HOBO Renewable Diesel LLC
Clinton, Iowa

Construction Permit Application Resubmittal for a Renewable Diesel Production Facility

April 2023

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Construction Permit Application Resubmittal for a Renewable Diesel Production Facility

Prepared for
HOBO Renewable Diesel LLC

April 2023

HOBO Renewable Diesel LLC

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1.0 Introduction and Background

HOBO Renewable Diesel LLC (HRD) plans to construct and operate a new 9,000 barrel per day (bpd) renewable diesel production facility in Clinton, Iowa. The facility will produce finished renewable diesel fuel, renewable hydrotreated naphtha, and renewable jet fuel from various feedstocks, including but not limited to animal fats, used cooking oil (UCO), distillers corn oil (DCO), and soybean oil.

Construction permits were originally issued to HRD on December 21, 2021 for this project. This submittal is for permit revisions to extend the deadline for commencing construction on the project and to remove the Biogas Flare from the project.

This narrative provides additional information in support of the construction permit application submitted via the Iowa Department of Natural Resources' (IDNR) EASYAir system.

The document includes the following sections:

- Section 2.0 contains a description of the Project.
- Section 3.0 contains a regulatory applicability analysis of the Environmental Protection Agency's (EPA's) and Iowa's Air Quality Regulations related to permitting requirements, standards of performance, and other air-quality related programs.

Information referenced in this narrative include the following that has been uploaded separately to EASYAir:

- Application Forms
- Potential-to-Emit (PTE) Calculations
- Process Flow Diagram

2.0 Project Scope for Air Permit

The objective of this application is to obtain revised air construction permits for equipment to be constructed as part of a new 9,000 barrel per day (bpd) renewable diesel production facility (the Project). Section 2.1 includes a high-level process description. Attachment 1 includes a more detailed process description. A detailed facility process flow diagram (PFD), including emission points and ancillary facility emission units, is uploaded to EASYAir.

2.1 High-Level Process Description

The HRD facility will utilize hydro-processing and hydrogen production technologies for the Renewable Diesel Unit (RDU). Table 2-1 outlines the high-level process steps. See Attachment 1 for additional detail.

Table 2-1 Process Unit Descriptions

Process Step	Description
Pretreatment Unit	This unit removes contaminants from feedstocks that are detrimental to downstream equipment catalysts. This step produces a treated feed that is ready for processing at the RDU.
Renewable Diesel Unit (RDU)	This process heats the feedstock in the presence of hydrogen and catalyst to hydrogenate the feedstock oils and remove oxygen and impurities; the material is then separated via atmospheric fractionation into several different streams as described below: • Hydrogen (recycled back to the hydrogenation reactor), • Hydrocarbons (further processed in the dewaxing reactor), • Naphtha product (shipped out as product or routed to the hydrogen plant to make hydrogen), • Jet Fuel product (shipped out as product), • Renewable Diesel product (shipped out as product), and • Sour Off-Gas (processed at SGT and then fed to Hydrogen Production Unit).
Sour Gas Treatment Unit (SGT) and Gas Compression	This unit removes hydrogen sulfide (H_2S) from the off-gas stream generated in the RDU so that it may be used as a feed for the downstream hydrogen facility. The sweet gas off-gas from the SGT is compressed and routed to the Hydrogen Production Unit under pressure.
Hydrogen Production Unit	This unit supplies pure hydrogen gas for the hydrotreater in the RDU. The unit uses steam methane reforming utilizing natural gas, naphtha product, or sweetened off-gas as feedstocks to form hydrogen gas and carbon dioxide.

2.2 Raw materials used

The facility will be designed to utilize various feedstocks, including but not limited to animal fats, UCO, DCO, and soybean oil. HRD plans to operate the facility at maximum rates that would utilize 11,000 bpd of feedstock on an annual basis. The facility will transport feedstocks to the site by either truck or rail.

2.3 Description of products

The process will result in three primary products: renewable diesel, renewable jet fuel, and renewable naphtha. For the emission calculations, a safety factor of 10% was applied to all nameplate throughputs.

2.3.1 Renewable Diesel

The diesel product is very similar to diesel produced from petroleum crude oil on a molecular level and can be utilized as a true replacement fuel. The facility expects a maximum production rate of approximately 9,850 bpd production rate for the diesel product. Both arctic grade (#1 diesel) and summer grade (#2 diesel) will be produced. The renewable diesel product will be shipped offsite via rail. The worst-case (i.e., highest vapor pressure) production scenario was used for storage tank and loadout emissions calculations to provide operational flexibility.

2.3.2 Renewable Jet Fuel

The facility will also produce renewable jet fuel. The facility expects a maximum production rate of approximately 4,300 bpd for the jet fuel product. The renewable jet fuel product will be shipped offsite via rail.

2.3.3 Renewable Naphtha

The facility will also produce renewable naphtha. The facility expects a maximum production rate of approximately 650 bpd for the jet fuel product. The renewable naphtha product will be shipped offsite via rail.

2.4 Equipment used in the process

Table 2-2 includes a description of all the permitted emission points in the process. Refer to the PTE and Form EI for details on the exempt or grandfathered sources, including information on tanks that are exempt from permitting.

Table 2-2 Process Equipment Descriptions

Equipment Name	Emission Point ID	Description
Pretreatment Vacuum Pump	EP-0101	Vacuum pump vent from the pretreatment process where any residual hexane remaining in soybean oil feedstock is assumed to be removed and vented.
HDO Startup Heater	EP-0201	59.1 MMBtu/hr natural gas-fired unit; used to heat the hydrogen and pretreated feed before entering the HDO reactor.
DWX Charge Heater	EP-0202	15.1 MMBtu/hr natural gas-fired unit; used to heat the heavier hydrocarbon stream leaving the HP Stripper prior to the dewaxing reactor
Fractionator Reboiler Heater	EP-0203	26.5 MMBtu/hr natural gas-fired unit; used to heat the stream prior to fractionation.
Steam Methane Reformer	EP-0501	184 MMBtu/hr unit; can combust both PSA off-gas and natural gas; used to heat purified feed and process steam in a catalytic reformer to produce syngas for hydrogen production.

