- Appendix 3a to Exhibit G: Allocation Procedure –
  User-Non-User
This Appendix 3a to Exhibit G, Allocation Procedure, is an exemplification of the complete set of equations constituting the Allocation Schedule. For the purpose of this Appendix 3a Crude Petroleum is delivered to the Pipeline by “Entrant A” designated as a Non-User and “Entrant B” designated as a User. However, an identical set of equations applies if a 3rd Entrant is introduced.

In the following, this set of equations illustrates the calculations to be made pursuant to steps 1-8 of the Allocation Schedule.
STEP 1 - CONVERSION OF WET VOLUMES TO WET MASSES FOR THE DAY

Flow measurements for use in the Allocation Schedule shall be in wet mass (tonnes). If only volume measurements are available, wet volume shall be converted to wet mass.

For each Day in the Allocation Period, the mass of each relevant stream shall be determined as the product of i) the measured wet volume of each stream and ii) the measured wet Density of the stream.

Finished Product Eqn. 1-2

\[ \text{Crude Oil} = CO = M_{Fred,CO,wet} = V_{Fred,CO,wet} \cdot D_{Fred,CO,wet} = 23.957,4 \times 824,3 = 19.748,112 \text{ kg/d} \]

Water

**Dewater_water Eqn. 1-3**

\[ M_{Fred,dewater \text{ water}_,wet} = V_{Fred,dewater \text{ water}_,wet} \cdot D_{Fred,dewater \text{ water}_,wet} = 0 \times 985,2 = 0 \text{ kg/d} \]

**Degasser_water Eqn. 1-4**

\[ M_{Fred,degasser \text{ water}_,wet} = V_{Fred,degasser \text{ water}_,wet} \cdot D_{Fred,degasser \text{ water}_,wet} = 93,6 \times 985,2 = 92.215 \text{ kg/d} \]

Fuel Gas Eqn. 1-5

\[ HP \text{ fuel} = M_{Fred,HP fuel,wet} = V_{Fred,HP fuel,wet} \cdot D_{Fred,HP fuel,wet} = 729,9 \times 39,1 = 28.512 \text{ kg/d} \]

\[ LP \text{ fuel} = M_{Fred,LP fuel,wet} = V_{Fred,LP fuel,wet} \cdot D_{Fred,LP fuel,wet} = 3.873,1 \times 10,2 = 39.384 \text{ kg/d} \]

\[ \text{Flare Pilot} = M_{Fred,Flare \text{ pilot}_,wet} = V_{Fred,Flare \text{ pilot}_,wet} \cdot D_{Fred,LP fuel,wet} = 0,0 \times 10,2 = 0 \text{ kg/d} \]

(Assumed to have the same Density as LP Fuel Gas)

\[ \text{Flare op purge} = M_{Fred,Flare \text{ op purse}_,wet} = V_{Fred,Flare \text{ op purse}_,wet} \cdot D_{Fred,LP fuel,wet} = 0,0 \times 10,2 = 0 \text{ kg/d} \]

(Assumed to have the same Density as LP Fuel Gas)

\[ Export = M_{Fred,Export,wet} = V_{Fred,Export,wet} \cdot D_{Fred,LP fuel,wet} = 0,0 \times 10,2 = 0 \text{ kg/d} \]

(Assumed to have the same Density as LP Fuel Gas)

\[ Import = M_{Fred,Import,wet} = V_{Fred,Import,wet} \cdot D_{Fred,Import,wet} = 0,0 \times 0,7 = 0 \text{ kg/d} \]
STEP 2 - CONVERSION OF WET MASSES TO DRY MASSES FOR THE DAY

For each Day in the Allocation Period, the total dry mass of Crude Petroleum and Finished Products shall be determined as the sum of i) the total wet mass of the relevant stream, less ii) the measured mass of water in such stream.

Crude Petroleum streams at Gorm E Eqn. 2-1

\[ Entrant \ A = A = M_{A, \text{crude pet,h}2O} = M_{A, \text{crude pet,wet}} \times \frac{BSW_{A, \text{crude pet}}}{100} = 15.893.856 \times \frac{0.6}{100} = 101.304 \text{ kg/d} \]

\[ Entrant \ B = B = M_{B, \text{crude pet,h}2O} = M_{B, \text{crude pet,wet}} \times \frac{BSW_{B, \text{crude pet}}}{100} = 4.268.538 \times \frac{0.01}{100} = 598 \text{ kg/d} \]

Dry mass Eqn. 2-2

\[ M_{A, \text{crude pet,dry}} = M_{A, \text{crude pet,wet}} - M_{A, \text{crude pet,h}2O} = 15.893.856 - 101.304 = 15.792.552 \text{ kg/d} \]

\[ M_{B, \text{crude pet,dry}} = M_{B, \text{crude pet,wet}} - M_{B, \text{crude pet,h}2O} = 4.268.538 - 598 = 4.267.941 \text{ kg/d} \]

Finished product Eqn. 2-3

\[ \text{Propane} = M_{\text{Fred,Propane,h}2O} = M_{\text{Fred,Propane,wet}} \times \frac{BSW_{\text{Fred,Propane}}}{100} = 100.680 \times \frac{0}{100} = 0 \text{ kg/d} \]

\[ \text{Butane} = M_{\text{Fred,Butane,h}2O} = M_{\text{Fred,Butane,wet}} \times \frac{BSW_{\text{Fred,Butane}}}{100} = 154.320 \times \frac{0}{100} = 0 \text{ kg/d} \]

\[ CO = M_{\text{Fred,CO,h}2O} = M_{\text{Fred,CO,wet}} \times \frac{BSW_{\text{Fred,CO}}}{100} = 19.748.112 \times \frac{0.051}{100} = 10.072 \text{ kg/d} \]

\( (M_{\text{Fred,CO,wet}} \text{ from Eqn 1-2) } \)

Dry mass Eqn. 2-4

\[ \text{Propane} = M_{\text{Fred,Propane,dry}} = M_{\text{Fred,Propane,wet}} - M_{\text{Fred,Propane,h}2O} = 100.680 - 0 = 100.680 \text{ kg/d} \]

\[ \text{Butane} = M_{\text{Fred,Butane,dry}} = M_{\text{Fred,Butane,wet}} - M_{\text{Fred,Butane,h}2O} = 154.320 - 0 = 154.320 \text{ kg/d} \]

\[ CO = M_{\text{Fred,CO,dry}} = M_{\text{Fred,CO,wet}} - M_{\text{Fred,CO,h}2O} = 19.748.112 - 10.072 = 19.738.040 \text{ kg/d} \]

Fuel Gas Eqn. 2-5

\[ HP_{\text{fuel}} = M_{\text{Fred,HPfuel,h}2O} = M_{\text{Fred,HPfuel,wet}} \times \frac{BSW_{\text{Fred,HPfuel}}}{100} = 28.512 \times \frac{0.179}{100} = 51 \text{ kg/d} \]

\[ LP_{\text{fuel}} = M_{\text{Fred,LPfuel,h}2O} = M_{\text{Fred,LPfuel,wet}} \times \frac{BSW_{\text{Fred,LPfuel}}}{100} = 39.384 \times \frac{0.28}{100} = 110 \text{ kg/d} \]

\[ \text{Flare Pilot} = M_{\text{Fred,Flare pilot,h}2O} = M_{\text{Fred,Flare pilot,wet}} \times \frac{BSW_{\text{Fred,Flare pilot}}}{100} = 0 \times \frac{0.28}{100} = 0 \text{ kg/d} \]
\[ \text{Flare op purge} = M_{Fred,\text{Flare op purge},H_2O} = M_{Fred,\text{Flare op purge},\text{wet}} \times \frac{\text{BSW}_{Fred,\text{Flare op purge}}}{100} = 0 \times 0.28 \]
\[ = 0 \text{ kg/d} \]
\[ \text{Export} = M_{Fred,\text{Export},H_2O} = M_{Fred,\text{Export},\text{wet}} \times \frac{\text{BSW}_{Fred,\text{Export}}}{100} = 0 \times \frac{0.28}{100} = 0 \text{ kg/d} \]
\[ \text{Import} = M_{Fred,\text{Import},H_2O} = M_{Fred,\text{Import},\text{wet}} \times \frac{\text{BSW}_{Fred,\text{Import}}}{100} = 0 \times \frac{0}{100} = 0 \text{ kg/d} \]

**Fuel Gas dry mass Eqn. 2-6**

\[ HP_{fuel} = M_{Fred,HP_{fuel},\text{dry}} = M_{Fred,HP_{fuel},\text{wet}} - M_{Fred,HP_{fuel},H_2O} = 28.512 - 51 = 28.461 \text{ kg/d} \]
\[ LP_{fuel} = M_{Fred,LP_{fuel},\text{dry}} = M_{Fred,LP_{fuel},\text{wet}} - M_{Fred,LP_{fuel},H_2O} = 39.384 - 110 = 39.274 \text{ kg/d} \]
\[ \text{Flare Pilot} = M_{Fred,\text{Flare pilot},\text{dry}} = M_{Fred,\text{Flare pilot},\text{wet}} - M_{Fred,\text{Flare pilot},H_2O} = 0 - 0 = 0 \text{ kg/d} \]
\[ \text{Flare op purge} = M_{Fred,\text{Flare op purge},\text{dry}} = M_{Fred,\text{Flare op purge},\text{wet}} - M_{Fred,\text{Flare op purge},H_2O} = 0 - 0 \]
\[ = 0 \text{ kg/d} \]
\[ \text{Export} = M_{Fred,\text{Export},\text{dry}} = M_{Fred,\text{Export},\text{wet}} - M_{Fred,\text{Export},H_2O} = 0 - 0 = 0 \text{ kg/d} \]
\[ \text{Import} = M_{Fred,\text{Import},\text{dry}} = M_{Fred,\text{Import},\text{wet}} - M_{Fred,\text{Import},H_2O} = 0 - 0 = 0 \text{ kg/d} \]

**Flare total**

**Wet mass Eqn. 2-7**

\[ \text{Flare} = M_{Fred,\text{Flare},H_2O} = M_{Fred,\text{flare pilot},H_2O} + M_{Fred,\text{Flare op purge},H_2O} = 0 + 0 = 0 \text{ kg/d} \]

**Dry mass Eqn. 2-8**

\[ \text{Flare} = M_{Fred,\text{Flare},\text{dry}} = M_{Fred,\text{flare pilot},\text{dry}} + M_{Fred,\text{Flare op purge},\text{dry}} = 0 + 0 = 0 \text{ kg/d} \]

**Off-spec Gas storage**

In addition, for each Day of the Allocation Period, the change in mass of water in Off-spec Gas shall be determined by difference from the end of the previous Day.

