- Appendix 3b to Exhibit G: Allocation Procedure –
  User-User
This Appendix 3b to Exhibit G, Allocation Procedure, is an exemplification of the complete set of equations constituting the Allocation Schedule. For the purpose of this Appendix 3b Crude Petroleum is delivered to the Pipeline by “Entrant A” designated as a 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

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

Water

Dewater_{water} Eqn. 1-3

\[ M_{\text{Fred,dewater water,wet}} = V_{\text{Fred,dewater water,wet}} \times D_{\text{Fred,dewater water,wet}} = 100 \times 985,2 = 98.520 \text{ kg/d} \]

Degasser_{water} Eqn. 1-4

\[ M_{\text{Fred,degasser water,wet}} = V_{\text{Fred,degasser water,wet}} \times D_{\text{Fred,degasser water,wet}} = 84,4 \times 985,2 = 83.151 \text{ kg/d} \]

Fuel Gas Eqn. 1-5

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

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

Flare Pilot = \( M_{\text{Fred,Flare pilot,wet}} = V_{\text{Fred,Flare pilot,wet}} \times D_{\text{Fred,LP fuel,wet}} = 0,0 \times 10,2 = 0 \text{ kg/d} \)

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

Flare op purge = \( M_{\text{Fred,Flare op purge,wet}} = V_{\text{Fred,Flare op purge,wet}} \times D_{\text{Fred,LP fuel,wet}} = 0,0 \times 10,2 = 0 \text{ kg/d} \)

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

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

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

Import = \( M_{\text{Fred,Import,wet}} = V_{\text{Fred,Import,wet}} \times D_{\text{Fred,Import,wet}} = 0,0 \times 0,7 = 0 \text{ kg/d} \)
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**

\[
\text{Entrant } A = A = M_{A,\text{crude pet,H2O}} = M_{A,\text{crude pet,wet}} \times \frac{BSW_{A,\text{crude pet}}}{100} = 15.893.856 \times \frac{4}{100} = 63.575 \text{ kg/d}
\]

\[
\text{Entrant } B = B = M_{B,\text{crude pet,H2O}} = M_{B,\text{crude pet,wet}} \times \frac{BSW_{B,\text{crude pet}}}{100} = 4.268.538 \times \frac{1.40}{100} = 59.760 \text{ kg/d}
\]

**Dry mass Eqn. 2-2**

\[
M_{A,\text{crude pet,dry}} = M_{A,\text{crude pet,wet}} - M_{A,\text{crude pet,H2O}} = 15.893.856 - 63.575 = 15.830.281 \text{ kg/d}
\]

\[
M_{B,\text{crude pet,dry}} = M_{B,\text{crude pet,wet}} - M_{B,\text{crude pet,H2O}} = 4.268.538 - 59.760 = 4.208.779 \text{ kg/d}
\]

**Finished product Eqn. 2-3**

\[
\text{Propane} = M_{F,\text{propane,H2O}} = M_{F,\text{propane,wet}} \times \frac{BSW_{F,\text{Propane}}}{100} = 100.680 \times \frac{0}{100} = 0 \text{ kg/d}
\]

\[
\text{Butane} = M_{F,\text{butane,H2O}} = M_{F,\text{butane,wet}} \times \frac{BSW_{F,\text{Butane}}}{100} = 154.320 \times \frac{0}{100} = 0 \text{ kg/d}
\]

\[
CO = M_{F,\text{CO,H2O}} = M_{F,\text{CO,wet}} \times \frac{BSW_{F,\text{CO}}}{100} = 19.748.112 \times \frac{0.053}{100} = 10.466 \text{ kg/d}
\]

\[(M_{F,\text{CO,wet}} \text{ from Eqn 1-2})\]

