

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**Batch Information**

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Operator: \_\_\_\_\_

Oil Source / Description: \_\_\_\_\_

Other Comments / Observations:

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #1 - PREPARATION**

STEP 1.1 - Confirm Starting Conditions

- ACTION 1.1.1 - Confirm tanks are empty, clean and dry. ....  \_\_\_\_
- ACTION 1.1.2 - Ensure working area is free of ignition sources. ....  \_\_\_\_
- ACTION 1.1.3 - Ensure spill containment systems are empty and  
in working order. ....  \_\_\_\_
- ACTION 1.1.4 - Confirm system vent termination outdoors is clear. ....  \_\_\_\_
- ACTION 1.1.5 - Confirm System Safe Condition:
  - 1. **Combustibility Sensors** are **ON** .....  \_\_\_\_
  - 2. **PMP-100** (Main Pump) is **OFF** .....  \_\_\_\_
  - 3. **HV-005** (Oil Tank Valve Bottom) is **OPEN** .....  \_\_\_\_
  - 4. **HV-010** (BD Tank Oil Inlet) is **CLOSED** .....  \_\_\_\_
  - 5. **HV-400** (Vacuum Reference Valve) is **CLOSED** .....  \_\_\_\_
  - 6. **HV-900** (System Drain) is **CLOSED** .....  \_\_\_\_
  - 7. **HV-975** (BD Take-off) is **CLOSED** .....  \_\_\_\_
  - 8. **HV-950** (Glycerin Take-off) is **CLOSED** .....  \_\_\_\_
  - 9. **HV-120** ( \_\_\_\_\_ ) is **CLOSED** .....  \_\_\_\_
  - 10. **HV-300** (Settling Tank Inlet) is **CLOSED** .....  \_\_\_\_
  - 11. **HV-200** (Oxide Tank Fill Inlet Valve) is **CLOSED** .....  \_\_\_\_
  - 12. **HV-105** (BD Tank Mix Inlet Valve) is **CLOSED** .....  \_\_\_\_
  - 13. **HV-100** (BD Tank Fill Inlet Valve) is **CLOSED** .....  \_\_\_\_
  - 14. **HV-150** (Ox/Settling Pump Inlet) is **CLOSED** .....  \_\_\_\_
  - 15. **HV-500** (Condenser Drain) is **CLOSED** .....  \_\_\_\_
  - 16. **HV-290** (Oxide Tank Bottom) is **CLOSED** .....  \_\_\_\_
  - 17. **HV-295** (Oxide Tank Skim) is **CLOSED** .....  \_\_\_\_
  - 18. **HV-380** (Settling Pump Inlet) is **CLOSED** .....  \_\_\_\_
  - 19. **HV-390** (Settling Tank Bottom) is **CLOSED** .....  \_\_\_\_
  - 20. **HV-800** (Alcohol Inlet) is **CLOSED** .....  \_\_\_\_
  - 21. **HV-610** (BD Tank Vent Valve) is **OPEN** .....  \_\_\_\_
  - 22. **HV-620** (Oxide Mix Tank Vent Valve) is **OPEN** .....  \_\_\_\_
  - 23. **HV-630** (Settling Tank Vent Valve) is **OPEN** .....  \_\_\_\_

-- S.O.P. #1 - Continued on Next Page --

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #1 - PREPARATION** (Continued)

ACTION 1.1.5 - - Confirm System Safe Condition (continued):

- 24. **HV-170** (BD Tank LI Valve Bottom) is **OPEN**..... \_\_\_\_\_
- 25. **HV-175** (BD Tank LI Valve Top) is **OPEN**..... \_\_\_\_\_
- 26. **HV-270** (Oxide Tank LI Valve Bottom) is **OPEN**..... \_\_\_\_\_
- 27. **HV-370** (Settling Tank LI Valve Bottom) is **OPEN** ..... \_\_\_\_\_

**-- END OF S.O.P. #1 --**

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #2 - FILL TNK-100 (BIODIESEL REACTION TANK)**

STEP 2.1 - Set Valves for TNK-100 Fill

1. **CLOSE HV-160** (BD Pump Inlet) .....  \_\_\_\_
2. **OPEN HV-170** (BD Tank LI Valve Bottom) .....  \_\_\_\_
3. **OPEN HV-175** (BD Tank LI Valve Top) .....  \_\_\_\_
4. **CLOSE HV-610** (BD Tank Vent Valve) .....  \_\_\_\_
5. **CLOSE HV-500** (Condenser Drain) .....  \_\_\_\_
6. **CLOSE HV-100** (BD Tank Fill Inlet Valve) .....  \_\_\_\_
7. **CLOSE HV-105** (BD Tank Mix Inlet Valve) .....  \_\_\_\_
8. Confirm **Top Hatch** on TNK-100 is **CLOSED** .....  \_\_\_\_