**Off-Spec Gas wet mass end of Day Eqn. 2-9**

\[ M_{Close,Fred,Offspec,H_2O} = M_{Close,Fred,Offspec,\text{wet}} \times \frac{\text{BSW}_{Fred,Offspec}}{100} \rightarrow \]
\[ 0 \times \frac{3}{100} = 0 \text{ kg/d} \]

**Off-spec Gas dry mass Eqn. 2-10**

\[ M_{Close,Fred,Offspec,\text{dry}} = M_{Close,Fred,Offspec,\text{wet}} - M_{Close,Fred,Offspec,H_2O} \rightarrow 0 - 0 = 0 \text{ kg/d} \]
Change in water in Off-Spec Gas stock Eqn. 2-11

\[ M_{\text{Fred,Offspec inc,H2O}} = M_{\text{Close,Fred,Offspec,H2O}} - (M_{\text{Close,Fred,Offspec,H2O,d-1}} + M_{\text{Adj,Fred,Offspec,H2O}}) \rightarrow 0 - (0 + 0) = 0 \text{ kg/d} \]
STEP 3 - CALCULATION OF COMPONENTS IN DELIVERED CRUDE PETROLEUM AND FINISHED PRODUCTS FOR THE DAY

For each Day of the Allocation Period, the total mass of each Component in the Entrant’s Crude Petroleum and the total mass of each Component in Finished Products, respectively, shall be determined as the product of i) the total dry mass of the relevant stream, and ii) the most recent verified dry composition of such stream.

Component mass Eqn. 3-1

\[ M_{A,\text{Crude Pet},N2} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},N2} \rightarrow 15.792.552 \times 0 = 0 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},CO2} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},CO2} \rightarrow 15.792.552 \times 0.0002 = 2.527 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C1} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C1} \rightarrow 15.792.552 \times 0.0003 = 3.948 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C2} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C2} \rightarrow 15.792.552 \times 0.0010 = 15.793 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C3} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C3} \rightarrow 15.792.552 \times 0.0047 = 74.383 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},iC4} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},iC4} \rightarrow 15.792.552 \times 0.0043 = 67.276 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},nC4} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},nC4} \rightarrow 15.792.552 \times 0.0100 = 158.241 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},iC5} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},iC5} \rightarrow 15.792.552 \times 0.9796 = 15.470.384 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},nC5} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},nC5} \rightarrow 15.792.552 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C6} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C6} \rightarrow 15.792.552 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C7} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C7} \rightarrow 15.792.552 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C8} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C8} \rightarrow 15.792.552 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C9} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C9} \rightarrow 15.792.552 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C10} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C10} \rightarrow 15.792.552 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C11} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C11} \rightarrow 15.792.552 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{A,\text{Crude Pet},C12+} = M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet},C12+} \rightarrow 15.792.552 \times 0.0000 = 0 \text{ kg/d} \]

\[ M_{B,\text{Crude Pet},N2} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},N2} \rightarrow 4.267.941 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},CO2} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},CO2} \rightarrow 4.267.941 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C1} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C1} \rightarrow 4.267.941 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C2} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C2} \rightarrow 4.267.941 \times 0.0023 = 9.944 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C3} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C3} \rightarrow 4.267.941 \times 0.0312 = 133.202 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C4} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C4} \rightarrow 4.267.941 \times 0.0136 = 57.916 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C5} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C5} \rightarrow 4.267.941 \times 0.0446 = 190.478 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C6} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C6} \rightarrow 4.267.941 \times 0.0908 = 3.876.229 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C7} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C7} \rightarrow 4.267.941 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C8} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C8} \rightarrow 4.267.941 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C9} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C9} \rightarrow 4.267.941 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C10} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C10} \rightarrow 4.267.941 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C11} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C11} \rightarrow 4.267.941 \times 0.0000 = 0 \text{ kg/d} \]
\[ M_{B,\text{Crude Pet},C12+} = M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet},C12+} \rightarrow 4.267.941 \times 0.0000 = 0 \text{ kg/d} \]

\( (M_{A,\text{crude pet,dry}}, M_{B,\text{crude pet,dry}} \) from Eqn. 2-2)
Finished Products Component masses Eqn. 3-2

\[ \text{Fredericia} = M_{\text{Fred,Propane,C2}} = M_{\text{Fred,Propane,dry}} \times X_{\text{Fred,Propane,C2}} \to 100.680 \times 0.0207 = 2.083 \text{ kg/d} \]
\[ M_{\text{Fred,Butane,C3}} = M_{\text{Fred,Butane,dry}} \times X_{\text{Fred,Butane,C3}} \to 154.320 \times 0.0061 = 943 \text{ kg/d} \]
\[ M_{\text{Fred,CO,C2}} = M_{\text{Fred,CO,dry}} \times X_{\text{Fred,CO,C2}} \to 19.738.040 \times 0.0002 = 4.737 \text{ kg/d} \]

\((M_{\text{Fred,Propane,dry}}, M_{\text{Fred,Butane,dry}}, M_{\text{Fred,CO,dry}} \text{ from Eqn. 2-4})\)

The same for all Components N2 to C12+

Fuel Gas Eqn. 3-3

\[ \text{HPfuel} = M_{\text{Fred,HPfuel,C02}} = M_{\text{Fred,HPfuel,dry}} \times X_{\text{Fred,HPfuel,C02}} \to 28.461 \times 0.0392 = 1.115 \text{ kg/d} \]
\[ \text{LPfuel} = M_{\text{Fred,LPfuel,C02}} = M_{\text{Fred,LPfuel,dry}} \times X_{\text{Fred,LPfuel,C02}} \to 39.274 \times 0.0306 = 1.201 \text{ kg/d} \]
\[ \text{Flare} = M_{\text{Fred,Flare,C02}} = M_{\text{Fred,Flare,dry}} \times X_{\text{Fred,Flare,C02}} \to 0 \times 0.0306 = 0 \text{ kg/d} \]
\[ \text{Export} = M_{\text{Fred,Export,C02}} = M_{\text{Fred,Export,dry}} \times X_{\text{Fred,Export,C02}} \to 0 \times 0.0306 = 0 \text{ kg/d} \]
\[ \text{Import} = M_{\text{Fred,Import,C02}} = M_{\text{Fred,Import,dry}} \times X_{\text{Fred,Import,C02}} \to 0 \times 0.0300 = 0 \text{ kg/d} \]

\((M_{\text{Fred,HPfuel,dry}}, M_{\text{Fred,LPfuel,dry}}, M_{\text{Fred,Flare,dry}}, M_{\text{Fred,Export,dry}}, M_{\text{Fred,Import,dry}} \text{ from Eqn. 2-6})\)

The same for all Components N2 to C12+

Total Exported Fuel Gas Eqn. 3-4

\[ M_{\text{Fred,Export,N20}} = M_{\text{Fred,HP export, H2O}} + M_{\text{Fred,LP export, H2O}} \to 51 + 0 = 51 \text{ kg/d} \]

The same for all Components N2 to C12+

Fuel Gas Total Eqn. 3-5

\[ M_{\text{Fred,FuelGas,C02}} = M_{\text{Fred,HP fuel,C02}} + M_{\text{Fred,LP fuel,C02}} + M_{\text{Fred,Flare,C02}} - M_{\text{Fred,Export,C02}} + M_{\text{Fred,Import,C02}} \to 1.115 + 1.201 + 0 + 0 - 0 = 2.316 \text{ kg/d} \]

The same for all Components H2O to C12+

In addition, for each Day of the Allocation Period, the produced mass of each Component in Off-spec Gas shall be calculated as the mass change of such Component during the Day.

Off-spec Gas Stock Closing Eqn. 3-6

\[ M_{\text{Close,Fred,Offspec,N2}} = M_{\text{Close,Fred,Offspec,dry}} \times X_{\text{Close,Fred,Offspec,N2}} \to 0 \times 0 = 0 \text{ kg/d} \]

The same for all Components N2 to C12+

Change in Off-spec Gas stock Eqn. 3-7

\[ M_{\text{Fred,Offspec inc,N2}} = M_{\text{Close,Fred,Offspec,dry}} - (M_{\text{Close,Fred,Offspec,N2,d-1}} + M_{\text{Adj,Fred,Offspec,N2}}) \to 0 - (0 + 0) = 0 \text{ kg/d} \]

The same for all Components N2 to C12+
STEP 4 – CALCULATION OF OPENING PIPELINE STOCK, CLOSING PIPELINE STOCK AND ALLOCATED TERMINAL INLET FOR THE ALLOCATION PERIOD

For the Allocation Period, the total mass of water at Terminal Inlet shall be equal to the sum of i) the total measured mass of water in Finished Products, ii) any change in mass of water in Off-spec Gas, iii) the total measured mass of water separated from the Crude Petroleum in the dewatering facilities, and iv) the total measured mass of water separated from the Crude Petroleum in the Degassing Facilities.