**Dry mass Eqn. 2-4**

\[
\text{Propane} = M_{F,\text{propane,dry}} = M_{F,\text{propane,wet}} - M_{F,\text{propane,H2O}} = 100.680 - 0 = 100.680 \text{ kg/d}
\]

\[
\text{Butane} = M_{F,\text{butane,dry}} = M_{F,\text{butane,wet}} - M_{F,\text{butane,H2O}} = 154.320 - 0 = 154.320 \text{ kg/d}
\]

\[
CO = M_{F,\text{CO,dry}} = M_{F,\text{CO,wet}} - M_{F,\text{CO,H2O}} = 19.748.112 - 10.466 = 19.737.646 \text{ kg/d}
\]

**Fuel Gas Eqn. 2-5**

\[
\text{HPfuel} = M_{F,\text{HPfuel,H2O}} = M_{F,\text{HPfuel,wet}} \times \frac{BSW_{F,\text{HPfuel}}}{100} = 28.512 \times \frac{0.179}{100} = 51 \text{ kg/d}
\]

\[
\text{LPfuel} = M_{F,\text{LPfuel,H2O}} = M_{F,\text{LPfuel,wet}} \times \frac{BSW_{F,\text{LPfuel}}}{100} = 39.384 \times \frac{0.28}{100} = 110 \text{ kg/d}
\]

\[
\text{Flare Pilot} = M_{F,\text{Flare pilot,H2O}} = M_{F,\text{Flare pilot,wet}} \times \frac{BSW_{F,\text{Flare pilot}}}{100} = 0 \times \frac{0.28}{100} = 0 \text{ kg/d}
\]
\[ Flare \text{ op\ purge} = M_{Fred,Flare \text{ op\ purge,}H_2O} = M_{Fred,Flare \text{ op\ purge,wet}} \cdot \frac{BSW_{Fred,Flare \text{ op\ purge}}}{100} = 0 \cdot \frac{0.28}{100} = 0 \text{ kg/d} \]

\[ Export = M_{Fred,Export,H_2O} = M_{Fred,Export,wet} \cdot \frac{BSW_{Fred,Export}}{100} = 0 \cdot \frac{0.28}{100} = 0 \text{ kg/d} \]

\[ Import = M_{Fred,Import,H_2O} = M_{Fred,Import,wet} \cdot \frac{BSW_{Fred,Import}}{100} = 0 \cdot \frac{0}{100} = 0 \text{ kg/d} \]

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

\[ HPfuel = M_{Fred,HPfuel,dry} = M_{Fred,HPfuel,wet} - M_{Fred,HPfuel,H_2O} = 28.512 - 51 = 28.461 \text{ kg/d} \]

\[ LPfuel = M_{Fred,LPfuel,dry} = M_{Fred,LPfuel,wet} - M_{Fred,LPfuel,H_2O} = 39.384 - 110 = 39.274 \text{ kg/d} \]

\[ Flare \text{ Pilot} = M_{Fred,Flare \text{ pilot,dry}} = M_{Fred,Flare \text{ pilot,wet}} - M_{Fred,Flare \text{ pilot,H}_2O} = 0 - 0 = 0 \text{ kg/d} \]

\[ Flare \text{ op\ purge} = M_{Fred,Flare \text{ op\ purge,dry}} = M_{Fred,Flare \text{ op\ purge,wet}} - M_{Fred,Flare \text{ op\ purge,H}_2O} = 0 - 0 = 0 \text{ kg/d} \]

\[ Export = M_{Fred,Export,dry} = M_{Fred,Export,wet} - M_{Fred,Export,H_2O} = 0 - 0 = 0 \text{ kg/d} \]

\[ Import = M_{Fred,Import,dry} = M_{Fred,Import,wet} - M_{Fred,Import,H_2O} = 0 - 0 = 0 \text{ kg/d} \]

**Flare total**

**Wet mass Eqn. 2-7**

\[ Flare = M_{Fred,Flare,H_2O} = M_{Fred,flare \text{ pilot,H}_2O} + M_{Fred,Flare \text{ op\ purge,H}_2O} = 0 + 0 = 0 \text{ kg/d} \]