STEP 2.2 - Fill TNK-100 with Oil using Vacuum

1. Turn **Vacuum Pump ON** .....  \_\_\_\_
2. **OPEN HV-400** (Vacuum Reference Valve) .....  \_\_\_\_
3. **Confirm Vacuum** using PI-100 .....  \_\_\_\_
4. **OPEN HV-010** (BD Tank Oil Inlet) .....  \_\_\_\_
5. **OPEN HV-005** (Oil Tank Valve Bottom) .....  \_\_\_\_
6. **Monitor LI-100** to observe the increasing level .....  \_\_\_\_
7. **Fill TNK-100** with oil to desired level .....  \_\_\_\_
8. **CLOSE HV-010** when oil is at desired level .....  \_\_\_\_
9. **Record oil level** indicated b LI-100: \_\_\_\_\_ **①**

Only do the following two steps if you plan to raise the oil temp using the PMP-100 for circulation.

10. **CLOSE HV-400** (Vacuum Reference Valve) .....  \_\_\_\_
11. **OPEN HV-610** (BD Tank Vent Valve) .....  \_\_\_\_

-- END OF S.O.P. #2 --

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #3 - RAISE OIL TEMP (IN TNK-100)**

STEP 3.1 - Ensure oil level in tank (LI-100) .....  \_\_\_\_\_

STEP 3.2 - Start circulation of water in HEX-100 .....  \_\_\_\_\_

STEP 3.3 - Start circulation of oil using PMP-100

ACTION 3.3.1 - Set Valves to Direct Flow Correctly

1. Confirm **HV-900** is **CLOSED** .....  \_\_\_\_\_
2. Confirm **HV-950** is **CLOSED** .....  \_\_\_\_\_
3. Confirm **HV-975** is **CLOSED** .....  \_\_\_\_\_
4. Confirm **HV-150** is **CLOSED** .....  \_\_\_\_\_
5. Confirm **HV-300** is **CLOSED** .....  \_\_\_\_\_
6. Confirm **HV-200** is **CLOSED** .....  \_\_\_\_\_
7. Confirm **HV-100** is **CLOSED** .....  \_\_\_\_\_
8. **OPEN HV-105** .....  \_\_\_\_\_
9. **OPEN HV-120** .....  \_\_\_\_\_
10. **OPEN HV-190** .....  \_\_\_\_\_
11. **OPEN HV-160** .....  \_\_\_\_\_
12. Check for leaks from TNK-100 to PMP-100 .....  \_\_\_\_\_

ACTION 3.3.2 - Start Circulation of oil

1. Turn **PMP-100 ON** .....  \_\_\_\_\_
2. Set **PMP-100 SPEED** to \_\_\_\_\_ .....  \_\_\_\_\_
3. Confirm **PMP-100 pressure** on **PI-120** .....  \_\_\_\_\_
4. Confirm circulation with **MI-100** .....  \_\_\_\_\_
5. Check for leaks in system .....  \_\_\_\_\_
6. Check that LI-200 and LI-300 are stable to ensure the fluid is only being directed to TNK-100 .....  \_\_\_\_\_

STEP 3.4 - Establish temperature set point of oil (TI-100) .....  \_\_\_\_\_

ACTION 3.4.1 - **Record oil temperature** set point: \_\_\_\_\_ ②

STEP 3.5 - Stop circulation of oil using PMP-100

ACTION 3.5.1 - Turn **PMP-100 OFF** .....  \_\_\_\_\_

ACTION 3.5.2 - **CLOSE HV-160** .....  \_\_\_\_\_

ACTION 3.5.3 - **CLOSE HV-120** .....  \_\_\_\_\_

ACTION 3.5.4 - **CLOSE HV-105** .....  \_\_\_\_\_

**-- END OF S.O.P. #3 --**

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #4 - FILL TNK-200 (OXIDE MIX TANK)**

STEP 4.1 - Set TNK-100 for Vacuum

ACTION 4.1.1 - Confirm **Combustibility Sensors** are **ON** .....  \_\_\_\_\_

ACTION 4.1.2 - Prepare Alcohol

1. Relocate Alcohol tank from storage to front of system .....  \_\_\_\_\_
2. Connect grounding strap between Alcohol tank and main system ground connection.....  \_\_\_\_\_
3. Connect Alcohol feed line to HV-800 connection using quick coupling.....  \_\_\_\_\_