**Water from Finished Product, Fuel Gas and Off-Spec Gas Eqn. 4-1**

\[ M_{Fred.outlet,H2O,p} = M_{Fred.Propane,H2O} + M_{Fred.Butane,H2O} + M_{Fred.CO,H2O} + M_{Fred.HPfue,H2O} + M_{Fred.LPfue,H2O} + M_{Fred.Flare,H2O} + M_{Fred.Export,H2O} + M_{Close,Fred,Offspec,H2O} - M_{Fred.Import,H2O} \]

\[ = 0 + 0 + 10.072 + 51 + 110 + 0 + 0 - 0 = 10.233 \text{ kg} \]

**Total mass of water leaving Terminal Eqn. 4-2**

\[ M_{Fred.inlet,H2O} = M_{Fred,dewater\,water,wet} + M_{Fred,degas\,water,wet} + M_{Fred.outlet,H2O} = 0 + 92.215 + 10.233 = 102.448 \text{ kg} \]

For the Allocation Period, the total mass of each Component at Terminal Inlet shall be deemed equal to the sum of i) the total mass of such Component in Finished Products and ii) any change in mass of such Component in Off-spec Gas.

**Component inlet mass Eqn. 4-3**

\[ M_{Fred.inlet,C3} = M_{Fred.Propane,C3} + M_{Fred.Butane,C3} + M_{Fred.CO,C3} + M_{Fred,FuelGas,C3} + M_{Fred.Offspec\,inc,C3} \]

\[ = 97.466 + 943 + 83.295 + 26.808 + 0 = 208.512 \text{ kg} \]

\((M_{Fred.Propane,C3}, M_{Fred.Butane,C3}, M_{Fred.CO,C3}, M_{Fred.FuelGas,C3}, M_{Fred.Offspec\,inc,C3}) \text{ from Eqn. 3-2, } M_{Fred.FuelGas,C3} \text{ from Eqn. 3-5 and } M_{Fred.Offspec\,inc,C3} \text{ from Eqn. 3-7}

The same for all Components N2 to C12+

**Total wet inlet mass Eqn. 4-4**

\[ \text{Inlet wet mass} = M_{Fred.inlet,wet} = M_{Fred.inlet,H2O} \]

\[ = \sum_{c=C12+}^{c=1} M_{Fred.inlet,c} \]

\[ \rightarrow 102.448 + 0 + 2.513 + 4.097 + 25.728 + 208.512 + 125.016 + 348.030 + 19.346.879 + 0 + 0 + 0 + 0 + 0 + 0 = 20.163.223 \text{ kg} \]

For each Component and for each Entrant, the Opening Pipeline Stock shall be calculated from the sum of i) the previous Closing Pipeline Stock, ii) any adjustments to Pipeline Stock to be applied for the Allocation Period, and iii) the Entrant’s Crude Petroleum for the Allocation Period.
Pipeline Stock Component masses Eqn. 4-5

\[ M_{\text{Initial}}_{A,\text{Pipeline},\text{H}_2\text{O}} = M_{\text{Close}}_{A,\text{Pipeline},\text{H}_2\text{O},d-1} + M_{\text{Adj}}_{A,\text{Pipeline},\text{H}_2\text{O}} + M_{A,\text{Crude Pet},\text{H}_2\text{O}} \rightarrow 253.260 + 0 + 101.304 = 354.564 \text{ kg} \]

\((M_{A,\text{Feed},\text{H}_2\text{O}}\text{from Eqn. 2-1})\)
\[ M_{\text{Initial}}_{A,\text{Pipeline},\text{C}_1} = M_{\text{Close}}_{A,\text{Pipeline},\text{C}_1,d-1} + M_{\text{Adj}}_{A,\text{Pipeline},\text{C}_1} + M_{A,\text{Crude Pet},\text{C}_1} \rightarrow 9.870 + 0 + 3.948 = 13.818 \text{ kg} \]

\((M_{\text{A,\text{Crude Pet},C}_1}\text{from Eqn. 3-1})\)
\[ M_{\text{Initial}}_{B,\text{Pipeline},\text{H}_2\text{O}} = M_{\text{Close}}_{B,\text{Pipeline},\text{H}_2\text{O},d-1} + M_{\text{Adj}}_{B,\text{Pipeline},\text{H}_2\text{O}} + M_{B,\text{Crude Pet},\text{H}_2\text{O}} \rightarrow 1.494 + 0 + 598 = 2.092 \text{ kg} \]

\((M_{B,\text{Crude Pet},\text{H}_2\text{O}}\text{from Eqn. 3-1})\)
\[ M_{\text{Initial}}_{B,\text{Pipeline},\text{C}_1} = M_{\text{Close}}_{B,\text{Pipeline},\text{C}_1,d-1} + M_{\text{Adj}}_{B,\text{Pipeline},\text{C}_1} + M_{B,\text{Crude Pet},\text{C}_1} \rightarrow 427 + 0 + 171 = 598 \text{ kg} \]

\((M_{B,\text{Crude Pet},\text{C}_1}\text{from Eqn. 3-1})\)

The same for all components H2O to C12+

Pipeline Stock wet Eqn. 4-6

\[ M_{\text{Initial}}_{A,\text{Pipeline},\text{wet}} = \sum_{c=C12+} M_{\text{Initial}}_{A,\text{Pipeline},c} \rightarrow 354.564 + 0 + 8.844 + 13.818 + 55.274 + 260.340 + 235.467 + 553.845 + 54.164.344 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 556.284.496 \text{ kg} \]

\[ M_{\text{Initial}}_{B,\text{Pipeline},\text{wet}} = \sum_{c=C12+} M_{\text{Initial}}_{B,\text{Pipeline},c} \rightarrow 2.092 + 0 + 0 + 598 + 34.805 + 466.209 + 202.706 + 666.674 + 13.566.802 + 0 + 0 \]

\[ + 0 + 0 + 0 + 0 + 0 = 14.939.884 \text{ kg} \]

For each Component and for each Entrant, the Allocated Terminal Inlet shall be calculated as the product of i) the Entrant’s delivery of Crude Petroleum and ii) the Entrant’s Opening Pipeline Stock. The Allocated Terminal Inlet shall then be normalised against the total mass of each Component at Terminal Inlet in order to account for any Component imbalance across the Terminal and the Stabilisation Plant.

Target inlet Eqn. 4-7

If \( F_{\text{Stock}}_A = 0 \)

Then \( M_{T,\text{A,Inlet,wet}} = M_{A,\text{Crude Pet,wet}} \rightarrow 15.893.856 = 15.893.856 \text{ kg} \)

Else \( M_{T,\text{A,Inlet,wet}} = M_{T,\text{A,Inlet,wet}} \)

Hejre = If \( F_{\text{Stock}}_B = 0 \)

Then \( M_{T,\text{B,Inlet,wet}} = M_{B,\text{Crude Pet,wet}} \rightarrow 4.268.538 = 4.268.538 \text{ kg} \)

Else \( M_{T,\text{B,Inlet,wet}} = M_{T,\text{B,Inlet,wet}} \)

\((M_{A,\text{Crude Pet,wet}}, M_{B,\text{Crude Pet,wet}}\text{from Eqn. 1-1})\)
Appendix 3

Initial Entrant inlet rate Eqn. 4-8

\[ M_{I_{A,\text{inlet, wet}}} = M_{F,\text{inlet, wet}} \cdot \frac{M_{T_{A,\text{inlet, wet}}}}{\sum_{E} M_{T_{E,\text{inlet, wet}}}} \rightarrow 20.163.223 \cdot \frac{15.893.856}{15.893.856 + 4.268.538} = 15.894.509 \text{ kg} \]

\[ M_{I_{B,\text{inlet, wet}}} = M_{F,\text{inlet, wet}} \cdot \frac{M_{T_{B,\text{inlet, wet}}}}{\sum_{E} M_{T_{E,\text{inlet, wet}}}} \rightarrow 20.163.223 \cdot \frac{4.268.538}{15.893.856 + 4.268.538} = 4.268.714 \text{ kg} \]

Initial Entrant inlet Component masses Eqn. 4-9

\[ M_{I_{A,\text{inlet,H2O}}} = M_{I_{A,\text{inlet,wet}}} \cdot \frac{M_{\text{Initial}_{A,\text{Pipestock,H2O}}}}{M_{\text{Initial}_{A,\text{Pipestock,wet}}}} \rightarrow 15.894.509 \cdot \frac{354.564}{55.628.496} = 101.308 \text{ kg} \]

\[ M_{I_{B,\text{inlet,H2O}}} = M_{I_{B,\text{inlet,wet}}} \cdot \frac{M_{\text{Initial}_{B,\text{Pipestock,H2O}}}}{M_{\text{Initial}_{B,\text{Pipestock,wet}}}} \rightarrow 4.268.714 \cdot \frac{2.092}{14.939.884} = 598 \text{ kg} \]

\[ M_{F,\text{inlet,H2O}} = M_{I_{A,\text{inlet,H2O}}} + M_{I_{B,\text{inlet,H2O}}} \rightarrow 101.308 + 598 = 101.906 \text{ kg} \]

The same for all Components H2O to C12+

Allocated Entrant inlet Component masses Eqn. 4-10

If \( M_{I_{A,\text{inlet,H2O}}} = 0 \)

Then \( M_{I_{A,\text{inlet,H2O}}} = 0 \)

Else \( M_{I_{A,\text{inlet,H2O}}} = M_{F,\text{inlet,H2O}} \cdot \frac{M_{I_{A,\text{inlet,wet}}}}{M_{F,\text{inlet,wet}}} \)

