Response Considerations for Renewable Fuel Spills

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Disclaimer:

There is limited formal data available regarding the fate and transport of renewables in the environment or the most strategic response strategies. The following information is based on SDS reviews, internet searches, informal conversations, and direct spill response experience in the field, but should be considered incomplete as this information is based on limited data.

Key Considerations for Spill Response

- Behavior in/on Water
- Volatility
- Ecotoxicity
- Persistence in Environment
- Biodegradation Rate
- Regularly Mixed with Petroleum?
- Ecological Threats
- Common Feedstocks
- Similarities with Petroleum Version
- Key Differences from Petroleum Version
- Potential Spill Sources
- Response Strategies

Key Considerations for ETHANOL

- **Behavior in/on Water** – Fully water soluble, but will float before it fully partitions into water. Time depends on volume spilled and energy of water (fire risk while floating)
- **Volatility** – Somewhat volatile
- **Ecotoxicity** – Considered non-toxic unless mixed with petro-gasoline in which case the gasoline toxicity is the driver. Toxicity occurs with high levels of ingestion.
- **Persistence in Environment** – Short. Highly biodegradable, will dilute quickly in water.
- **Regularly Mixed with Petroleum?** Yes E10 & E85 (10% & 85% ethanol respectively). Note co-solvency extends petroleum plume reach
- **Ecological Threats** – Sudden severe depletion of dissolved oxygen may cause fish kill

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Key Considerations for ETHANOL

- **Common Feedstocks** – Wheat, corn, barley, sorghum
- **Similarities with Petroleum Version** – Similar to gasoline with short-term persistence in the environment
- **Key Differences from Petroleum Version** – Soluble in water; low toxicity unless blended with petroleum; highly mobile in soil (does not adhere to sediment)
- **Potential Spill Sources** – Barge, rail, truck
- **Response Strategies** – Vacuum recovery of water/ethanol mixture; excavation of impacted soils; natural attenuation in water – ADD AERATION; in-situ burn. If discharged to larger water body, monitor both DO and ethanol levels to assess when concentrations approach anoxic (DO) or toxic (ethanol) levels. Barge aerators may be used to improve DO levels.

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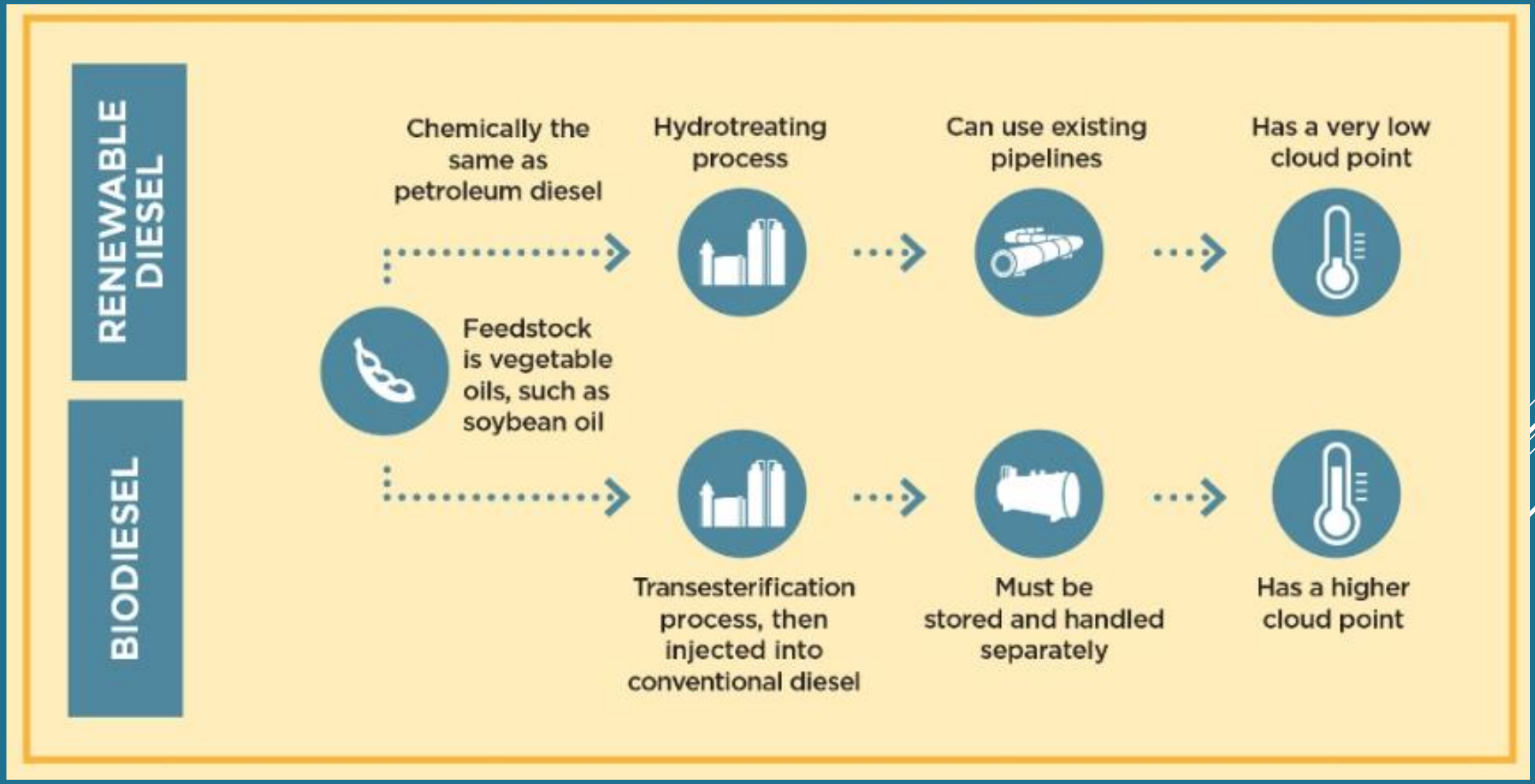
RENEWABLE DIESEL & BIODIESEL



