



Top 3 Reasons to Revisit Facility Siting for Refinery Conversion to Biodiesel

By Alex Ferguson

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With a global push for decarbonization, significant projects are both planned and ongoing to retrofit existing hydrocarbon equipment for the biofuel economy. One such conversion is transitioning hydrotreating equipment to treat plant derived oils, which can result in a fuel having a higher-octane rating than traditional diesel product. However, due to the unsaturated nature of the plant derived oils, the hydrotreating process needs to operate at higher pressures and use more hydrogen feedstock to produce the diesel. As a result, the consequences and associated risk will change for the new operation.

While operational hazards for biodiesel hydrotreating are similar to hydrocarbon refining, the introduction of process changes does necessitate revisiting facility siting per U.S. 29CFR1910.119¹ (Process Safety Management of Highly Hazardous Chemicals) to evaluate potential impacts from explosions, fires, and toxic events on facility employees. When revisiting facility siting for biodiesel facilities, pay close attention to the requirement for additional hydrogen, which introduces three potentially significant process changes:

1. requirement for additional hydrogen production,
2. changes in the routing of hydrogen feedstock to the unit, and
3. need to increase the hydrogen supply pressure for the hydrotreater.

To meet the requirement for additional hydrogen production, some facilities are ramping up existing hydrogen production while many others are bringing hydrogen plants back online or installing new plants. Regardless of how a facility is adapting to meet demand, this additional hydrogen production means new hazards or increased utilization of existing hydrogen plant capacity, increasing the potential likelihood of a hydrogen release and, therefore, the associated risk to exposed personnel.

In situations where a new hydrogen supply line is needed to support biodiesel production, design teams need to consider the hydrogen routing to the hydrotreater. In areas of the facility where new supply lines are needed, predicted blast loads may increase due to a hydrogen release into existing or new congestion and confinement. This may result in a hydrogen vapor cloud explosion (VCE) in a location where one was not possible previously. Because hydrogen is a highly energetic fuel, a release and subsequent VCE could increase the predicted loads on nearby occupied or critical infrastructure buildings.

¹ United States Occupational Safety and Health Administration; *OSHA 1910.119: Process Safety Management of Highly Hazardous Chemicals* (8 FR 9313); February 2013; Occupational Safety & Health Administration 200 Constitution Ave., NW, Washington, DC 20210

Many biodiesel sites will require an increase in the hydrogen supply pressure, flow, or both. For facilities utilizing existing equipment, one may not identify a need to revisit facility siting to evaluate the consequences associated with changes 1 and 2. However, the third point, an increase in hydrogen pressure and/or flow, means that a loss of containment is likely to have a higher mass flow resulting in larger vapor clouds, larger VCEs, and ultimately increased damage to occupied buildings.

In summary, if your facility is undertaking a project to convert to biodiesel production, your siting study needs to be revisited to understand the potential impact on the siting of occupied buildings. While this short article focuses on hydrogen impacts, it is likely that additional process changes may also need to be reviewed. While U.S. 29CFR1910.1191 requires facility siting, API RP 752² /753³ /756⁴ provide further guidance on best practices to locate onsite populations in permanent buildings, temporary buildings, and tents, respectively.

For more information, contact Alex Fergusson at AFergusson@BakerRisk.com.

² API RP 752 - API (American Petroleum Institute), "Management of Hazards Associated with Location of Process Plant Permanent Buildings," API Recommended Practice **752**, 3rd Ed., December 2009.

³ API RP 753 - API (American Petroleum Institute), "Management of Hazards Associated with Location of Process Plant Portable Buildings," API Recommended Practice **753**, 1st Ed., June 2007.

⁴ API RP 756 - API (American Petroleum Institute), "Management of Hazards Associated with Location of Process Plant Tents," API Recommended Practice **756**, 1st Ed., September 2014.