If \( M_{I_{B,\text{inlet,H2O}}} = 0 \)

Then \( M_{I_{B,\text{inlet,H2O}}} = 0 \)

Else \( M_{I_{B,\text{inlet,H2O}}} = M_{F,\text{inlet,H2O}} \cdot \frac{M_{I_{B,\text{inlet,wet}}}}{M_{F,\text{inlet,wet}}} \)

\[ M_{I_{A,\text{inlet,H2O}}} \neq 0 \rightarrow M_{T_{A,\text{inlet,H2O}}} = M_{F,\text{inlet,H2O}} \cdot \frac{M_{I_{A,\text{inlet,H2O}}}}{M_{F,\text{inlet,H2O}}} \rightarrow 102.448 \cdot \frac{101.308}{101.906} = 101.847 \text{ kg} \]

\[ M_{I_{B,\text{inlet,H2O}}} \neq 0 \rightarrow M_{T_{B,\text{inlet,H2O}}} = M_{F,\text{inlet,H2O}} \cdot \frac{M_{I_{B,\text{inlet,H2O}}}}{M_{F,\text{inlet,H2O}}} \rightarrow 102.448 \cdot \frac{598}{101.906} = 601 \text{ kg} \]

The same for all Allocated Components H2O to C12+

The sum of Allocated inlet Component masses Eqn. 4-12

\[ M_{A,\text{inlet, dry}} = \sum_{c=C^{12+}}^{c=N^{2}} M_{A,\text{inlet,c}} \]

\[ = 0 + 2.513 + 3.927 + 15.787 + 74.715 + 67.182 + 157.929 + 15.470.597 + 0 + 0 + 0 + 0 + 0 + 0 = 15.792.649 \text{ kg} \]

\[
M_{B,inlet,wet} = \sum_{c=H2O}^{c=C12+} M_{B,inlet,c} = 0 + 0 + 170 + 9.941 + 133.797 + 57.834 + 190.102 + 3.876.282 + 0 + 0 + 0 + 0 + 0 = 4.268.126 \text{ kg}
\]

The sum of Allocated inlet Component masses with water Eqn. 4-13

\[
M_{A,inlet,wet} = M_{A,inlet,dry} + M_{A,inlet,H2O} = 15.792.649 + 101.847 = 15.894.496 \text{ kg}
\]

\[
M_{B,inlet,wet} = M_{B,inlet,dry} + M_{B,inlet,H2O} = 4.268.126 + 601 = 4.268.727 \text{ kg}
\]

Each Entrant’s Components in Closing Pipeline Stock shall then be calculated from i) the Entrant’s Components in Opening Pipeline Stock less ii) the Entrant’s Components in Allocated Terminal Inlet.

Closing Pipeline Stock Component Eqn. 4-11

\[
M_{Close_{A,pipestock,H2O}} = M_{Initial_{A,pipestock,H2O}} - M_{A,inlet,H2O} = 354.564 - 101.847 = 252.717 \text{ kg}
\]

\[
M_{Close_{B,pipestock,H2O}} = M_{Initial_{B,pipestock,H2O}} - M_{B,inlet,H2O} = 2.092 - 601 = 1.491 \text{ kg}
\]

The same for all components H2O to C12+

The sum of Closing Pipeline Stock Component masses Eqn. 4-14

\[
M_{Close_{A,pipestock,wet}}^{c=C12+} = \sum_{c=H2O}^{c=C12+} M_{Close_{A,pipestock,c}}
\]

\[
= 252.717 + 0 + 6.331 + 9.891 + 39.487 + 185.625 + 168.285 + 395.916 + 38.675.747 + 0 + 0 + 0 + 0 + 0 + 0 = 39.734.000 \text{ kg}
\]

\[
M_{Close_{B,pipestock,wet}}^{c=C12+} = \sum_{c=H2O}^{c=C12+} M_{Close_{B,pipestock,c}}
\]

\[
= 1.491 + 0 + 0 + 428 + 24.864 + 332.411 + 144.871 + 476.572 + 9.690.520 + 0 + 0 + 0 + 0 + 0 = 10.671.157 \text{ kg}
\]

Warning on Pipeline Stock Eqn. 4-15

\[
If \ M_{Close_{A,pipestock,wet}} < M_{Limit_{A,pipestock,wet}} \ Then \ FError_{A} = 1 \rightarrow 36.721.411 < 39.734.000
\]

\[
If \ M_{Close_{B,pipestock,wet}} < M_{Limit_{B,pipestock,wet}} \ Then \ FError_{B} = 1 \rightarrow 12.240.470 < 10.671.157
\]

For the Allocation Period, the total mass of water available for allocation to Finished Products shall then be calculated as i) the total mass of water at Terminal Inlet less ii) the mass of water separated from the Crude Petroleum less iii) any change in the mass of water in Off-spec Gas.
Allocated change in Off-Spec Gas in storage Eqn. 4-16

\[
M_{A,\text{off spec inc,}H_2O} = M_{\text{Fred,off spec inc,}H_2O} \times \frac{M_{A,\text{inlet,}H_2O}}{M_{\text{Fred,}H_2O}} \rightarrow 0 \times \frac{101.847}{102.448} = 0 \text{ kg/d}
\]

\[
M_{B,\text{off spec inc,}H_2O} = M_{\text{Fred,off spec inc,}H_2O} \times \frac{M_{B,\text{inlet,}H_2O}}{M_{\text{Fred,}H_2O}} \rightarrow 0 \times \frac{170}{4.097} = 0 \text{ kg/d}
\]

The same for all Components H2O to C12+

For the Allocation Period, the mass of water separated from the Crude Petroleum shall be allocated to an Entrant in proportion to such Entrant’s mass of water in Terminal Inlet.

Mass of water to treatment Eqn. 4-17

\[
M_{\text{Fred,treated water,}\text{wet}} = M_{\text{Fred,dewater water,}\text{wet}} + M_{\text{Fred,degas water,}\text{wet}} = 92.215 + 0 = 92.215 \text{ kg}
\]

Mass of water to treatment allocated to Entrant Eqn. 4-20

\[
AM_{A,\text{treated water}} = M_{\text{Fred,treated water,}\text{wet}} \times \frac{M_{A,\text{inlet,}H_2O}}{M_{\text{Fred,}H_2O}} = 92.215 \times \frac{101.847}{102.448} = 91.674 \text{ kg}
\]

\[
AM_{B,\text{treated water}} = M_{\text{Fred,treated water,}\text{wet}} \times \frac{M_{B,\text{inlet,}H_2O}}{M_{\text{Fred,}H_2O}} = 92.215 \times \frac{601}{102.448} = 541 \text{ kg}
\]

Similarly, for each Entrant, the mass of each Component available for allocation to Finished Products shall be calculated as i) the mass of such Component in Allocated Terminal Inlet, less ii) the change in the mass of such Component in Off-spec Gas. Such change in Off-spec Gas shall be allocated in proportion to each Entrant’s Allocated Terminal Inlet.

Allocated inlet available water Eqn. 4-18

\[
M_{\text{Fred,inlet avail,}H_2O} = M_{\text{Fred,inlet,}H_2O} - M_{\text{Fred,treated water,}\text{wet}} - M_{\text{Fred,off spec inc,}H_2O} = 102.448 - 92.215 - 0 = 10.233 \text{ kg}
\]

Allocated inlet available Component Eqn. 4-19

\[
M_{\text{Fred,inlet avail,CO}_2} = M_{\text{Fred,inlet,CO}_2} - M_{\text{Fred,off spec inc,CO}_2} = 2.513 - 0 = 2.513 \text{ kg}
\]

The same for all Components N2 to C12+

Allocated inlet available water to Entrant Eqn. 4-21

\[
M_{A,\text{inlet avail,}H_2O} = M_{A,\text{inlet,}H_2O} - AM_{A,\text{treated water}} - M_{A,\text{off spec inc,}H_2O} = 101.847 - 91.674 - 0 = 10.173 \text{ kg}
\]

\[
M_{B,\text{inlet avail,}H_2O} = M_{B,\text{inlet,}H_2O} - AM_{B,\text{treated water}} - M_{B,\text{off spec inc,}H_2O} = 601 - 541 - 0 = 60 \text{ kg}
\]
Allocated inlet available Component to Entrant Eqn. 4-22

\[ M_{A,inlet \text{ avail},CO2} = M_{A,inlet,CO2} - M_{A,Off spec inc,CO2} = 2.513 - 0 = 2.513 \text{ kg} \]

\[ M_{B,inlet \text{ avail},C1} = M_{B,inlet,C1} - M_{B,Off spec inc,C1} = 170 - 0 = 170 \text{ kg} \]

The same for all Components N2 to C_{12+}

Total Allocated inlet available Component to Entrant Eqn. 4-23

\[ M_{A,inlet \text{ avail},dry} = \sum_{c=N2}^{c=C_{12+}} M_{A,inlet \text{ avail},c} \]

\[ = 0 + 2.513 + 3.927 + 15.787 + 74.715 + 67.182 + 157.929 + 15.470.597 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 15.792.649 \text{ kg} \]

\[ M_{B,inlet \text{ avail},dry} = \sum_{c=N2}^{c=C_{12+}} M_{B,inlet \text{ avail},c} \]

\[ = 0 + 0 + 170 + 9.941 + 133.797 + 57.834 + 190.102 + 3.876.282 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 4.268.126 \text{ kg} \]
STEP 5 – INITIAL ALLOCATION OF TOTAL COMPONENTS AVAILABLE TO ALLOCATED CRUDE OIL AND TOTAL COMPONENTS AVAILABLE TO RESIDUAL OFF GASES FOR THE ALLOCATION PERIOD

For each Entrant, the mass of each Component that can be initially allocated to the Allocated Crude Oil for the Allocation Period shall be determined by the product of i) the total mass of such Component in produced Crude Oil and ii) the proportional mass of such Component available from the Entrant’s Allocated Terminal Inlet for allocation to Finished Products.