**Dry mass Eqn. 2-8**

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

**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**

\[ M_{Close_{Fred,Offspec,H_2O}} = M_{Close_{Fred,Offspec,wet}} \cdot \frac{BSW_{Fred,Offspec}}{100} \rightarrow 0 \cdot \frac{3}{100} = 0 \text{ kg/d} \]

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

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

\[ M_{Fred,Offspec \text{ inc} \text{ H}_2\text{O}} = M\text{Close}_{Fred,Offspec \text{ H}_2\text{O}} - (M\text{Close}_{Fred,Offspec \text{ H}_2\text{O},d-1} + M\text{Adj}_{Fred,Offspec \text{ H}_2\text{O}}) \rightarrow 0 - (0 + 0) = 0 \text{ kg/d} \]
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

\[
\begin{align*}
M_{A,\text{Crude Pet,N2}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,N2}} \rightarrow 15.830.281 \times 0.000 = 0 \text{ kg/d} \\
M_{A,\text{Crude Pet,CO}_2} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,CO}_2} \rightarrow 15.830.281 \times 0.0002 = 2.375 \text{ kg/d} \\
M_{A,\text{Crude Pet,C1}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C1}} \rightarrow 15.830.281 \times 0.0003 = 4.116 \text{ kg/d} \\
M_{A,\text{Crude Pet,C2}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C2}} \rightarrow 15.830.281 \times 0.0011 = 17.256 \text{ kg/d} \\
M_{A,\text{Crude Pet,C3}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C3}} \rightarrow 15.830.281 \times 0.0055 = 86.753 \text{ kg/d} \\
M_{A,\text{Crude Pet,C4}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C4}} \rightarrow 15.830.281 \times 0.0067 = 106.126 \text{ kg/d} \\
M_{A,\text{Crude Pet,nC4}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,nC4}} \rightarrow 15.830.281 \times 0.0163 = 258.281 \text{ kg/d} \\
M_{A,\text{Crude Pet,C5}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C5}} \rightarrow 15.830.281 \times 0.0111 = 175.248 \text{ kg/d} \\
M_{A,\text{Crude Pet,nC5}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,nC5}} \rightarrow 15.830.281 \times 0.0102 = 161.159 \text{ kg/d} \\
M_{A,\text{Crude Pet,C6}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C6}} \rightarrow 15.830.281 \times 0.0303 = 479.993 \text{ kg/d} \\
M_{A,\text{Crude Pet,C7}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C7}} \rightarrow 15.830.281 \times 0.0491 = 777.299 \text{ kg/d} \\
M_{A,\text{Crude Pet,C8}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C8}} \rightarrow 15.830.281 \times 0.0512 = 810.841 \text{ kg/d} \\
M_{A,\text{Crude Pet,C9}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C9}} \rightarrow 15.830.281 \times 0.0384 = 608.416 \text{ kg/d} \\