Deaerator Vent	EP-0503	A steam vent from the deaeration of process condensate before it is recycled within the Hydrogen Production Unit; the steam includes some dissolved gases conservatively assumed to be emitted from this vent.
Boiler #1	EP-1001A	80 MMBtu/hr boiler; it produces steam for the facility.
Boiler #2	EP-1001B	80 MMBtu/hr boiler; it produces steam for the facility.
Boiler #3	EP-1001C	80 MMBtu/hr boiler; it produces steam for the facility.
Main Flare	EP-2401	Natural gas-fired flare used to combust off-gas during upset conditions and startup and shutdown scenarios. The flare is sized to combust gas from the facility during emergencies.
Loadout VCU	EP-1202	Natural gas-fired VCU used to control product loadout emissions.
Emergency Fire Pump	EP-1801	800 HP diesel-fired fire pump that provides water supply during emergencies.
Emergency Generator	EP-1003	670 HP natural gas-fired emergency generator that provides electric power to critical equipment during emergencies.
Cooling Tower	EP-1004	2-cell Cooling Tower with a maximum water flow rate of 4,250 gallons per minute that provides cooling water for the facility.
Slop/Off-Spec Tank	EP-TK19	25,000 Barrel Slop/Off-Spec Tank that can hold materials that do not meet product quality specifications. Material is routed back to the RDU for reprocessing.
Renewable Naphtha Storage Tank 1	EP-TK07	10,000 Barrel renewable naphtha tank; holds naphtha from the RDU; material can feed the Hydrogen Production Unit or routed for rail loadout.
Renewable Naphtha Storage Tank 2	EP-TK08	10,000 Barrel renewable naphtha tank; holds naphtha from the RDU; material can feed the Hydrogen Production Unit or routed for rail loadout.
Fugitive Components	EP-FUG	Fugitive emissions from piping components.
Plant Roads	EP-ROAD	Fugitive emissions from truck traffic.
Product Loadout Naphtha by Rail	EP-1202A	Fugitive emissions from Naphtha Rail Loading (emissions not captured and routed to the VCU)
Product Loadout Jet Fuel by Rail	EP-1202B	Fugitive emissions from Jet Fuel Rail Loading (emissions not captured and routed to the VCU)
Product Loadout Renewable Diesel by Rail	EP-1202C	Fugitive emissions from Renewable Diesel Rail Loading (emissions not captured and routed to the VCU)
Wastewater Treatment	NA	Fugitive emissions from wastewater treatment are exempt from construction permitting requirements in accordance with IAC 567 22.1(2)" w"
Exempt Tanks[1]	NA	Storage tanks exempt from construction permitting requirements in accordance with IAC 567 22.1(2)"t"
Exempt Pre-Treatment Vents[2]	NA	Pre-Treatment Unit vents exempt from construction permitting requirements in accordance with IAC 567 22.1(2)"w"

[1] – Exempt Tanks includes feedstock storage tanks (TK01, TK02), treated feedstock tanks (TK03 – TK06), renewable jet fuel tanks (T 09 – TK11), renewable diesel tanks (TK12 – TK17) and fossil fuel diesel tanks (TK18, TK20).
[2] – Exempt Pre-Treatment Vents includes dry additive storage silos and hoppers constrolled by fabric filters and vacuum system vents.

3.0 Regulatory Applicability Analysis

This section summarizes federal and state requirements that are applicable or potentially applicable to the Project.

3.1 New Source Review (NSR) Requirements

The Facility location is in an attainment area for all criteria pollutants. Emissions from a new or modified source in an attainment area must be reviewed for applicability under 40 CFR §52.21 "Prevention of Significant Deterioration of Air Quality" (PSD rule). NSR requirements apply to (1) a new major source that has the PTE 100 tons per year (tpy) or more for any criteria pollutant for a facility that is one of the 28 industrial source categories;[1] or (2) a new major source that has the potential to emit 250 tpy if the facility is not on the list of industrial source categories; or (3) a modified existing major source that exceeds a PSD significant emission rate[2] or (4) a modification to an existing minor source that is major in itself.

The facility is considered a chemical process plant, one of the listed industrial source categories, and therefore, is subject to the major source threshold of 100 tpy, including fugitive emissions. The 100 tpy limit applies to carbon monoxide (CO), nitrogen oxide (NOx), particulate matter (PM), particulate matter with aerodynamic diameter less than 10 microns (PM_{10}), particulate matter with aerodynamic diameter less than 2.5 microns ($PM_{2.5}$), sulfur dioxide (SO_2), and volatile organic compound (VOC).

Table 3-1 summarizes the facility's potential controlled emissions. As shown below, the facility's potential to emit is less than the major source threshold. The Project PTE calculations are uploaded to EASYAir.

Table 3-1 Facility Potential Controlled Emissions

	CO (tpy)	NOx (tpy)	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)
Non-fugitive sources	77.21	81.27	20.54	20.54	20.54	29.93	50.55
Fugitive sources	--	--	7.05	1.41	0.35	--	32.17
Exempt Sources	--	--	0.31	0.31	0.31	--	15.83
Total (including exempt sources)	**77.21**	**81.27**	**27.91**	**22.27**	**21.20**	**29.93**	**98.55**
Major Source Thresholds	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Threshold Exceeded?	**No**	**No**	**No**	**No**	**No**	**No**	**No**

[1] 40 CFR §52.21(b)(1)(i)(a)

[2] 40 CFR §52.21 (b)(23)(i)

3.2 National Ambient Air Quality Standards

The Project is located in Clinton County, Iowa. The county is in attainment of all state and National Ambient Air Quality Standards (NAAQS).