Initial Allocation of Allocated Crude Oil Component masses Eqn. 5-1

Allocated Crude Oil = \[ ACO \]

\[
\text{If } M_{\text{Fred,inlet avail,c}} <> 0 \rightarrow 10.233 > 0
\]

\[
\text{Then } IM_{A,\text{ACO},H_2O} = M_{\text{Fred,CO,H}_2O} \cdot \frac{M_{A,\text{inlet avail,H}_2O}}{\sum E M_{\text{Fred,inlet avail,H}_2O}} \rightarrow 10.072 \cdot \frac{10.173}{10.233} = 10.012 \text{ kg}
\]

\[
\text{Else } IM_{A,\text{ACO},c} = * \frac{M_{E,\text{inlet avail,dry}}}{\sum E M_{E,\text{inlet avail,dry}}}
\]

\[
H_2O = \text{If } M_{\text{Fred,inlet avail,c}} <> 0 \rightarrow 10.233 > 0
\]

\[
\text{Then } IM_{B,\text{ACO},H_2O} = M_{\text{Fred,CO,H}_2O} \cdot \frac{M_{B,\text{inlet avail,H}_2O}}{\sum E M_{\text{Fred,inlet avail,H}_2O}} \rightarrow 10.072 \cdot \frac{60}{10.233} = 59 \text{ kg}
\]

\[
\text{Else } IM_{B,\text{ACO},c} = * \frac{M_{E,\text{inlet avail,dry}}}{\sum E M_{E,\text{inlet avail,dry}}}
\]

The same for all Components N₂ to C₁₂⁺

\( (M_{\text{Fred,inlet avail,c}} \text{ from Eqn. 4-18 and 4-19, } M_{\text{Fred,CO,H}_2O} \text{ from Eqn. 3-2 and 2-3 and } M_{E,\text{inlet avail,dry}} \text{ from Eqn. 4-21 and 4-22}) \)

For each Entrant, the total initially allocated Components to Residual Off Gases shall then be determined by difference between i) such Components in Allocated Terminal Inlet and ii) such Components initially allocated to Allocated Crude Oil.

Initial Allocation of Fuel Gas Component masses Eqn. 5-2

\[
\text{If } M_{\text{Fred,inlet avail,c}} <> 0 \rightarrow 10.233 > 0
\]

\[
\text{Then } IM_{A,\text{Fuel Gas,H}_2O} = M_{\text{Fred,Fuel Gas,H}_2O} \cdot \frac{M_{A,\text{inlet avail,H}_2O}}{\sum E M_{\text{Fred,inlet avail,H}_2O}} \rightarrow 161 \cdot \frac{10.173}{10.233} = 160 \text{ kg}
\]

\[
\text{Else } IM_{A,\text{ACO},c} = M_{\text{Fred,Fuel Gas,H}_2O} \cdot \frac{M_{A,\text{inlet avail,dry}}}{\sum E M_{E,\text{inlet avail,dry}}}
\]

\[
\text{If } M_{\text{Fred,inlet avail,c}} <> 0 \rightarrow 10.233 > 0
\]

\[
\text{Then } IM_{B,\text{Fuel Gas,H}_2O} = M_{\text{Fred,Fuel Gas,H}_2O} \cdot \frac{M_{B,\text{inlet avail,H}_2O}}{\sum E M_{\text{Fred,inlet avail,H}_2O}} \rightarrow 161 \cdot \frac{60}{10.233} = 1 \text{ kg}
\]

\[
\text{Else } IM_{B,\text{ACO},c} = M_{\text{Fred,Fuel Gas,H}_2O} \cdot \frac{M_{B,\text{inlet avail,dry}}}{\sum E M_{E,\text{inlet avail,dry}}}
\]
The same for all Components H2O to C12+

For each Entrant, the total mass of Components allocated to Residual Off Gases shall be determined by difference between i) the mass of such Components in Off Gases, and ii) the net mass of such Components in measured Fuel Gas.

**Initial allocation of Residual Fuel Gas Component masses Eqn. 5-3**

\[
\begin{align*}
IM_{A,\text{Res Off Gases},C_2} &= M_{A,\text{inlet avail},C_2} - IM_{A,\text{ACO},C_2} - IM_{A,\text{Fuel Gas},C_2} \rightarrow 15.787 - 2.907 - 11.602 = 1.278 \text{ kg} \\
IM_{B,\text{Res Off Gases},C_2} &= M_{B,\text{inlet avail},C_2} - IM_{B,\text{ACO},C_2} - IM_{B,\text{Fuel Gas},C_2} \rightarrow 9.941 - 1.830 - 7.360 = 805 \text{ kg}
\end{align*}
\]

The same for all Components H2O to C12+
STEP 6 – DESIGNATION OF A USER, A LIGHT END DONOR AND A LIGHT END RECEIVER

An Entrant shall be designated a User in accordance with Section 11.3 of the Agreement.

The Allocation Schedule aims to approximate the quality of each Allocated Crude Oil to the quality of the Entrant’s quality of Crude Oil if such Entrant’s Crude Petroleum had not been part of the commingled stream from the Gorm “E” Platform to the Terminal.

C₄ in dry Crude Oil mass fraction Eqn. 6-1

\[
X_{FRed,CO,C₄} = \frac{\sum_{c=c_{C1}}^{c=c_{C1}} X_{FRed,CO,\text{dry}}}{\sum_{c=c_{N2}}^{c=c_{N2}} X_{FRed,CO,\text{dry}}} \times 0.0002 + 0.0042 + 0.0037 + 0.0118 + 0.9800 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 \times 2.00 \%
\]

C₄ in Allocated Crude Oil mass fraction to Entrant Eqn. 6-2

\[
IX_{A,ACO,C₄} = \frac{\sum_{c=c_{C1}}^{c=c_{C1}} IM_{A,ACO,c}}{\sum_{c=c_{N2}}^{c=c_{N2}} IM_{A,ACO,c}} \times 189 + 2.907 + 29.846 + 39.564 + 105.779 \times 0 + 197 + 189 + 2.907 + 29.846 + 39.564 + 105.779 + 15.467.403 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 \times 1.14 \%
\]

\[
IX_{B,CO,C₄} = \frac{\sum_{c=c_{C1}}^{c=c_{C1}} IM_{B,CO,c}}{\sum_{c=c_{N2}}^{c=c_{N2}} IM_{B,CO,c}} \times 8 + 1.830 + 53.448 + 34.059 + 127.328 \times 0 + 0 + 8 + 1.830 + 53.448 + 34.059 + 127.328 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 \times 5.29 \%
\]

\( (IM_{A,ACO,c}, IM_{B,ACO,c} \text{ from Eqn. 5-1}) \)

Such mechanism requires a swap of C₄ Components between Light End Donors and Light End Receivers. Accordingly, each Entrant shall be designated a Light End Donor or a Light End Receiver by comparison of the actual mass of C₄ Components in the Crude Oil with the initially allocated mass of C₄ Components to each Entrant in step 5.

Light Ends to be received in Allocated Crude Oil Eqn. 6-3

If \( IX_{A,ACO,C₄} < X_{FRed,CO,C₄} \rightarrow 2.00 \% < 1.14 \% \)

Then \( LEType_A = \text{LERcEx} \)

Else \( LEType_A = "LEDonor" \)

If \( IX_{B,ACO,C₄} < X_{FRed,CO,C₄} \rightarrow 2.00 \% < 5.29 \% \)

Then \( LEType_B = \text{LERcEx} \)

Else \( LEType_B = "LEDonor" \)
STEP 7 – MOVEMENT OF C4 COMPONENTS AND ALLOCATION OF FINISHED PRODUCTS

For an Entrant designated as a Light End Receiver, the mass of C4 Components to be moved from Residual Off Gases into the Allocated Crude Oil shall be calculated as the product of i) such Entrant’s excess C4 Components in the actual Crude Oil compared with initially allocated C4 Components to the Allocated Crude Oil, and ii) the C4 Components initially allocated to the Entrant’s Residual Off Gases and in proportion to iii) the C4 Components in such Entrant’s Residual Off Gases as calculated by difference from the measured proportion of actual C4 Components in the Allocated Crude Oil.

Since the actual C4 Components in Residual Off Gases cannot be determined by measurement, such Components shall be calculated from the product of i) the allocated C4 Components in Residual Off Gases, and ii) 100% less the actual mass fraction of C4 Components in Crude Oil, and less iii) the C4 Components in inert gases.

