

Hierarchy of Hazard Controls Analysis (HCA) for a New Process - Proposed Biofuels System

The HCA team used the Process Hazard Analysis (PHA) for all risk relevant data for the below HCA. The HCA team used the PHA work product (spreadsheet) as it identified, characterized and prioritized each process safety hazard. The Matrix below covers the iterative approach to reduce Process Safety Hazards identified in the PHA to the greatest extent feasible.

<i>Date of analysis</i>	<i>Process unit</i>
2/12/2020	Biofuels System

Team Member Role	Expertise	Years of Experience
HCA Facilitator	Facilitator	9
Process Engineer	Engineering	34
Operations Representative	Operations	35

Process Safety Hazards Analyzed Loss of Containment of biofuels to grade, potential fire and personnel exposure

	1st order (Eliminate)	2nd order (Reduce - Minimize, Substitute, Moderate or Simplify)	Additional Safeguards (1st, 2nd, passive, active or procedural)		Recommendation (1st, 2nd, passive, active or procedural)
<u>Feeds (Raw Material), Reaction products (Intermediates) and finished products</u>	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	N/A
<u>Process Storage and Equipment (vessels, pipe size, tanks etc)</u>	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	N/A
<u>Process Controls</u>	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	N/A
<u>Process Piping (e.g. oversized or excess pipe lengths)</u>	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	N/A
<u>Process Equipment Conditions (temp, flow, exchanger bypasses, SIS bypasses)</u>	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	N/A
<u>Transportation (can we transport less or have less on site?)</u>	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	N/A
Are solvents or additives injected in the process that can be reviewed? (Misc. Material)	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	No additional safety measures or safeguards identified	N/A

General comments:

The team did not identify any opportunities to eliminate or reduce hazards, nor any opportunities to add any additional safeguards to the unit. The HCA Team therefore has no recommendations.

Eliminate	Indicates eliminating a hazardous substances or process/equipment to eliminate potential for a major loss of containment
Minimize	Use smaller quantities of hazardous substances
Substitute	Replace with a less hazardous substance
Moderate	Use less hazardous conditions (Press/Temp) or form of material to minimize the impact of a release.
Simplify	Can we simplify the process/eliminate unnecessary complexity to make human error less likely/more forgiving
Passive	Process or equipment design that minimize a hazard by reducing either its frequency or consequence, without the active functioning of any device; for example, a diked wall around a storage tank of flammable liquids.
Active	Controls, alarms, safety instrumented systems and mitigation systems that are used to detect and respond to deviations; example, a pump that is shut off by a high-level switch.
Procedural	Policies, operating procedures, training, administrative checks, emergency response and other management approaches used to prevent incidents or to minimize the effects. Examples- Ops Alarm response procedure, emergency response procedures.