The NAAQS are identified in 40 CFR Part 50. Primary NAAQS defines levels of air quality, which EPA deems necessary to protect public health. Secondary NAAQS defines levels of air quality, which the EPA judges necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

The IDNR modeling thresholds from IDNR Form MD and the net project emission increase are listed below in Table 3-2. The net project emission increase, excluding fugitive emissions, exceeds the IDNR's modeling thresholds for NOx, PM_{10}, and $PM_{2.5}$. HRD submitted the modeling analysis and it was approved by IDNR.

Table 3-2 Net Project Emission Increase (including Main Flare Design Scenario)

Parameter	CO (lb/hr)	NO_X (lb/hr)[1]	NO_X (tpy)[2]	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	SO_2 (lb/hr)
Net Project Emission Increase	1352.50	311.08	81.27	36.78	36.78	534.75
IDNR Modeling Threshold	22.80	9.13	40	3.42	2.28	9.13
Threshold Exceeded?	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**No**

[1] – Excluding intermittent sources
[2] – All sources

3.3 40 CFR Part 60 - New Source Performance Standards (NSPS)

New Source Performance Standards (NSPS), 40 CFR Part 60, apply to any new, modified, or reconstructed stationary sources that meet or exceed specified applicability within each individual subpart. The following sections include a summary of applicable and potentially applicable NSPS to Project affected emission units.

3.3.1 Subpart Db: Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

NSPS Subpart Db applies to steam generating units with a maximum design heat input capacity of greater than 100 million British thermal units per hour (MMBtu/hr). A steam generating unit is defined as a unit that combusts any fuel and produces steam or heats water or heats any heat transfer medium and does not include process heaters. NSPS Subpart Db defines process heaters as "a device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst."

The Steam Methane Reformer (EP-0501, 184 MMBtu/hr) combusts gas to produce steam used as a reactant in the process and would be considered a process heater, and therefore, is not subject to NSPS Subpart Db.

3.3.2 Subpart Dc: Standards of Performance for Small Industrial-Commercial Institutional Steam Generating Units

NSPS Subpart Dc applies to steam generating units with a maximum design heat input capacity of greater than 10 MMBtu/hr and less than or equal to 100 MMBtu/hr. A steam generating unit is defined as a unit that combusts any fuel and produces steam or heats water or heats any heat transfer medium and does not include process heaters. NSPS Subpart Dc defines process heaters as "a device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst."

The HDO startup heater (EP-0201, 59.1 MMBtu/hr), the DWX charge heater (EP-0202, 15.1 MMBtu/hr), and the fractionator reboiler heater (EP-0203, 26.5 MMBtu/hr) are process heaters, and therefore, are not subject to NSPS Subpart Dc. The three boilers (EP-1001A, EP-1001B, EP-1001C, 80 MMBtu/hr each) are considered steam generating units subject to NSPS Subpart Dc. The boilers will comply with NSPS Subpart Dc by being limited to firing natural gas.

3.3.3 Subpart Kb: Standards of Performance for Volatile Organic Liquid Storage Vessels for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984

NSPS Subpart Kb applies to storage vessels used to store volatile organic liquids. This section summarizes the applicability of the storage tanks.

The renewable naphtha storage tanks (EP-TK07, EP-TK08), will each be subject to NSPS Kb because the tank capacities will be greater than 151 cubic meters (m^3) and the maximum true vapor pressure is greater than 3.5 kilopascals (kPa, 0.5 pounds per square inch absolute (psia)). The tank will comply with NSPS Subpart Kb through the installation of an internal floating roof.

The renewable diesel storage tanks (TK12, TK13, TK14, TK15, TK16, TK17), renewable jet fuel storage tanks (TK09, TK10, TK11), feedstock storage tanks (TK01, TK02), treated feedstock storage tanks (TK05, TK06), and fossil fuel diesel tanks (TK18 and TK20) will not be subject to NSPS Kb because the maximum true vapor pressures will not be greater than 0.5 psia.

The treated feedstock day tanks (TK03, TK04) and the slop/off-spec tank (TK19) will not be subject to NSPS Kb because "process tanks" are excluded from the definition of a storage vessel. NSPS Kb defines a process tank as "A tank that is used within a process (including a solvent or raw material recovery process) to collect material discharged from a feedstock storage vessel or equipment within the process before the material is transferred to other equipment within the process, to a product or by-product storage vessel, or to a vessel used to store recovered solvent or raw material. In many process tanks, unit operations such as reactions and blending are conducted. Other process tanks, such as surge control vessels and bottoms receivers, however, may not involve unit operations."

3.3.4 Subpart VVa: Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry (SOCMI) for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006

NSPS Subpart VVa applies to process units that produce for sale, as intermediate or final products, one or more of the chemicals listed in 40 CFR 60.489 of the standard. HRD will not produce any of the chemicals included in the list (i.e., naphtha, jet fuel, and diesel are not listed chemicals); therefore, the equipment in VOC service at the facility is not subject to NSPS Subpart VVa.

3.3.5 Subpart NNN: Standards of Performance for VOC Emissions from SOCMI Distillation Operations

NSPS Subpart NNN of 40 CFR 60 applies to distillation units in the SOCMI industry that produces any of the organic chemicals listed in 40 CFR 60.667 of the standard as a product, co-product, by-product, or intermediate. The proposed facility does not produce any of the chemicals included in the list; therefore, the facility is not subject to NSPS Subpart NNN.

3.3.6 Subpart RRR: Standards of Performance for VOC Emissions from SOCMI Reactor Processes

NSPS Subpart RRR of 40 CFR 60 applies to reactor processes in the SOCMI industry that any of the organic chemicals listed in 40 CFR 60.707 of the standard as a product, co-product, by-product, or intermediate. The proposed facility does not produce any of the chemicals included in the list; therefore, the facility is not subject to NSPS Subpart RRR.