**Initial allocated Finished Product streams masse for (LE Donor) Eqn. 7A-1**

\[
\text{If } \text{LEType}_B = \text{LEDonor} \text{ Then IM LEDonor}_{B, \text{Res Off Gases}, C2} = IM_{B, \text{Res Off Gases}, C2} = 805 \text{ kg} \\
\text{Else IM LERecvr}_{B, \text{Off Gases}, C2} = IM_{B, \text{Off Gases}, C2}
\]

\[
\text{If } \text{LEType}_B = \text{LEDonor} \text{ Then IM LEDonor}_{B, \text{ACO}, H2O} = IM_{B, \text{ACO}, H2O} = 59 \text{ kg} \\
\text{Else IM LERecvr}_{B, \text{ACO}, H2O} = IM_{B, \text{ACO}, H2O}
\]

The same for all Components H2O to C12+

\( (IM_{B,ACO,C2} \text{ from Eqn. 5-1and } IM_{B, Res Off Gases,C2} \text{ from Eqn. 5-3}) \)

**Initial allocated Finished Product streams masse for (LE Receiver) Eqn. 7A-1**

\[
\text{If } \text{LEType}_A = \text{LEDonor} \text{ Then IM LEDonor}_{A, \text{Res Off Gases}, C2} = IM_{A, \text{Res Off Gases}, C2} = 1.278 \text{ kg} \\
\text{Else IM LERecvr}_{A, \text{Res Off Gases}, H2O} = IM_{A, \text{Res Off Gases}, H2O}
\]

\[
\text{If } \text{LEType}_A = \text{LEDonor} \text{ Then IM LEDonor}_{A, \text{ACO}, C2} = IM_{A, \text{ACO}, C2} = 10.012 \text{ kg} \\
\text{Else IM LERecvr}_{A, \text{ACO}, C2} = IM_{A, \text{ACO}, C2}
\]

The same for all Components H2O to C12+

\( (IM_{A,ACO,C2} \text{ from Eqn. 5-1and } IM_{A, Res Off Gases,C2} \text{ from Eqn. 5-3}) \)

The mass of Components to be swapped shall however be limited by the mass of C4 Components initially allocated to the Allocated Crude Oil of such Entrants designated as Light End Donors.

**Maximum component mass that can be swapped into Allocated Crude Oil of LE Receivers Eqn. 7A-2**

\[
M_{\text{SwapMax,H2O}} = \min \left[ \sum_{A} IM_{A, \text{LERecvr}, \text{Res Off Gases}, C2} \text{ or } \sum_{B} IM_{B, \text{LEDonor}, \text{Res Off Gases}, C2} \right] \\
\rightarrow 1.278 + 0 \text{ or } 0 + 1.830 = 1.278 \text{ kg}
\]
The same for all Components N2 to C12+

**Total mass that can be swapped for C4 Component Eqn. 7A-3**

\[
MS_{\text{Max C4}} = \sum_{c=\text{C1}}^{c=\text{nC4}} MS_{\text{Max C4},c} = 0 + 1.278 + 24.757 + 70.1942 = 109.142 \text{ kg}
\]

**Initial mass of C4 in allocated dry Allocated Crude Oil Eqn. 7A-4**

\[
IM_{\text{A,ACO,C4}} = \sum_{c=\text{C1}}^{c=\text{nC4}} IM_{\text{A,ACO,C4}} \rightarrow 189 + 2.907 + 29.846 + 39.564 + 105.779 = 178.285 \text{ kg}
\]

\[
IM_{\text{B,ACO,C4}} = \sum_{c=\text{C1}}^{c=\text{C12+}} IM_{\text{B,ACO,C4}} \rightarrow 8 + 1.830 + 53.448 + 34.059 + 127.328 = 216.673 \text{ kg}
\]

(\text{IM}_{\text{B,ACO,C4}}, \text{IM}_{\text{B,ACO,C4}} \text{ from Eqn. 5-1})

**Initial mass of allocated dry Allocated Crude Oil Eqn. 7A-5**

\[
IM_{\text{A,ACO,C4}} = \sum_{c=\text{C12+}}^{c=\text{nC4}} IM_{\text{A,ACO,C4}}
\]

\[
\rightarrow 0 + 197 + 189 + 2.907 + 29.846 + 39.564 + 105.779 + 15.467.403 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 15.645.885 \text{ kg}
\]

\[
IM_{\text{B,ACO,C4}} = \sum_{c=\text{C12+}}^{c=\text{nC4}} IM_{\text{B,ACO,C4}}
\]

\[
\rightarrow 0 + 0 + 8 + 1.830 + 53.448 + 34.059 + 127.328 + 3.875.482 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 4.092.156 \text{ kg}
\]

(\text{IM}_{\text{B,ACO,C4}}, \text{IM}_{\text{B,ACO,C4}} \text{ from Eqn. 5-1})

**Initial mass of C4 in allocated Residual Off Gases Eqn. 7A-6**

\[
IM_{\text{A,Res Off Gases,C4}} = \sum_{c=\text{C1}}^{c=\text{nC4}} IM_{\text{A,Res Off Gases,C4}} \rightarrow 0 + 1.278 + 24.757 + 70.1942 = 109.142 \text{ kg}
\]

\[
IM_{\text{B,Res Off Gases,C4}} = \sum_{c=\text{C1}}^{c=\text{C12+}} IM_{\text{B,Res Off Gases,C4}} \rightarrow 0 + 805 + 63.147 + 21.313 + 57.591 = 142.855 \text{ kg}
\]

(\text{IM}_{\text{B,Res Off Gases,C4}}, \text{IM}_{\text{B,Res Off Gases,C4}} \text{ from Eqn. 5-3})

**Initial mass of inert and C5+ in allocated dry Residual Off Gases Eqn. 7A-7**

\[
IM_{\text{A,Res Off Gases,Inert}} = \sum_{c=\text{C12+}}^{c=\text{C12+}} IM_{\text{A,Res Off Gases,C}} + \sum_{c=\text{nC4}}^{c=\text{nC4}} IM_{\text{A,Res Off Gases,C}}
\]

\[
= 0 + 0 + 0 + 2.401 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 2.401 \text{ kg}
\]

\[
IM_{\text{B,Res Off Gases,Inert}} = \sum_{c=\text{C1}}^{c=\text{C12+}} IM_{\text{B,Res Off Gases,C}} + \sum_{c=\text{nC4}}^{c=\text{nC4}} IM_{\text{B,Res Off Gases,C}}
\]

\[
\rightarrow 0 + 0 + 0 + 602 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 8602 \text{ kg}
\]
Target mass C4 to be moved into Allocated Crude Oil Eqn. 7A-8

If \( \text{LET}_{A} = \text{LER}_{\text{Recvr}} \) Then \( M_{\text{Swap}, C4} = \)
\[
\frac{(1 + X_{\text{Fred}, C4}) \times (IM_{A, \text{Res Off Gases}, C4} \times IM_{\text{Fred}, C0, \text{dry}} - IM_{A, \text{ACO}, C4})}{\left[109.142 \times (15.645.885 * 2.00 - 178.285)\right]} = 137.603 \text{ kg}
\]
Else \( M_{\text{Swap}, C4} = 0 \)

If \( \text{LET}_{B} = \text{LER}_{\text{Recvr}} \) Then \( M_{\text{Swap}, C4} = \)
\[
\frac{(1 + X_{\text{Fred}, C4}) \times (IM_{B, \text{Res Off Gases}, C4} \times IM_{\text{Fred}, C0, \text{dry}} - IM_{B, \text{ACO}, C4})}{\left[109.142 \times (1 - 2.00) - 2 \times 2.401\right]} = 137.603 \text{ kg}
\]
Else \( M_{\text{Swap}, C4} = 0 \)

For an Entrant designated as a Light End Receiver, each of the C4 Components shall be distributed to the Allocated Crude Oil in proportion to the mass of the Component in the total C4 Components to be moved.

Total mass of C4 to be moved into LE Receivers’ Crude Oil Eqn. 7A-9

\[
M_{\text{Swap}_{\text{Fred},C4}} = \text{Minimum} \left( M_{\text{SwapMax, C4} - E, \text{MT Swap}_{E, C4}} \right) \rightarrow 109.142 \text{ or } 137.603 + 0
\]
\[
M_{\text{Swap}_{\text{Fred},C4}} = 109.142 \text{ kg}
\]

Mass of C4 Components to be moved into Allocated Crude Oil Eqn. 7A-10

\[
M_{\text{Swap}_{\text{Fred},C2}} = M_{\text{Swap}_{\text{Fred},C4}} \times \frac{M_{\text{SwapMax,Fred,C2}}}{\sum_{E} M_{\text{SwapMax,C4}}} \rightarrow 109.142 \times \frac{1.278}{109.142} = 1.278 \text{ kg}
\]

The same for C1 to nC4

Components mass to be moved into LE Receiver’s Allocated Crude Oil Eqn. 7A-11

\[
M_{\text{Swap}_{\text{N,ACO,C2}}} = M_{\text{Swap}_{\text{Fred,C1}}} \times \frac{IM_{\text{LE Recvr}_A, \text{Res Off Gases,C2}}}{\sum_{E} IM_{\text{LE Recvr}_E, \text{Res Off Gases,C2}}} \rightarrow 1.278 \times \frac{1.278}{1.278 + 0} = 1.278 \text{ kg}
\]

The same for C1 to nC4

Components mass to be moved out of LE Receiver’s Residual Off Gases Eqn. 7A-12

\[
M_{\text{SwapOut}_{A, \text{Res Off Gases,C2}}} = -M_{\text{Swap}_{\text{N,ACO,C2}}} = -1.278 \text{ kg}
\]

The same for C1 to nC4
Fraction of C4- moved from LE Receiver’s dry Residual Off Gases Eqn. 7A-13

\[
F_{Out,A,Res Off Gases,C4^{-}} = \frac{-\sum_{C=1}^{C4} M_{SwapOut,A,Res Off Gases,C} \cdot \sum_{C=1}^{C4} M_{A,Res Off Gases,C}}{-0+ -1.278+ -35.262+ -24.757+ -47.844 \rightarrow 0+ 1.278+ 35.262+ 24.757+ 47.844} = 1.000%
\]

Target of remaining Components to move out of LE Receivers Residual Off Gases Eqn. 7A-14

\[
MT_{SwapOut,A,Res Off Gases,iCS} = -IM_{LERecvr,A,Res Off Gases,iCS} \cdot F_{Out,A,Res Off Gases,C4^{-}} \rightarrow -2.401 \cdot 1.000% = -2.401 \, kg
\]

The same for N2 to CO2 and for nC5 to C12+

Mass of inerts to move out of LE Receivers Residual Off Gases Eqn. 7A-15

\[
\text{Abs} \left( \sum_{E} MT_{SwapOut,A,Res Off Gases,iCS} \right) < MS_{SwapMax,iCS}
\]

Then \(MT_{SwapOut,A,Res Off Gases,iCS} = MT_{SwapOut,A,Res Off Gases,iCS} = -2.401 \, kg\)

Else \(MT_{SwapOut,A,Res Off Gases,iCS} = -MS_{SwapMax,iCS} \cdot \frac{MT_{SwapOut,A,Res Off Gases,iCS}}{\sum_{E} MT_{SwapOut,E,Res Off Gases,iCS}}\)

The same for N2 to CO2 and for nC5 to C12+

In order to maintain mass balance, an equivalent mass of C4- Components shall be swapped from the Allocated Crude Oil initially allocated to those Entrants designated as Light End Donors and into such Entrants initially allocated Residual Off Gases.

