditch Number 46
Ditch Number 26
Ditch Number 29
Ditch Number 25
Map Scale = 1:74805
0 1mi
cares.missouri.edu

2nd Glycerin Dumpsite

Damages/Costs

- EER and other State and Federal agencies conducted oversight of site for months
- Decreased water quality
- 25,000 fish counted, amounting to ~100,000 fish dead
- Killed last population of federally listed Fat Pocketbook Mussel, *Potamilus capax*.
- Violations of State and Federal environmental laws resulting in substantial penalties.
- Federal Felony Indictment for CWA violations.

Responsible Party Costs

- Violation of Clean Water Act
  - 2 years probation
  - $10,000 fine
- Cleanup Cost
- Costs associated w/ agencies involved
- Wildlife/Natural Resource damages
- Attorney fees

Fish damages

Fish and crayfish damages in Belle Fountain Ditch assessed by MDC staff, Sept-Oc 2007.

Species	Fish kill on 9/30/2007	Fish kill on 10/17/2007	Totals
Blue catfish	2	0	2
Bluegill	0	12	12
Buffalo	1262	268	1530
Carpsuckers	254	0	254
Channel catfish	354	16	370
Common carp	238	5	243
Crayfish	4	0	4
Flathead catfish	2	0	2
Freshwater drum	110	6	116
Gar	0	1	1
Gizzard shad	6076	11	6087
Goldeye	20	0	40
Green sunfish	696	0	696
Largemouth bass	54	9	63
Minnows	15674	0	15674
Northern hogsucker	2	0	2
White bass	2	0	2
White crappie	14	0	14
Fish total	**24,764**	**328**	**25,088**

Mussel Damages

Mussel damages determined by MDC based on MDC collections and USFWS provided data.*

Species	MDC collected mussels	MDC loss estimate from AR FWS data	Totals
Bleufer	2	80	82
Deertoe	0	1	1
Fawnsfoot	1	1	2
Fragile papershell	92	101	193
Giant floater	0	3	3
Mapleleaf	0	2	2
Pink papershell	13	137	150
Plain pocketbook	0	73	73
Threehorn wartyback	0	1	1
Wartyback	0	1	1
White heelsplitter	0	82	82
Yellow sandshell	0	10	10
Threeridge	1	0	1
Fatmucket	1	0	1
Mussel total	**110**	**492**	**602**

Agencies Involved

- MO Department of Natural Resources
- MO Department of Conservation
- EPA Regions 6 & 7
- US Fish and Wildlife Service
- Arkansas Deparment of Environmental Quality (ADQ)

Permitting Considerations

- Big piles of glycerin contaminated soil
- Very high oxygen demand in glycerin
- Methanol present at high levels
- Storm water flows during cleanup
- Completing the clean up and returning the area to crop production

Permitting Considerations

- Contaminated soil was covered in plastic
- Investigation revealed soil was not homogeneous, “clumps” of unincorporated glycerin still present.
- Methanol content within these clumps exceeded our Default Target Levels for ground water and drinking water protection.

What are we going to allow?

- Initial thought was simply to require all of the soil to be landfilled
- Applicant sought to land apply everything

The Plan

- Decided to allow bioremediation treatment of *most* of the soil
  - “clumps” of glycerin hauled to landfill, department staff overseeing visual segregation
  - Area receiving land applied soil bermed to prevent storm water runon, and prevent runoff
  - Soil spread in treatment cell, allowing glycerin and methanol to break down

Permit Conditions

- Plastic must be removed and properly disposed of in a landfill
- Storm Water Pollution Prevention Plan required before permit issuance, then incorporated into the permit by reference
- Instream monitoring to demonstrate no further impact on the stream

How do we know if it works?

- Permit required soil samples taken from the treatment cell to verify methanol is gone
- Vegetation must be established
- However…

Results

- All soil samples revealed “non detect” for methanol
- Area will be returned to crop production
- Once plastic is removed, the NPDES permit may be terminated

Results

Inspection Process

The Inspections.