3.3.7 NSPS Subpart IIII—Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

NSPS Subpart IIII of 40 CFR 60 applies to manufacturers, owners, and operators of stationary compression ignition (CI) internal combustion engines (ICE). The emergency diesel fire pump engine (EP-1801) manufacture date will be after April 1, 2006, and therefore, is subject to NSPS Subpart IIII. The emergency diesel fire pump engine will be certified to applicable emission standards, installed and configured according to the manufacturer's emission-related specifications and operated as an emergency engine to comply with NSPS IIII.

3.3.8 NSPS Subpart JJJJ—Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

NSPS Subpart JJJJ of 40 CFR 60 applies to manufacturers, owners, and operators of stationary spark ignition (SI) ICE. The natural gas emergency generator (EP-1003) manufacture date will be after January 1, 2009, and therefore, is subject to NSPS Subpart JJJJ. The emergency generator engine will be an engine certified to applicable emission standards, installed and configured according to the manufacturer's emission-related specifications and operated as an emergency engine to comply with NSPS JJJJ.

3.4 40 CFR Part 61 and 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants

40 CFR 61 and 40 CFR 63 define source categories that emit hazardous air pollutants (HAPs) for major and area sources of HAPs. The major source threshold is 10 tpy for single HAP or 25 tpy for combined HAP emissions. Area sources are sources with potential HAP emissions below the major source thresholds.

The Project's facility-wide potential HAP emissions are less than 10 tpy for single HAP and less than 25 tpy for total HAP. Table 3-3 summarizes the potential HAP emissions, where methanol is the highest single HAP. The Project PTE calculations are uploaded to EASYAir.

Table 3-3 Facility Potential HAP Emissions

Parameter	Methanol (tpy)	Total HAP (tpy)
Facility Potential Emissions	4.39	7.58
Facility-Wide Major Source Threshold	**10**	**25**
Exceeds Threshold?	**No**	**No**

3.4.1 NESHAP Subpart ZZZZ—National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

NESHAP Subpart ZZZZ of 40 CFR 63 applies to own or operate a stationary reciprocating internal combustion engine (RICE) at a major or area source of HAP emissions. The emergency diesel fire pump engine (EP-1801) and the natural gas emergency generator (EP-1003) are subject to NESHAP Subpart ZZZZ area source standards. The emergency diesel fire pump and the natural gas emergency generator will comply with NESHAP Subpart ZZZZ by complying with NSPS IIII and NSPS JJJ, respectively.

3.4.2 Subpart VVVVVV: NESHAP for HAPs for Chemical Manufacturing Area Sources

Applicability of NESHAP subpart VVVVVV is based on the existence of certain listed chemicals in excess of 0.1 % by weight in process streams. None of the listed chemicals are present in any process streams in excess of this concentration at the facility; therefore, NESHAP Subpart VVVVVV is not applicable.

3.4.3 Subpart JJJJJJ: NESHAP for HAPs for Industrial, Commercial, and Institutional Boilers Area Sources

NESHAP Subpart JJJJJJ includes an exemption for gas-fired boilers. All heaters at the site combust gaseous fuels; therefore, NESHAP Subpart JJJJJJ is not applicable.

3.5 Iowa Administrative Code

The following sections of the Iowa Administrative Code (IAC) are applicable to the facility as a whole or to specific equipment that is a part of this project:

- 567 IAC 22.1(1): *Permit required*. Unless exempted in subrule 22.1(2), no person shall construct, install, reconstruct, or alter any equipment, control equipment, or anaerobic lagoon without first obtaining a construction permit.

- 567 IAC 23.3(2)"*a*": *Particulate matter*. General Emission Rate. For sources constructed, modified or reconstructed on or after July 21, 1999, the emission of particulate matter from any process shall not exceed an emission standard of 0.1 grain per dry standard cubic foot (dscf) of exhaust gas, except as provided in 567—21.2(455B), 567—23.1(455B), 567—23.4(455B), and 567—Chapter 24.

- 567 IAC 23.3(2)"*b*''(3): *Particulate matter*. Combustion for indirect heating. For a new unit of less than 150 million Btu per hour heat input, the maximum allowable emissions from such new unit shall be 0.6 pounds of particulates per million Btu of heat input.

- 567 IAC 23.3(2)"*c*": *Particulate matter*. Fugitive dust. (1) Attainment and unclassified areas. A person shall take reasonable precautions to prevent particulate matter from becoming airborne in quantities sufficient to cause a nuisance as defined in Iowa Code section 657.1 when the person allows, causes or permits any materials to be handled, transported or stored or a building, its appurtenances or a construction haul road to be used, constructed, altered, repaired or demolished, with the exception of farming operations or dust generated by ordinary travel on unpaved roads. Ordinary travel includes routine traffic and road maintenance activities such as scarifying, compacting, transporting road maintenance surfacing material, and scraping of the unpaved public road surface. All persons, with the above exceptions, shall take reasonable precautions to prevent the discharge of visible emissions of fugitive dusts beyond the lot line of the property on which the emissions originate. The public highway authority shall be responsible for taking corrective action in those cases where said authority has received complaints of or has actual knowledge of dust conditions which require abatement pursuant to this subrule. Reasonable precautions may include, but not be limited to, the following procedures.

    1. Use, where practical, of water or chemicals for control of dusts in the demolition of existing buildings or structures, construction operations, the grading of roads or the clearing of land.

    2. Application of suitable materials, such as but not limited to asphalt, oil, water or chemicals on unpaved roads, material stockpiles, race tracks and other surfaces which can give rise to airborne dusts.

    3. Installation and use of containment or control equipment, to enclose or otherwise limit the emissions resulting from the handling and transfer of dusty materials, such as but not limited to grain, fertilizer or limestone.