Mass of inerts to be moved into LE Receivers Allocated Crude Oil Eqn. 7A-16

\(MS_{SwapIn,A,Res Off Gases,iCS} = -MS_{SwapOut,A,ACO,iCS} = 2.401 \, kg\)

The same for N2 to CO2 and for nC5 to C12+

Component mass to be moved out of LE Donors Allocated Crude Oil Eqn. 7A-17

\(MS_{SwapOut,B,ACO,H2O} = -\sum_{E} MS_{SwapIn,E,iCS} \cdot IM_{LEDonor,B,ACO,iCS} \cdot \sum_{E} IM_{LEDonor,E,ACO,iCS} \rightarrow -1.278 \cdot \frac{1.830}{0+ 1.830} = -1.278 \, kg\)

The same for N2 to C12+

Component mass to be moved into LE Donors Off Gases Eqn. 7A-18

\(MS_{SwapIn,B,Res Off Gases,HC2} = -MS_{SwapOut,B,ACO,C2} = 1.278 \, kg\)

The same for N2 to C12+

For each Entrant’s Allocated Crude Oil and Residual Off Gases, the mass of Components to be allocated shall be calculated from the sum of i) the mass of Components initially allocated to the Entrant’s Crude Oil and Off Gases, ii) the mass of Components swapped into the
Allocated Crude Oil and Residual Off Gases and iii) the mass of Components swapped out of the Allocated Crude Oil and Residual Off Gases.

**Allocated component masses Eqn. 7A-19**

\[
AM_{A,\text{Res Off Gases},H_2O} = IM_{A,\text{Res Off Gases},H_2O} + M_{\text{SwapIn}A,\text{Res Off Gases},H_2O} + M_{\text{SwapOut}A,\text{Res Off Gases},H_2O} \rightarrow 0 + -0 + 0 = 0 \text{ kg}
\]

\[
AM_{B,\text{Res Off Gases},C_2} = IM_{B,\text{Res Off Gases},C_2} + M_{\text{SwapIn}B,\text{Res Off Gases},C_2} + M_{\text{SwapOut}B,\text{Res Off Gases},C_2} \rightarrow 0 + 1.278 + 805 = 2.083 \text{ kg}
\]

The same for Crude Oil

The same for N\textsubscript{2} to C\textsubscript{12+}

\[(IM_{A,\text{Res Off Gases}}, IM_{B,\text{Res Off Gases}} \text{ from Eqn. 5-3})\]

For any Entrant that is designated a User, the measured mass of each Component in Propane and Butane, respectively, shall be distributed to such Entrant’s allocated Propane and Butane in proportion to the mass of the Component in the Entrant’s allocated Off Gases.

**Allocated Off Gases component masse to Non-Users Eqn. 7B-1**

\[
\text{If } User = \text{No} \\
\text{Then } AM_{\text{NonUser}_{A,\text{Off Gases},H_2O}} = AM_{A,\text{Res Off Gases},H_2O} + IM_{A,\text{Fuel Gas}} \rightarrow 160 \text{ kg}
\]

\[
\text{Else } AM_{\text{User}_{A,\text{Off Gases}} = AM_{A,\text{Off Gases},H_2O} + IM_{A,\text{Fuel Gas}}}
\]

\[
\text{If } User = \text{No} \\
\text{Then } AM_{\text{NonUser}_{B,\text{Off Gases},H_2O}} = AM_{B,\text{Res Off Gases},H_2O} + IM_{B,\text{Fuel Gas}} \rightarrow 1 \text{ kg}
\]

\[(IM_{A,\text{Fuel Gas}}, IM_{B,\text{Fuel Gas}} \text{ from Eqn. 5-2})\]

The same for all Components N\textsubscript{2} to C\textsubscript{12+}

**Total Components mass for Propane and Butane (LPG) Eqn. 7B-2**

\[
M_{\text{Fred,LPG,C}_2} = M_{\text{Fred,Propane,C}_2} + M_{\text{Fred,Butane,C}_2} \rightarrow 2.083 + 0 = 2.083 \text{ kg}
\]

\[(M_{\text{Fred,Propane,C}_2}, M_{\text{Fred,Butane,C}_2} \text{ from Eqn. 3-2})\]

**Allocation of Propane and Butane (LPG) to Users Eqn. 7B-3**

\[
\text{If } User = \text{Yes} \\
\text{Then } M_{B,LPG,C_2} = Min \left( M_{\text{Fred,LPG,C}_2} \frac{AM_{\text{User}_{B,\text{Off Gases,C}_2}}}{\sum E_{\text{User}_{E,\text{Off Gases,C}_2}}} \rightarrow 9.941 \text{ or } 2.083 \times \frac{9.941}{0 + 9.941} \right)
\]

\[
\text{Else } M_{B,LPG,C_2} = 0
\]

**Unallocated LPG Eqn. 7B-4**
\[ M_{\text{Fre d,LPG Rem},C_2} = M_{\text{Fre d,LPG},C_2} - \sum_E M_{E,LPG,C_2} \rightarrow 2.083 - (0 + 2.083) = 0 \, \text{kg} \]

The same for all Components \( \text{H}_2\text{O} \) to \( \text{C}_{12^+} \)

**Allocation of Propane and Butane (LPG) to Non-Users Eqn. 7B-5**

\[
\begin{align*}
\text{If User = Yes} & \\
\text{Then } AM_{A,LPG,C_1} &= M_{A,LPG,C_1} \\
AM_{A,LPG,C_1} &= \frac{AM_{\text{NonUser},\text{A,off Gases},C_1}}{\sum_E AM_{\text{NonUser},E,\text{off Gases},C_1}} \rightarrow 0 \times \frac{3.738}{3.738 + 0} = 0 \, \text{kg} \\
\text{Else } AM_{B,LPG,C_2} &= M_{B,LPG,C_2} \rightarrow 2.083 \, \text{kg} \\
AM_{B,LPG,C_2} &= \frac{AM_{\text{NonUser},B,\text{off Gases},C_2}}{\sum_E AM_{\text{NonUser},E,\text{off Gases},C_2}}
\end{align*}
\]

The same for all Components \( \text{H}_2\text{O} \) to \( \text{C}_{12^+} \)

**Allocation of Propane Eqn. 7B-6**

\[
\begin{align*}
AM_{A,\text{Propane},C_3} &= \frac{M_{\text{Fre d,Propane},C_3}}{M_{\text{Fre d,LPG},C_3}} \rightarrow 0 \times \frac{97.466}{98.409} = 0 \, \text{kg} \\
AM_{B,\text{Propane},C_3} &= \frac{M_{\text{Fre d,Propane},C_3}}{M_{\text{Fre d,LPG},C_3}} \rightarrow 98.409 \times \frac{97.466}{98.409} = 97.466 \, \text{kg}
\end{align*}
\]

The same for all Components \( \text{H}_2\text{O} \) to \( \text{C}_{12^+} \)

**Allocation of Butane Eqn. 7B-7**

\[
\begin{align*}
AM_{A,\text{Butane},C_3} &= \frac{M_{\text{Fre d,Butane},C_3}}{M_{\text{Fre d,LPG},C_3}} \rightarrow 0 \times \frac{943}{98.409} = 0 \, \text{kg} \\
AM_{B,\text{Butane},C_3} &= \frac{M_{\text{Fre d,Butane},C_3}}{M_{\text{Fre d,LPG},C_3}} \rightarrow 98.409 \times \frac{943}{98.409} = 943 \, \text{kg}
\end{align*}
\]

The same for all Components \( \text{H}_2\text{O} \) to \( \text{C}_{12^+} \)

Finally, for each Entrant and each Component, the mass of such Component to be allocated to the Entrant’s mass of Fuel Gas shall be calculated as i) the mass of the Component allocated to the Entrant’s Residual Off Gases less ii) the mass of the Component allocated to the Entrant’s Propane and Butane, respectively.

**Allocation of Fuel Gas Eqn. 7B-8**

\[
\begin{align*}
AM_{A,\text{FuelGas},C_1} &= AM_{A,\text{Off Gases},C_1} + IM_{A,\text{Fuel Gas},C_1} - AM_{A,\text{Propane},C_1} - AM_{A,\text{Butane},C_1} \rightarrow 0 + 3.738 - 0 - 3.738 = 3.738 \, \text{kg} \\
AM_{B,\text{FuelGas},C_2} &= AM_{B,\text{Off Gases},C_2} + IM_{B,\text{Fuel Gas},C_2} - AM_{B,\text{Propane},C_2} - AM_{B,\text{Butane},C_2} \rightarrow 2.083 + 7.306 - 2.083 - 0 = 7.306 \, \text{kg}
\end{align*}
\]

The same for all Components \( \text{H}_2\text{O} \) to \( \text{C}_{12^+} \)
STEP 8 - CALCULATION OF ALLOCATED MASSES TO FINISHED PRODUCTS FOR THE ALLOCATION PERIOD AND CONVERSION FROM MASSES TO VOLUMES

For each Entrant, the total dry mass of Allocated Crude Oil for the Allocation Period shall be calculated as the sum of Components allocated to the Allocated Crude Oil for the Allocation Period.