M_{A,\text{Crude Pet,C10}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C10}} \rightarrow 15.830.281 \times 0.0395 = 625.158 \text{ kg/d} \\
M_{A,\text{Crude Pet,C11}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C11}} \rightarrow 15.830.281 \times 0.0320 = 506.211 \text{ kg/d} \\
M_{A,\text{Crude Pet,C12+}} &= M_{A,\text{Crude Pet,dry}} \times X_{A,\text{Crude Pet,C12+}} \rightarrow 15.830.281 \times 0.0702 = 11.211.050 \text{ kg/d} \\
M_{B,\text{Crude Pet,N2}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,N2}} \rightarrow 4.208.779 \times 0.0000 = 0 \text{ kg/d} \\
M_{B,\text{Crude Pet,CO}_2} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,CO}_2} \rightarrow 4.208.779 \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 4.208.779 \times 0.0004 = 168 \text{ kg/d} \\
M_{B,\text{Crude Pet,C2}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C2}} \rightarrow 4.208.779 \times 0.0023 = 9.808 \text{ kg/d} \\
M_{B,\text{Crude Pet,C3}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C3}} \rightarrow 4.208.779 \times 0.0312 = 131.374 \text{ kg/d} \\
M_{B,\text{Crude Pet,C4}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C4}} \rightarrow 4.208.779 \times 0.0136 = 57.121 \text{ kg/d} \\
M_{B,\text{Crude Pet,nC4}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,nC4}} \rightarrow 4.208.779 \times 0.0446 = 187.822 \text{ kg/d} \\
M_{B,\text{Crude Pet,C5}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C5}} \rightarrow 4.208.779 \times 0.0205 = 86.376 \text{ kg/d} \\
M_{B,\text{Crude Pet,nC5}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,nC5}} \rightarrow 4.208.779 \times 0.0324 = 136.552 \text{ kg/d} \\
M_{B,\text{Crude Pet,C6}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C6}} \rightarrow 4.208.779 \times 0.0484 = 203.523 \text{ kg/d} \\
M_{B,\text{Crude Pet,C7}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C7}} \rightarrow 4.208.779 \times 0.0428 = 180.045 \text{ kg/d} \\
M_{B,\text{Crude Pet,C8}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C8}} \rightarrow 4.208.779 \times 0.0446 = 187.815 \text{ kg/d} \\
M_{B,\text{Crude Pet,C9}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C9}} \rightarrow 4.208.779 \times 0.0335 = 140.927 \text{ kg/d} \\
M_{B,\text{Crude Pet,C10}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C10}} \rightarrow 4.208.779 \times 0.0344 = 144.805 \text{ kg/d} \\
M_{B,\text{Crude Pet,C11}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C11}} \rightarrow 4.208.779 \times 0.0279 = 117.254 \text{ kg/d} \\
M_{B,\text{Crude Pet,C12+}} &= M_{B,\text{Crude Pet,dry}} \times X_{B,\text{Crude Pet,C12+}} \rightarrow 4.208.779 \times 0.0623 = 2.625.188 \text{ kg/d}
\end{align*}
\]