    4. Covering, at all times when in motion, open-bodied vehicles transporting materials likely to give rise to airborne dusts.

5. Prompt removal of earth or other material from paved streets or to which earth or other material has been transported by trucking or earth-moving equipment, erosion by water or other means.

6. Reducing the speed of vehicles traveling over on-property surfaces as necessary to minimize the generation of airborne dusts.

- 567 IAC 23.3(2)" d" *Particulate matter*. Visible emissions. No person shall allow, cause or permit the emission of visible air contaminants into the atmosphere from any equipment, internal combustion engine, premise fire, open fire or stack, equal to or in excess of 40 percent opacity.

- 567 IAC 23.3(3)"*e*": *Other processes capable of emitting sulfur dioxide*. After January 1, 1974, no person shall allow, cause, or permit the emission of sulfur dioxide from any process, other than sulfuric acid manufacture, in excess of 500 parts per million, based on volume.

Attachment 1

Overall Facility Process Description

OVERALL FACILITY PROCESS DESCRIPTION

PROJECT NO. : 60-174

PROJECT NAME : 9000 BPD RENEWABLE DIESEL FACILITY

CLIENT : HOBO RENEWABLE DIESEL, LLC

SITE : CLINTON, IOWA

Rev	Description	Date	Created	Checked	Approved
C1	Issued for Information	7/30/21	RB	JS	KA
C0	Issued for Information	7/8/21	CD	JS	KA
B0	Issued for Review	6/23/21	CD	JS	KA

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DEFINITIONS

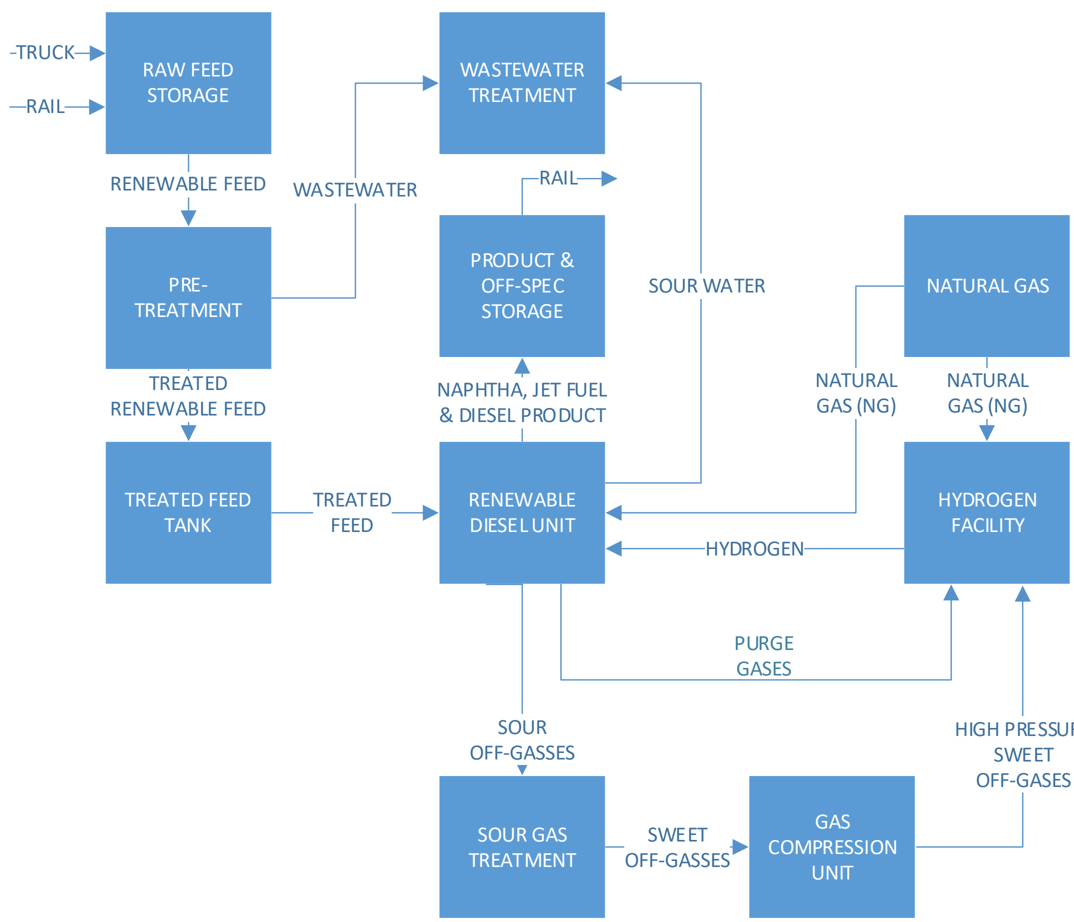
ANSI	American National Standards Institute
API	American Petroleum Institute
API RP	American Petroleum Institute Recommended Practices
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, & Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BPD	Barrels Per Day
BPSD	Barrels per Stream Day
CGI	Chemex Global, Inc.
DMDS	Dimethyl Disulfide
dP	Differential Pressure
EOR	End of Run
ESD	Emergency Shut Down
FEED	Front End Engineering Design
FCC	Facility Control Center
GCU	Gas Compression Unit
HMI	Human Machine Interface
ISBL	Inside Battery Limit
LEL	Lower Explosive Limit
MCC	Motor Control Center
MMSCFD	Million Standard Cubic Feet Per Day
NEC	National Electrical Code
NFPA	National Fire Protection Association
OSBL	Outside Battery Limits
OSHA	Occupational Safety and Health Administration
PLC	Programmable Logic Controller
RDU	Renewable Diesel Unit
SCADA	Supervisory Control and Data Acquisition
SGT	Sour Gas Treatment
SOR	Start of Run
TBD	To be determined.
TEMA	Tubular Exchanger Manufacturers Association
VSD	Variable Speed Drive
WWT	Wastewater Treatment

1. INTRODUCTION

The purpose of this document is to provide a basic process description for design of a 9,000 BPD Renewable diesel facility and all supporting units located in Clinton, Iowa. The facility consists of storage tanks, loading/unloading facilities, feed pre-treatment, renewable diesel facility, hydrogen production facility, sour gas treatment, gas compression, wastewater treatment, and all associated utilities.