- Inspected a total of three facilities in our region.
- Two had several deficiencies.

Problems Faced.

- Very little information on large scale biodiesel production.
  - Most information obtained from the internet deals with small scale production or “home brewers”.
- Public misconceptions on biofuels.
  - Sold to the public as safe for the environment (biodegradable).

Problems Faced.

- Inexperience of manufacturers.
  - Many were farmers, small business owners and/or entrepreneurs with little or no experience in fuel manufacturing.
- The sudden and rapid growth of the industry.
  - The plants are relatively simple and easy to construct.
  - The facilities basically consist of a large metal building, secondary containment and a tank farm. The rest of the equipment is brought in on skids and put together on-site.

Plant equipment is brought in on skids and put together on-site.

- Lack of industry specific regulations and government oversight.
  - Regulations did not have time to catch up with the rapidly growing and relatively new industry.
  - No prior inspections or enforcement cases to reference.
- Lack of industry standards and support.
  - Did not appear to be a set standard or guidelines in the construction of these facilities.

What we discovered.

- Shoddy construction and questionable materials used.
- Tank insulation material is highly absorbent.
- Tanks sit on a gasket that would dissolve once it comes in contact with product and leave an oily sheen during rain events.

Tank Insulation

- One of the facilities we inspected reported release of poultry fat into the secondary containment.
- After the spill was cleaned up, the insulation absorbed the product or poultry fat and would continue to seep out and leave an oily sheen during rain events.

Tank Gasket

- The tanks sit on gasket constructed of felt or tar paper like material.
- One of the facilities we inspected reported a spill of biodiesel product into the secondary containment.
- The gasket under the tanks dissolved and would continue to leave an oily sheen during rain events.

Shoddy construction.

- Cracks in concrete walls of the secondary containment structure.
- This facility was a little over a year old at the time this picture was taken.

Lack of Industry Standards

- This facility did not have secondary containment for spills that may occur inside the production plant.
- Floor of facility was flat and did not have any built in containment.

Faulty equipment & design.

- Two of the facilities reported problems with the oil & water separators.
- Facilities claimed that the equipment was faulty and not effective in removing oil and product from the storm water.

What we learned.

- No production/operational/technical support from Natural Biodiesel Board (NBB) and little provided from manufacturer.
- Some voiced concerns over shoddy construction methods and designs and would like to see industry minimums or recommendations.
- MFA will only buy biodiesel derived from soy oil (which currently is the more expensive of the common feed stocks).
- Construction materials not compatible with finished product (ie. gaskets that dissolve or crack when in contact with biodiesel).
- Lack of business management skills appears to be more detrimental than market conditions

Where to go from here?

- Increase public awareness.
  - Current media and internet outlets have not provided accurate information on biofuels.
  - Because something is biodegradable does not make it safe for the environment.
- Set industry minimum design standards.
- Increase discussions with industry stakeholders.
- Provide additional training to State and Federal regulators.

Steps Taken


Environmental Laws
Applicable to Construction and Operation
of
Biodiesel Production Facilities
November 2008
EPA-907-B-08-001
www.epa.gov/region07/priorities/agriculture

Purpose of the Manual

This compliance assistance manual serves as a road map of information on federal environmental programs and federal, state, and local agency roles as they apply to parties interested in designing, building, and operating biodiesel manufacturing facilities. This manual emphasizes federal environmental laws and regulations implemented by the United States Environmental Protection Agency and its state partners. Air, water, hazardous waste, accident prevention and release reporting are examples of requirements that might apply.

Questions?


In case of environmental emergency...
Call
MISSOURI DEPARTMENT OF NATURAL RESOURCES
Environmental Emergency Response
(573) 634-2436
National Response Center 800-424-8802
U.S. EPA Region VII ..... (913) 281-0991
Chemtrec 800-424-9300