ACTION 4.1.3 - Set valves for development of vacuum on TNK-100

1. Confirm **HV-010** is **CLOSED** .....  \_\_\_\_\_
2. Confirm **HV-160** is **CLOSED** .....  \_\_\_\_\_
3. Confirm **HV-100** is **CLOSED** .....  \_\_\_\_\_
4. Confirm **HV-105** is **CLOSED** .....  \_\_\_\_\_
5. Confirm **HV-500** is **CLOSED** .....  \_\_\_\_\_
6. **CLOSE HV-610** .....  \_\_\_\_\_
7. Turn **Vacuum Pump ON**.....  \_\_\_\_\_
8. **OPEN HV-400**.....  \_\_\_\_\_
9. **Confirm Vacuum** using PI-100.....  \_\_\_\_\_

STEP 4.2 - Setup TNK-200 for Fill

ACTION 4.2.1 - Ensure **top hatch is closed** on TNK-200.....  \_\_\_\_\_

ACTION 4.2.2 - Set valves for vacuum fill of TNK-200

1. Confirm **HV-380** is **CLOSED** .....  \_\_\_\_\_
2. Confirm **HV-150** is **CLOSED** .....  \_\_\_\_\_
3. Confirm **HV-200** is **CLOSED** .....  \_\_\_\_\_
4. **OPEN HV-295<sup>a</sup>** .....  \_\_\_\_\_
5. **OPEN HV-290**.....  \_\_\_\_\_
6. **OPEN HV-270**.....  \_\_\_\_\_
7. **CLOSE HV-620** .....  \_\_\_\_\_

**-- S.O.P. #4 - Continued on Next Page --**

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<sup>a</sup> NOTE: The level lines on LI-200 were calibrated with HV-295 open and account for the volume of plumbing associated with it. This is the reason this valve needs to be open during this step; for accurate metering of alcohol fill.

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #4 - FILL TNK-200 (OXIDE MIX TANK) (Continued)**

STEP 4.3 - Fill TNK-200 with Alcohol

ACTION 4.3.1 - Start filling TNK-200 with Alcohol

1. **OPEN HV-500** .....  \_\_\_\_\_
2. **OPEN HV-800** .....  \_\_\_\_\_
3. **Monitor LI-200** to observe the increasing level.....  \_\_\_\_\_
4. **Fill TNK-200** with alcohol to desired level.....  \_\_\_\_\_
5. **CLOSE HV-800** when alcohol is at desired level.....  \_\_\_\_\_
6. **Record oil level** indicated by LI-200: \_\_\_\_\_ ③
7. Check for leaks in system.....  \_\_\_\_\_

ACTION 4.3.2 - Stop Vacuum Fill of TNK-200

1. Turn **Vacuum Pump OFF** .....  \_\_\_\_\_
2. **OPEN HV-620** .....  \_\_\_\_\_
3. **OPEN HV-610** .....  \_\_\_\_\_
4. **CLOSE HV-500**.....  \_\_\_\_\_
5. **CLOSE HV-400**.....  \_\_\_\_\_
6. **CLOSE HV-270**.....  \_\_\_\_\_
7. Check for leaks in system.....  \_\_\_\_\_

STEP 4.4 - Load Catalyst in TNK-200

ACTION 4.4.1 - Obtain measured quantity of catalyst from storage ....  \_\_\_\_\_

ACTION 4.4.2 - Record catalyst quantity: \_\_\_\_\_ ④

ACTION 4.4.3 - Load Catalyst

1. **OPEN Top Hatch** on **TNK-200** .....  \_\_\_\_\_
2. **Pour Catalyst** into **TNK-200**.....  \_\_\_\_\_
3. **CLOSE Top Hatch** on **TNK-200**.....  \_\_\_\_\_

-- END OF S.O.P. #4 --

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #5 - MIX OXIDE in TNK-200 (OXIDE MIX TANK)**

STEP 5.1 - Set Valves for Oxide Mixing

1. Confirm **HV-290** is **CLOSED** .....  \_\_\_\_
2. Confirm **HV-380** is **CLOSED** .....  \_\_\_\_
3. Confirm **HV-300** is **CLOSED** .....  \_\_\_\_
4. Confirm **HV-975** is **CLOSED** .....  \_\_\_\_
5. Confirm **HV-950** is **CLOSED** .....  \_\_\_\_
6. **OPEN HV-295** .....  \_\_\_\_
7. **OPEN HV-150** .....  \_\_\_\_
8. **OPEN HV-120** .....  \_\_\_\_
9. **OPEN HV-200** .....  \_\_\_\_
10. Check for leaks in system.....  \_\_\_\_