The following flow diagram shows a basic block flow diagram of all major units.

HOBO FACILITY BLOCK FLOW DIAGRAM



2. FACILITY DESIGN LIFE & RUN LENGTH

2.1. OPERATING RANGES AND RELIABILITY

The operating reliability of all units will be designed for a minimum of 8,400 hours. The operating range for all units will be such that the individual units can support the Renewable Diesel Unit operating range of 50% to 100%. At this time, it is envisioned that all units will have an equal operating range of 50 to 100%. Any exceptions to this paragraph are listed here:

- Hydrogen facility operating range to be 40 – 100%

2.2. OUTAGE CYCLE

The overall facility will operate upon an outage cycle of 2 weeks every year, during which all expected maintenance and catalyst replacement will occur. Equipment maintenance cycle will be a multiple of the outage cycle with a minimum of 2 years. More frequent maintenance and catalyst change-out can occur as long as equipment has the capability to be isolated from the process safely and can be removed without impacting production.

3. PROCESS DESCRIPTION

3.1. PRE-TREATMENT UNIT

The Pre-Treatment Unit will process incoming light and heavy feeds to remove contaminants that are detrimental to either equipment or downstream catalyst in the Renewable Diesel Unit (RDU). Contaminants shall be removed to acceptable levels prior to being fed to the RDU.

Heavy feed is processed in the “heavy train” of the Pre-Treatment Unit. The pre-treatment process for heavy feeds involves drying, the addition of filter aid, and filtration. The processed heavy feed is stored in the light receipts storage tank prior to being fed to the “light train” of the Pre-Treatment Unit.

Light feed or processed heavy feed enters a degumming process that involves the addition of citric acid and caustic. This process is followed by physical separation, water washing with centrifuge separation, and final purification involving the addition of bleaching earth and filtering. After the feed has been processed in the light train it is stored in the treated feed day tanks.

Filter aid and bleaching earth for the Pre-Treatment Unit will each be received by rail and pneumatically conveyed to a storage silo. Vents on the silos will be equipped with dust filtration systems. The filter aid and bleaching earth will be pneumatically conveyed to process hoppers. From the hoppers, the material is gravity fed to the material feeders which load the material into the respective slurry tank within the pretreatment process. The filters in the pretreatment process will be purged with steam periodically to clean the filter system. The removed filter cake is dropped to a collection dumpster below the filter and disposed.

3.2. RENEWABLE DIESEL UNIT

The Renewable Diesel Unit (RDU) shall be a 9,000 BPD unit capable of producing renewable diesel and jet fuel.

Pre-treated feed from the treated feed tanks is pumped to the renewable diesel unit. In the RDU, the oil is heated in the presence of hydrogen and catalyst to hydrogenate the oils and remove oxygen and impurities. A small amount of dimethyl disulfide will be fed to the reactor because sulfur is needed for the catalyst to function properly and maintain optimum catalyst life. The hydrocarbons from the hydrotreater will contain unreacted hydrogen, varying length hydrocarbon chains, and other by-products. This process stream will flow through a series of equipment that will separate the hydrogen, hydrogen sulfide, and light end hydrocarbons from the heavier hydrocarbon stream. Separated hydrogen will be recycled back to the hydrogenation reactor.

The heavier hydrocarbons will be further processed by the dewaxing reactor in order to improve the cold flow properties of the products. The dewaxing reactor effluent will also contain a naphtha by-product. The first product separation step involves the removal of hydrogen, hydrogen sulfide, ammonia, light ends, and light naphtha from the hydrocarbon liquid. Recovered hydrogen gas is recycled back to the dewax reactor. The second step splits the heavy hydrocarbon stream into heavy naphtha, jet fuel and renewable diesel.

The light and heavy naphtha will be stabilized prior to storage in the naphtha storage tanks. Some of the naphtha will be shipped out as a product and some will be fed to the hydrogen unit to make hydrogen for the process. Jet fuel product will be stored in the jet fuel storage tanks. The RDU has the ability to produce one of two grades of renewable diesel. #2 diesel will be produced for use in the summer and #1 diesel will be produced for use in colder weather. Separate storage tanks will be available for each grade of renewable diesel product.

A continuous sour off-gas stream will be sent to the Sour Gas Treatment unit which will ultimately be compressed and used as feed in the Hydrogen Production Unit. An intermittent purge gas stream will be sent directly to the hydrogen unit and purified in the membrane unit.

3.3. SOUR GAS TREATMENT UNIT

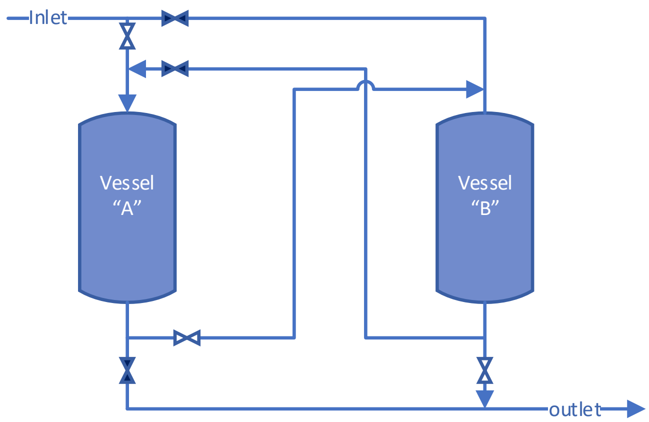
The Sour Gas Treatment Unit (SGT) removes hydrogen sulfide (H_2S) from the off-gas stream generated in the upstream Renewable Diesel Unit (RDU) so that it may be used as a feed for the downstream hydrogen facility.