Dry mass allocated Eqn. 8-1

\[ AM_{A,FuelGas,dry} = \sum_{c=N_2}^{c=C_{12}+} AM_{A,FuelGas,c} \]
\[ \rightarrow 0 + 2.316 + 3.738 + 11.602 + 9.606 + 2.861 + 4.306 + 793 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 35.221 \text{ kg} \]

\[ AM_{B,FuelGas,dry} = \sum_{c=N_2}^{c=C_{12}+} AM_{B,FuelGas,c} \]
\[ \rightarrow 0 + 0 + 162 + 7.306 + 17.202 + 2.463 + 5.183 + 199 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 32.514 \text{ kg} \]

The same for Propane, Butane and Allocated Crude Oil

Removed sum of components from Fuel Gas, Propane and Butane Eqn. 8-2

\[ AM_{A,FP,H_2O,rem} = AM_{A,FuelGas,H_2O} + AM_{A,Propane,H_2O} + AM_{A,Butane,H_2O} + AM_{A,treated\_water} \]
\[ \rightarrow 160 + 0 + 0 + 91.674 = 91.834 \text{ kg} \]

\[ AM_{A,FP,C_1,rem} = AM_{A,FuelGas,C_1} + AM_{A,Propane,C_1} + AM_{A,Butane,C_1} \rightarrow 3.738 + 0 + 0 = 3.738 \text{ kg} \]

\[ AM_{B,FP,H_2O,rem} = AM_{B,FuelGas,H_2O} + AM_{B,Propane,H_2O} + AM_{B,Butane,H_2O} + AM_{B,treated\_water} \]
\[ \rightarrow 1 + 0 + 0 + 541 = 542 \text{ kg} \]

\[ AM_{B,FP,C_1,rem} = AM_{B,FuelGas,C_1} + AM_{B,Propane,C_1} + AM_{B,Butane,C_1} \rightarrow 162 + 0 + 0 = 162 \text{ kg} \]

The same for all Components CO\textsubscript{2} to nC\textsubscript{5}

Total sum of components redelivered Eqn. 8-3

\[ AM_{A,red} = \sum_{c = C_{02}}^{c = C_{n5}} AM_{A,FP,c,rem} + AM_{A,FP,H_2O,rem} + \sum_{c = H_2O}^{c = C_{12}+} AM_{A,ACO,c} \]
\[ \rightarrow 2.316 + 3.738 + 11.602 + 9.606 + 2.861 + 4.306 + 793 + 0 + 91.834 + 10.012 + 0 + 197 + 189 + 4.185 + 65.109 + 64.321 + 153.623 + 15.469.804 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 15.894.496 \text{ kg} \]
\[ AM_{B,\text{red}} = \sum_{c=CO2}^{c=nC5} AM_{B,PP,\text{rem}} + AM_{B,PP,H2O,\text{rem}} + \sum_{c=H2O}^{c=nC5} AM_{B,\text{ACO},c} \]
\[ = 0 + 162 + 9.389 + 115.611 + 48.533 + 110.618 + 3.202 + 0 + 542 + 59 + 0 + 0 + 8 + 552 + 18.186 + 9.302 + 79.484 + 3.873.081 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 \]
\[ = 4.268.727 \text{ kg} \]

\((AM_{A,\text{ACO}}, AM_{B,\text{ACO}}, \text{from Eqn. 7B-9})\)

**Fraction of Components of redelivered Finished Products Eqn. 8-4**

\[ Frac \ AM_{A,PP,H2O,\text{rem}} = \frac{AM_{A,PP,H2O,\text{rem}}}{AM_{A,\text{red}}} \to \frac{91.834}{15.894.496} = 0.0058 \]

\[ Frac \ AM_{B,PP,H2O,\text{rem}} = \frac{AM_{B,PP,H2O,\text{rem}}}{AM_{B,\text{red}}} \to \frac{542}{4.268.727} = 0.0001 \]

The same for all Components H\(_2\)O and CO\(_2\) to nC\(_5\)

**Fraction of Allocated Crude Oil of redelivered Finished Products Eqn. 8-5**

\[ Frac \ AM_{A,\text{ACO}} = \frac{\sum_{c=H2O}^{c=nC5} AM_{A,\text{ACO},c}}{AM_{A,\text{red}}} \to \frac{10.012 + 197 + 189 + 4.185 + 65.109 + 64.321 + 153.623 + 15.469.804 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0}{15.894.496} = 0.9920 \]

\[ Frac \ AM_{B,\text{ACO}} = \frac{\sum_{c=H2O}^{c=nC5} AM_{B,\text{ACO},c}}{AM_{B,\text{red}}} \to \frac{59 + 0 + 8 + 552 + 18.186 + 9.302 + 79.484 + 3.873.081 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0}{4.268.727} = 0.9325 \]

**Fraction of Crude Petroleum Eqn. 8-6**

\[ \text{If } AM_{A,\text{red}} = M_{A,\text{inlet\_wet\_p}} \]

\[ \text{Then } Frac \ AM_{A,\text{Crude Pet}} = \frac{M_{A,\text{inlet\_wet\_p}}}{AM_{A,\text{red}}} \to \frac{15.894.496}{15.894.496} = 1.000 \]

\[ \text{Else } Frac \ AM_{A,\text{Crude Pet}} = 1.0000 \]

\[ \text{If } AM_{B,\text{red}} = M_{B,\text{inlet\_wet\_p}} \]

\[ \text{Then } Frac \ AM_{B,\text{Crude Pet}} = \frac{M_{B,\text{inlet\_wet\_p}}}{AM_{B,\text{red}}} \to \frac{4.268.727}{4.268.727} = 1.000 \]

\[ \text{Else } Frac \ AM_{B,\text{Crude Pet}} = 1.0000 \]

**Calculated density of Allocated Crude Oil Eqn. 8-7**

\[ D_{A,\text{ACO}} = \frac{\text{Frac } AM_{A,\text{Crude Pet}} \times D_{A,\text{Crude Pet}_{\text{wet\_p}}}}{\text{Frac } AM_{A,\text{PP,H2O}_{\text{rem}}} \times D_{H2O} + \sum_{c=nC5} \frac{\text{Frac } AM_{A,\text{PP,rem}} \times SD_c}{0.9920}} \]

\[ = 851 \text{Sm}^3 \]
Allocated ideal volume in Allocated Crude Oil

The total volume of each an Entrant’s Allocated Crude Oil shall then be calculated from the product of i) the total mass of each of the Entrant’s Crude Oil and ii) the calculated Allocated Crude Oil Density for Entrant.

**Water Eqn. 8-8**

\[
AV_{A,ACO,H2O} = \frac{AM_{A,ACO,H2O}}{D_{Fred,dewater\ water,wet}} \rightarrow \frac{10.072}{985.2} = 10 \text{ kg}
\]

\[
AV_{B,ACO,H2O} = \frac{AM_{B,ACO,H2O}}{D_{Fred,dewater\ water,wet}} \rightarrow \frac{0}{985.2} = 0 \text{ kg}
\]

The same for all components C₁ to C₁₂.

**Ideal volume in Allocated Crude Oil Eqn. 8-9**

\[
V_{ideal, dry}^{A,ACO} = \frac{AM_{A,ACO}}{D_{A,ACO}} \rightarrow \frac{15.757.428}{851} = 18.517 \text{ kg}
\]

\[
V_{ideal, dry}^{B,ACO} = \frac{AM_{B,ACO}}{D_{B,ACO}} \rightarrow \frac{3.980.612}{778} = 5.114 \text{ kg}
\]

\((AM_{A,ACO} \cdot AM_{B,ACO} \text{ from Eqn. 7B-12})\)

Finally, the ideal volume of Allocated Crude Oil shall be normalised to the measured change in Crude Oil stock volume for the Allocation Period.

**Allocated dry volume in Allocated Crude Oil Eqn. 8-10**

\[
V_{Fred,CO, dry} = V_{Fred,CO, wet} - \sum E AV_{E,ACO,H2O} \rightarrow 23.957 - (10 + 0) = 23.947 \text{ Sm}^3
\]

\((V_{Fred,CO, wet} \text{ from analysis})\)

**Allocated dry volume to Allocated Crude Oil to Entrant Eqn. 8-11**

\[
AV_{A,ACO, dry} = \frac{V_{ideal, dry}^{A,ACO}}{V_{ideal, dry}^{A,ACO} + V_{ideal, dry}^{B,ACO}} \rightarrow 23.947 \times \frac{18.517}{18.517 + 5.114} = 18.765 \text{ Sm}^3
\]

\[
AV_{B,ACO, dry} = \frac{V_{ideal, dry}^{B,ACO}}{V_{ideal, dry}^{A,ACO} + V_{ideal, dry}^{B,ACO}} \rightarrow 23.947 \times \frac{5.114}{18.517 + 5.114} = 5.182 \text{ Sm}^3
\]

**Allocated dry volume in bbls Eqn. 8-12**
\[ AV_{A,ACO, dry, bbls} = AV_{A,ACO, dry, sm3} \times \frac{bbls}{sm3} \rightarrow 18.756 \times 6,292,955 = 118,087 \text{ bbls} \]

\[ AV_{B,ACO, dry, bbls} = AV_{B,ACO, dry, sm3} \times \frac{bbls}{sm3} \rightarrow 5.182 \times 6,292,955 = 32,611 \text{ bbls} \]