STEP 5.2 - Mix Oxide – Phase One (from Skim Port of TNK-200)

1. Turn **PMP-100 ON** .....  \_\_\_\_
2. Set **PMP-100 SPEED** to **50 Hz (water)**.....  \_\_\_\_
3. Confirm **PMP-100 pressure** on **PI-120** (60 psig water) ..  \_\_\_\_
4. Confirm circulation and mixing with **MI-100**.....  \_\_\_\_
5. Check for leaks in system.....  \_\_\_\_
6. Circulate to mix Oxide for \_\_\_\_\_ minutes.....  \_\_\_\_

STEP 5.3 - Mix Oxide – Phase Two (from Bottom of TNK-200)

1. **OPEN HV-290** .....  \_\_\_\_
2. **CLOSE HV-295**.....  \_\_\_\_
3. Confirm **PMP-100 pressure** on **PI-120** (60 psig water) ..  \_\_\_\_
4. Confirm circulation and mixing with **MI-100**.....  \_\_\_\_
5. Check for leaks in system.....  \_\_\_\_
6. Circulate to mix Oxide for \_\_\_\_\_ minutes.....  \_\_\_\_

STEP 5.4 - Stop Oxide Mixing

1. Turn **PMP-100 OFF** .....  \_\_\_\_

-- END OF S.O.P. #5 --



State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #6 - TRANSFER OXIDE FROM TNK-200 to TNK-100**

STEP 6.1 - Set Valves for Oxide Transfer to TNK-100

1. Confirm **HV-610** is **OPEN** .....  \_\_\_\_\_
2. Confirm **HV-620** is **OPEN** .....  \_\_\_\_\_
3. Confirm **HV-380** is **CLOSED** .....  \_\_\_\_\_
4. Confirm **HV-120** is **OPEN** .....  \_\_\_\_\_
5. Confirm **HV-100** is **CLOSED** .....  \_\_\_\_\_
6. Confirm **HV-150** is **OPEN** .....  \_\_\_\_\_
7. Confirm **HV-290** is **OPEN** .....  \_\_\_\_\_
8. Confirm **HV-295** is **CLOSED** .....  \_\_\_\_\_
9. Confirm **HV-190** is **OPEN** .....  \_\_\_\_\_
10. **OPEN HV-105** .....  \_\_\_\_\_
11. **CLOSE HV-200**.....  \_\_\_\_\_
12. **OPEN HV-170** .....  \_\_\_\_\_
13. **OPEN HV-175** .....  \_\_\_\_\_
14. Turn **PMP-100 ON** .....  \_\_\_\_\_
15. Set **PMP-100 SPEED** to \_\_\_\_\_ .....  \_\_\_\_\_
16. Confirm **PMP-100 pressure** on **PI-120** .....  \_\_\_\_\_
17. Check system for leaks .....  \_\_\_\_\_
18. **Monitor** transfer of Oxide to TNK-100 using **LI-100 (increasing level)** and **LI-200 (decreasing level)**.  
Transfer typically takes \_\_\_\_\_ minutes.....  \_\_\_\_\_
19. **CLOSE HV-150**.....  \_\_\_\_\_
20. **OPEN HV-160** .....  \_\_\_\_\_

NOTE: When Oxide transfer step is complete, be prepared to do the following two steps (in S.O.P. #7 - MIX BD...) quickly as possible

-- END OF S.O.P. #6 --

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #7 - MIX BD and START REACTION**

NOTE: When Oxide transfer step is complete, be prepared to do the following two steps as quickly as possible

1. Confirm **HV-150** is **CLOSE**.....  \_\_\_\_
2. Confirm **HV-160** is **OPEN** .....  \_\_\_\_
3. Set **PMP-100 SPEED** to **47 Hz** (water) .....  \_\_\_\_
4. Confirm **PMP-100 pressure** on **PI-120** .....  \_\_\_\_
5. Check system for leaks .....  \_\_\_\_
6. **Monitor** mixing of biodiesel reactants using **MI-100** .....  \_\_\_\_
7. **Continue mixing** for \_\_\_\_ minutes (typically) .....  \_\_\_\_
8. Turn **PMP-100 OFF** .....  \_\_\_\_
9. **CLOSE HV-105**.....  \_\_\_\_
10. **CLOSE HV-120**.....  \_\_\_\_

-- END OF S.O.P. #7 --

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #8 - TRANSFER FUEL TO TNK-300 (SETTLING TANK)**