Off-gas originates from the overhead of the Product Stripper Reflux Drum in the Renewable Diesel Unit. The stream exits the RDU and is sent directly to the SGT sulfur removal beds.

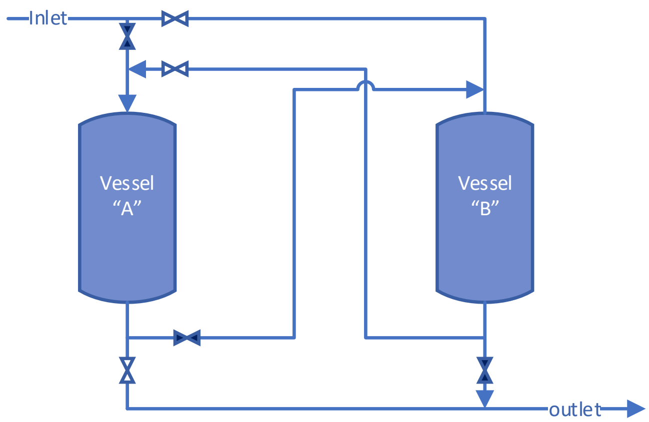
The SGT unit consists entirely of fixed-bed vessels arranged in a lead lag configuration. The solid catalyst in the beds is an iron oxide/hydroxide based product which selectively targets sulfur compounds, converting them into iron sulfide and elemental sulfur.

Upon saturation of the lead vessel, the vessel can be isolated and taken out of service for catalyst replacement while the lag bed remains in service. Each vessel is designed to have sufficient isolation for onstream servicing. Once the lead bed catalyst has been replaced, it is then placed into service as lag bed. See below for expected configurations.

Configuration 1: "A" Vessel Lead and "B" Vessel Lag



Configuration 2: "A" Vessel Lag and "B" Vessel Lead



Sweet off-gas leaves the SGT and is compressed in the Gas Compression Unit up to the hydrogen unit feed gas pressure. The sweet gas stream will have a maximum sulfur content of less than 10 ppm(v).

3.4. GAS COMPRESSION UNIT

The Gas Compression Unit (GCU) will have two 100% in-service multistage reciprocating compressors (2 x 100%). Both compressors will normally be simultaneously operating at 50% capacity. After off-gas from the RDU is sweetened in the SGT, the sweet off-gas is compressed in the GCU up to the Hydrogen Production Unit feed pressure.

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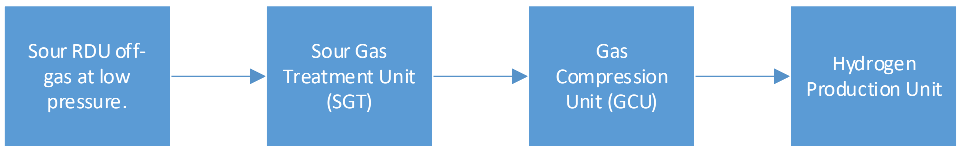
GAS COMPRESSION UNIT BLOCK FLOW (GCU)



The sweet off-gas stream will be discharged at 555 psig, matching the required feed pressure for the Hydrogen Production Unit. Refer to section 3.5 for more information on the Hydrogen Production Unit.

Inter-stage temperatures are maintained at least 20 degrees F above the hydrocarbon or water dew point, whichever is greater, to prevent condensation.

The compressor packages will include suction scrubbers at the inlet to each compression stage; these are meant to capture any liquid droplets that may be present in the gas stream. Accumulated liquid in these vessels will be drained automatically to the closed drain system. Normal operation will maintain operating temperatures above the dew point of the stream.

3.5. HYDROGEN PRODUCTION UNIT

The Hydrogen Production Unit supplies pure hydrogen for the hydrotreater in the RDU. The Hydrogen Production Unit is designed to accept RDU hydrocarbon rich streams as feed and will generate 28 MMSCFD of pure hydrogen.

The hydrogen plant will use natural gas in addition to naphtha product and sweetened off-gas from the RDU as feedstocks to react with steam to form hydrogen gas and carbon dioxide. The hydrogen plant will have a natural gas burner equipped with selective catalytic reduction (SCR) for NOx control. The hydrogen from the reformer will be processed in a pressure swing adsorption system (PSA) to purify the hydrogen prior to sending to the RDU. The PSA off-gas will be sent to the reformer burner as the primary source of fuel. Natural gas will supplement the PSA off-gas as fuel for the reformer.

An intermittent purge gas stream from the RDU is treated in the Hydrogen Production Unit. The purge gas is treated in a membrane unit to recover hydrogen (permeate gas). This permeate gas is processed in the PSA along with the reformer product prior to export back the to RDU. The non-permeate gas from the membrane unit is mixed with the hydrocarbon rich feed streams at the unit battery limit.

Demineralized water is required for steam generation within the unit. Refer to section 4.8.2 for additional information.

3.6. WASTEWATER TREATMENT

The combined wastewater from the Pretreatment Unit and sour water from the Renewable Diesel Unit contain a high amount of contaminants which prevent direct discharge to the local municipal sewer system.

A wastewater unit consisting of pretreatment, primary treatment, and sludge dewatering system that treats the wastewater produced in the facility such that it is acceptable for offtake by the city.

Wastewater enters the dissolved air floatation system from the equalization tank. Air is forced into the wastewater under pressure. As the air comes out of solution, it forms microscopic bubbles that attach to the flocculated solids, causing them to float. The buoyant solids rise to the surface and accumulate in a floating surface layer. This floating layer is removed from the unit with a skimmer. The skimmed layer is collected in a sludge hopper and transferred back to the aeration tank to maintain the target suspended solids concentration.

