RENEWABLE FUELS ASSOCIATION

The Impact of Accidental Ethanol Releases on the Environment

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On Feb. 4, two engines and 14 railcars carrying ethanol derailed on a stretch of track near Dubuque, Iowa, operated by Canadian Pacific. The track is adjacent to the Mississippi River. Three of the railcars caught fire, and ethanol from at least eight railcars leaked into the river. No injuries were reported and the fires were quickly controlled by first responders. By Feb. 8, all derailed cars had been removed from the site and the track had been reopened to rail traffic.

The facts below are intended to address common questions that have been raised in the wake of the incident about the safety of ethanol transportation by rail and the potential environment effects of an ethanol release.

ETHANOL-BY-RAIL'S SAFETY RECORD

- Rail is the primary means of transporting ethanol in the United States. It is estimated that roughly 70% of ethanol moves to market by rail in the U.S., meaning there were more than 340,000 railcar shipments of ethanol last year.
- Ethanol railcar derailments and accidental releases (spills) are incredibly rare occurrences, and the industry maintains an impeccable safety record when it comes to shipping ethanol.
    - According to the most recent data, ethanol and other products classified as hazardous material are delivered safely and without incident 99.998% of the time.[1]
    - Since 2006, the data show that **99.994%** of ethanol tankcars have reached their destination without any type of accidental release.[2]
    - Looked at another way, for every ethanol tankcar that experiences a spill, there are 16,438 ethanol tankcars that reach their destination without any type of accidental release.[3]
- This excellent safety record stems in large part from the commitment of the rail and ethanol industries to continuous safety training for ethanol producer, shippers, and first responders. In fact, the Ethanol Emergency Response Coalition (EERC)—a joint coalition formed by the Renewable Fuels Association (RFA) and other stakeholders—held ethanol emergency response seminars in Dubuque, Iowa in 2012.

[1] Association of American Railroads.
[2] U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration & Bureau of Explosives.
[3] Id.

ETHANOL FATE AND TRANSPORT CHARACTERISTICS

- Because ethanol is derived from natural materials and is comprised of 35% oxygen, it degrades quickly in the natural environment. Biodegradation is rapid in soil, groundwater and surface water, with predicted half-lives ranging from several hours to 10 days.
- According to the Massachusetts Department of Environmental Protection (DEP), "In surface water following a pure ethanol spill, ethanol is predicted to quickly biodegrade with half-lives ranging from 0.25 to 1 day."
- Ethanol completely dissolves in water, and once in solution, volatilization and adsorption are not likely to be significant transport pathways in soil/groundwater or surface water. Thus, ethanol is a short-lived compound in surface waters and subsurface aquifers, substantially limiting the risk to aquatic organisms. According to Massachusetts DEP, "Upon reaching a surface water body, either as groundwater discharge or surface flow, ethanol will rapidly mix with the water and go into solution because ethanol is completely soluble in water."

FATE OF ETHANOL AFTER MAJOR RELEASE		
Media	**Biodegradation Rate**	**Ethanol Fate**
Soil	0.1 – 2.1 days	• Ethanol is rapidly biodegraded in soil
Surface Water	0.25 – 1 day	• Neat ethanol rapidly mixes with water • Ethanol is rapidly biodegraded in surface water
Groundwater	0.1 – 2.1 days	• Ethanol is rapidly biodegraded in groundwater
Air	0.5 – 5 days	• Ethanol vapor is denser than air and tends to settle in low areas • Ethanol vapor disperses rapidly after release
Storm/sanitary sewers	0.5 – 5 days	• Ethanol will volatilize and rapidly biodegrade

Source: EPA and MA DEP

- Depletion of dissolved oxygen, which could contribute to hypoxia or asphyxia for aquatic life, is the primary risk associated with releases of ethanol to surface water. But this typically occurs only in situations where a very high concentration of ethanol is released into a small body of water with limited flow.

MONITORING THE IMPACTS OF THE DUBUQUE INCIDENT

- Following the Dubuque incident, CP coordinated closely with the Iowa Department of Natural Resources, U.S. Fish & Wildlife and the U.S. Environmental Protection Agency to ensure the protection of the environment. To monitor potential effects of the ethanol spill on water quality, 40 separate monitoring sites were established at one-mile increments over a 10-mile

stretch downstream from the incident. The monitors detect the presence of ethanol in the water and the level of dissolved oxygen.

  - Lab results from the monitors just one day after the accident implied that the ethanol had quickly biodegraded. **The two monitors closest to the derailment site displayed "barely detectable" levels of ethanol, and no other monitoring sites detected any presence of ethanol.**

- While the cause of the derailment remains under investigation, the incident highlights the importance of track maintenance. Data from the Federal Railroad Administration show track defects are the leading the cause of derailments, accounting for 43% of derailments since 2010. Equipment failures (12%) and human error (30%) are other leading derailment causes.

WHY ETHANOL RELEASES ARE DIFFERENT THAN OIL SPILLS

- ***The Dubuque incident again underscored some of the major differences between accidental releases of ethanol and releases of petroleum products.***

- While biodegradation of ethanol in both aerobic and anaerobic environments occurs relatively rapidly, biodegradation of hydrocarbons can take years or decades depending on the compounds and their toxicity.

- Unlike ethanol, oil does not readily dissolve in water. According to API, only 2-5% of spilled oil is removed by natural dissolution, and the portions of oil that dissolve into water "are typically the more acutely toxic components" and "if exposed to marine life, can cause environmental impacts/injuries."

- Oil in water also emulsifies, and according to API this process can form "tarballs, lumps, patties or tar mats" that "result in difficult clean-up and disposal issues…"

- Sedimentation is another common fate of spilled oil. Because oil is sticky it tends to adhere to particles in the water, on shorelines, or on river floors.

- Oil components with low boiling points can also evaporate from surface water. These components are typically the most toxic, and thus the evaporation process transfers toxins from the water surface to the air.