STEP 8.1 - Set valves for transfer

1. Confirm **HV-390** is **CLOSED** .....  \_\_\_\_
2. Confirm **HV-610** is **OPEN** .....  \_\_\_\_
3. Confirm **HV-630** is **OPEN** .....  \_\_\_\_
4. **OPEN HV-300** .....  \_\_\_\_
5. Note level in **TNK300** using **LI-300** .....  \_\_\_\_

STEP 8.2 - Start transfer of fuel from TNK-100 to TNK-300

1. Turn **PMP-100 ON** .....  \_\_\_\_
2. Set **PMP-100 SPEED** to **30 Hz** (water) .....  \_\_\_\_
3. Confirm **PMP-100 pressure** on **PI-120** .....  \_\_\_\_
4. Check system for leaks .....  \_\_\_\_
5. **Monitor** transfer of Fuel to TNK-300 using **LI-100 (decreasing level)** and **LI-300 (increasing level)** .  
Transfer typically takes \_\_\_\_\_ minutes.....  \_\_\_\_

STEP 8.3 - Stop transfer of fuel

1. When transfer is complete, turn **PMP-100 OFF**.....  \_\_\_\_

STEP 8.4 - Drain pump

1. Drain **PMP-100** using **HV-900** .....  \_\_\_\_
2. Check system for leaks .....  \_\_\_\_

**-- END OF S.O.P. #8 --**

State Line Biofuels  
**Standard Operating Procedures (SOP's)**

**S.O.P. #9 - SAFE THE SYSTEM (SHUTDOWN)**

ACTION 9.1.1 - Confirm System Safe Condition:

1. **Combustibility Sensors** are **ON** .....  \_\_\_\_
2. **PMP-100** (Main Pump) is **OFF** .....  \_\_\_\_
3. **HV-005** (Oil Tank Valve Bottom) is **CLOSED** .....  \_\_\_\_
4. **HV-010** (BD Tank Oil Inlet) is **CLOSED** .....  \_\_\_\_
5. **HV-400** (Vacuum Reference Valve) is **CLOSED**.....  \_\_\_\_
6. **HV-190** (BD Tank Bottom) is **CLOSED** .....  \_\_\_\_
7. **HV-160** (BD Pump Inlet) is **CLOSED** .....  \_\_\_\_
8. **HV-900** (System Drain) is **CLOSED** .....  \_\_\_\_
9. **HV-975** (BD Take-off) is **CLOSED** .....  \_\_\_\_
10. **HV-950** (Glycerin Take-off) is **CLOSED** .....  \_\_\_\_
11. **HV-120** ( \_\_\_\_\_ ) is **CLOSED** .....  \_\_\_\_
12. **HV-300** (Settling Tank Inlet) is **CLOSED** .....  \_\_\_\_
13. **HV-200** (Oxide Tank Fill Inlet Valve) is **CLOSED** .....  \_\_\_\_
14. **HV-105** (BD Tank Mix Inlet Valve) is **CLOSED** .....  \_\_\_\_
15. **HV-100** (BD Tank Fill Inlet Valve) is **CLOSED** .....  \_\_\_\_
16. **HV-150** (Ox/Settling Pump Inlet) is **CLOSED** .....  \_\_\_\_
17. **HV-500** (Condenser Drain) is **CLOSED** .....  \_\_\_\_
18. **HV-290** (Oxide Tank Bottom) is **CLOSED** .....  \_\_\_\_
19. **HV-295** (Oxide Tank Skim) is **CLOSED** .....  \_\_\_\_
20. **HV-380** (Settling Pump Inlet) is **CLOSED** .....  \_\_\_\_
21. **HV-390** (Settling Tank Bottom) is **CLOSED**.....  \_\_\_\_
22. **HV-800** (Alcohol Inlet) is **CLOSED**.....  \_\_\_\_
23. **HV-610** (BD Tank Vent Valve) is **OPEN** .....  \_\_\_\_
24. **HV-620** (Oxide Mix Tank Vent Valve) is **OPEN** .....  \_\_\_\_
25. **HV-630** (Settling Tank Vent Valve) is **OPEN** .....  \_\_\_\_
26. **HV-170** (BD Tank LI Valve Bottom) is **OPEN** .....  \_\_\_\_
27. **HV-175** (BD Tank LI Valve Top) is **OPEN** .....  \_\_\_\_
28. **HV-270** (Oxide Tank LI Valve Bottom) is **OPEN** .....  \_\_\_\_
29. **HV-370** (Settling Tank LI Valve Bottom) is **OPEN** .....  \_\_\_\_

-- END OF S.O.P. #9 --