Final effluent will flow, by gravity, out of the dissolved air floatation system and to the municipal sewage system of the City of Clinton, Iowa.

3.7. RAIL AND TRUCK LOADING/UNLOADING

On-site shipping and receiving of feedstock, product, and chemicals will be conducted by truck or rail.

Truck unloading is designed to offload 100% of feedstocks for the facility. Twelve (12) truck unloading spots are designated for feedstocks.

Rail unloading is designed to offload 15% of feedstocks for the facility. Four (4) rail unloading spots are designated for feedstocks. In addition, rail will be used for offloading bleaching earth and filter aid solids required for the Pretreatment Unit. These solids will be unloaded directly into their respective storage silos.

Rail loading is designed to load 100% of renewable diesel products, jet fuel products, and naphtha products. Ten (10) rail spots are designated for renewable diesel product loading. Six (6) rail spots are designated for jet fuel product loading. Three (3) of these jet fuel spots are also capable of loading naphtha. Rail spots for jet fuel or naphtha loading will have vapor recovery systems routed to flare.

3.8. TANKAGE

The facility shall include tankage for storage of feedstocks, diesel products, jet fuel products, and naphtha products. In addition, working tankage shall be included for blending and for slop/off spec product.

Two (2) raw feed tanks are designed for 60,000 bbl of storage each. These tanks receive feedstock unloaded from truck or rail. One tank is designated for "heavy receipts" and the other is designated for "light receipts". Light receipts require less pretreatment and will be kept separate from heavy receipts requiring more pretreatment. Heavy receipts processed in the heavy train of the Pre-treatment Unit are stored in the light receipts tank prior to final pre-treatment in the light train of the PTU.

Two (2) treated feed day tanks are designed for 10,000 bbl of storage each. These tanks hold treated feed from the Pre-treatment Unit and are used to test each day's production prior to transfer to the treated feed storage tanks.

Two (2) treated feed storage tanks are designed for 60,000 bbl of storage each. Both tanks receive treated feed from the treated feed day tanks after verification has been made that contaminant levels have been adequately reduced. The treated feed storage tanks feed forward to supply the Renewable Diesel Unit with feedstock.

Two (2) renewable naphtha tanks are designed for 10,000 bbl of storage each. These tanks hold naphtha produced in the RDU. The tanks will normally feed the Hydrogen Unit but will also be capable of sending naphtha to rail loading.

Three (3) jet fuel tanks are designed for 25,000 bbl of storage each. These tanks hold jet fuel produced in the RDU. Stored jet fuel will be exported from the facility by rail.

Three (3) arctic grade diesel (#1 diesel) tanks are designed for 40,000 bbl of storage each. These tanks hold diesel produced in the RDU. Two grades of diesel may be produced in the facility. Only arctic grade diesel will be held in these tanks. Stored arctic grade diesel will be exported from the facility by rail.

Three (3) summer grade diesel (#2 diesel) tanks are designed for 40,000 bbl of storage each. These tanks hold diesel produced in the RDU. Two grades of diesel may be produced in the facility. Only summer grade diesel will be held in these tanks. Stored summer grade diesel will be exported from the facility by rail.

One (1) blending tank is designed for 470 bbl of storage. This tank holds fossil fuel diesel which is blended into both grades of renewable diesel at very low rates.

One (1) slop/off-spec tank is designed for 25,000 bbl of storage. Any slop material or products which do not meet product quality are sent to this tank. Material stored in this tank will be pumped back to the beginning of the process for reprocessing.

4. UTILITIES

4.1. NATURAL GAS

Natural gas will be provided by substation to be built by a selected natural gas supplier at a location specified by EPC and approved by HOBO. Supplier shall provide a letdown station inside of the metering station to reduce the supply pressure down to the normal natural gas pressure.

4.2. INSTRUMENT AIR

Instrument air package to be designed with two (2) by 120% air compressors.

Dew point: < -40°F.
Instrument air will be clean and oil free.

4.3. PLANT AIR

The source of the plant (utility) air will be the instrument air system.

4.4. RAW WATER

Raw water will be supplied from fresh city water via a metering station provided by a selected water supplier at 50 psig.

4.5. COOLING WATER

Cooling water will be provided by an open circuit cooling tower system. Blowdown from the cooling water system will be sent to the municipal sewage system of the City of Clinton, Iowa.

4.6. FIREWATER

Firewater is available via a metering station provided by a selected water supplier at 50 psig. A pump skid will be supplied and include a main electric pump, jockey pump and diesel operated back-up firewater pump. In addition, a firewater tank shall be included as part of the firewater system to ensure adequate water supply.

4.7. DEMINERALIZED WATER

Demineralized water to be colorless, clear, and free from non-dissolved matter.

A reverse osmosis system shall provide demineralized water to the facility. Demineralized water shall be used in the Hydrogen Production Unit, and in the utility steam system.

4.8. STEAM

4.8.1. Auxiliary Boiler System

Steam to be saturated, dry, and free from solids.

Typical steam requirements for the facility result in normal operating steam usage that is about 25 to 50% of the required steam for startup. Three natural gas fired boilers will be provided and shall be sized to provide a combined capacity sufficient for startup of the facility.

Demineralized water from the reverse osmosis system is sent to the auxiliary boiler deaerator. The deaerator effluent is fed as boiler feed water to the boilers.

4.8.2. Hydrogen Production Unit Steam

Demineralized water from the reverse osmosis system is sent to the Hydrogen Production Unit which is used to make steam.

4.9. START-UP HYDROGEN

Import hydrogen is required for start-up of feed purification section and for start-up and shut-down requirements of reforming section Hydrogen Production Unit.

Pressurized hydrogen storage is included on site.