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Key Considerations for RENEWABLE DIESEL

- **Behavior in/on Water** – Floats, very low solubility
- **Volatility** – Not volatile, slow evaporation
- **Ecotoxicity** – Toxic to aquatic organisms; may cause long-term effects in the aquatic environment
- **Persistence in Environment** – Stable, but readily biodegradable. Rapid biodegradation in water under aerobic conditions. Dissipates relatively quickly in mixing waters.
- **Regularly Mixed with Petroleum?** Considered a replacement for petrodiesel, but may be blended in any percentage. Tax credits currently require blending.
- Ecological Threats – Will foul feathers or fur, ingestion, floating product may cut off oxygen exchange to water column.

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Key Considerations for RENEWABLE DIESEL

- **Common Feedstocks** – Fats, vegetable oils & greases, particularly waste vegetable oils and waste animal fats.
- **Similarities with Petroleum Version** – Nearly identical to petroleum diesel.
- **Key Differences from Petroleum Version** – None noted
- **Potential Spill Sources** – Ships, tanks, trucks, pipelines (eventually)
- **Response Strategies** – Same as petroleum diesel. However, high biodegradation rate may warrant consideration of natural attenuation rather than physical removal that would require significant habitat destruction.

Key Considerations for BIODIESEL

- **Behavior in/on Water** – Floats, very low solubility
- **Volatility** – Not volatile, slow evaporation
- **Ecotoxicity** – Low toxicity unless mixed with petrodiesel in which case the diesel toxicity is the driver.
- **Persistence in Environment** – Stable, but readily biodegradable. Rapid biodegradation in water under aerobic conditions. Dissipates relatively quickly in mixing waters.
- **Regularly Mixed with Petroleum?** Yes. B10 and B20 (10% and 20% biodiesel respectively). May be used neat
- **Ecological Threats** – Will foul feathers or fur, floating product may cut off oxygen exchange to water column.

Key Considerations for BIODIESEL

- **Common Feedstocks** – Fats, vegetable oils & greases, particularly waste vegetable oils and waste animal fats.
- **Similarities with Petroleum Version** – Nearly identical to petroleum diesel but has lower water-soluble fraction
- **Key Differences from Petroleum Version** – None noted
- **Potential Spill Sources** – Tanks, trucks
- **Response Strategies** – Same as petroleum diesel. However, high biodegradation rate may warrant consideration of natural attenuation rather than physical removal impacting habitat

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Key Considerations for VEGETABLE OILS

- **Behavior in/on Water** – Floats, low solubility
- **Volatility** – Not volatile, slow evaporation
- **Ecotoxicity** – Highly variable depending on type of oil, and if waste oils are included, they're even more variable in terms of physical and chemical properties as well as fate and transport in the environment.
- **Persistence in Environment** – Stable, biodegradation rates vary widely depending on oil type, environmental conditions (particularly temperature), polymerization. Low evaporation, low dispersal in water, low emulsification.
- **Regularly Mixed with Petroleum?** No.
- **Ecological Threats** – Physical impacts of smothering shoreline organisms, heavy sticky coating of fur/feathers. Floating product may cut off oxygen exchange to water column. Biodegradation may lower dissolved oxygen.

Key Considerations for VEGETABLE OILS

- **Common Feedstocks** – Soybeans, corn, palm
- **Similarities with Petroleum Version (crude)** – Sticky (adhesive and cohesive), persistent in environment, may readily polymerize to semi-solid, preferential biodegradation of certain components, strong odor.
- **Key Differences from Petroleum Version** – Lower toxicity, less viscous than California crude
- **Potential Spill Sources** – Ships, Trucks
- **Response Strategies** – Same as petroleum crude. Skimmers and sorbents should have similar effectiveness. For long-term response in small water bodies, consider dissolved oxygen needs.

Response Considerations

- Lots to learn, but glad to be learning about less persistent, less toxic fuels.
- Rapid biodegradation can create a dissolved oxygen crash (e.g., ethanol) & needs to be addressed immediately. Also note initial fire risk.
- Relatively rapid biodegradation (e.g., renewable diesel/biodiesel) may also be relevant to response strategies (DO meters/aeration) and cleanup endpoints (NEBA).
- Wildlife impacts are not well documented but typically will be consistent with petroleum impacts.
- No spill data for Sustainable Aviation Fuel

Thank You!

Questions?

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