\(\left(\text{\text{M}_{\text{A,Crude Pet,dry}} = \text{\text{M}_{\text{B,Crude Pet,dry}}}} \right) \text{\text{from Eqn. 2-2}}\)
Finished Products Component masses Eqn. 3-2

\[ \begin{align*}
\text{Fredericia} &= M_{\text{Fred,Propane,}_C2} = M_{\text{Fred,Propane,dry}} \times X_{\text{Fred,Propane,}_C2} \rightarrow 100.680 \times 0.0207 = 2.083 \text{ kg/d} \\
M_{\text{Fred,Butane,}_C3} &= M_{\text{Fred,Butane,dry}} \times X_{\text{Fred,Butane,}_C3} \rightarrow 154.320 \times 0.0061 = 943 \text{ kg/d} \\
M_{\text{Fred,CO,}_C2} &= M_{\text{Fred,CO,dry}} \times X_{\text{Fred,CO,}_C2} \rightarrow 19.737.646 \times 0.0002 = 4.740 \text{ kg/d}
\end{align*} \]

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

The same for all Components \( N_2 \) to \( C_{12^+} \)

Fuel Gas Eqn. 3-3

\[ \begin{align*}
\text{HPfuel} &= M_{\text{Fred,HPfuel,CO}_2} = M_{\text{Fred,HPfuel,dry}} \times X_{\text{Fred,HPfuel,CO}_2} \rightarrow 28.461 \times 0.0392 = 1.115 \text{ kg/d} \\
\text{LPfuel} &= M_{\text{Fred,LPfuel,CO}_2} = M_{\text{Fred,LPfuel,dry}} \times X_{\text{Fred,LPfuel,CO}_2} \rightarrow 39.274 \times 0.0306 = 1.201 \text{ kg/d} \\
\text{Flare} &= M_{\text{Fred,Flare,CO}_2} = M_{\text{Fred,Flare,dry}} \times X_{\text{Fred,Flare,CO}_2} \rightarrow 0 \times 0.0306 = 0 \text{ kg/d} \\
\text{Export} &= M_{\text{Fred,Export,CO}_2} = M_{\text{Fred,Export,dry}} \times X_{\text{Fred,Export,CO}_2} \rightarrow 0 \times 0.0306 = 0 \text{ kg/d} \\
\text{Import} &= M_{\text{Fred,Import,CO}_2} = M_{\text{Fred,Import,dry}} \times X_{\text{Fred,Import,CO}_2} \rightarrow 0 \times 0.0300 = 0 \text{ kg/d}
\end{align*} \]

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

The same for all Components \( N_2 \) to \( C_{12^+} \)

Total Exported Fuel Gas Eqn. 3-4

\[ M_{\text{Fred,Export,H}_2O} = M_{\text{Fred,HP export,H}_2O} + M_{\text{Fred,LP export,H}_2O} \rightarrow 51 + 0 = 51 \text{ kg/d} \]

The same for all Components \( N_2 \) to \( C_{12^+} \)

Fuel Gas Total Eqn. 3-5

\[ M_{\text{Fred,FuelGas,CO}_2} = M_{\text{Fred,HP fuel,CO}_2} + M_{\text{Fred,LP fuel,CO}_2} + M_{\text{Fred,Flare,CO}_2} + M_{\text{Fred,Export,CO}_2} + M_{\text{Fred,Import,CO}_2} \rightarrow 1.115 + 1.201 + 0 + 0 + 0 = 2.316 \text{ kg/d} \]

The same for all Components \( H_2O \) to \( C_{12^+} \)

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

\[ M_{\text{Close,Offspec,}_N2} = M_{\text{Close,Offspec,dry}} \times X_{\text{Close,Offspec,}_N2} \rightarrow 0 \times 0 = 0 \text{ kg/d} \]

The same for all Components \( N_2 \) to \( C_{12^+} \)

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

\[ M_{\text{Fred,Offspec inc,}_N2} = M_{\text{Close,Offspec,dry}} - \left( M_{\text{Close,Offspec,}_N2,d-1} + M_{\text{Adj,Offspec,}_N2} \right) \rightarrow 0 - (0 + 0) = 0 \text{ kg/d} \]

The same for all Components \( N_2 \) to \( C_{12^+} \)
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

\[ M_{\text{Fred, outlet H2O}} = M_{\text{Fred,Propane,H2O}} + M_{\text{Fred,Butane,H2O}} + M_{\text{Fred,CO,H2O}} + M_{\text{Fred,LP fuel,H2O}} + M_{\text{Fred,HN fuel,H2O}} + M_{\text{Fred,Flare,H2O}} + M_{\text{Fred,Export,H2O}} + M_{\text{Close,Fred,Offspec,H2O}} + M_{\text{Fred,Import,H2O}} \]

\[ \rightarrow 0 + 0 + 10.466 + 51 + 110 + 0 + 0 - 0 = 10.628 \text{ kg} \]

Total mass of water leaving Terminal Eqn. 4-2

\[ M_{\text{Fred, inlet H2O}} = M_{\text{Fred, dewater water, wet}} + M_{\text{Fred, degas water, wet}} + M_{\text{Fred, outlet H2O}} \]

\[ = 98.520 + 83.151 + 10.628 = 192.299 \text{ kg} \]

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

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

\[ \rightarrow 97.464 + 943 + 83.337 + 26.808 + 0 = 208.552 \text{ kg} \]

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

The same for all Components N2 to C12+

Total wet inlet mass Eqn. 4-4

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

\[ = M_{\text{Fred, inlet H2O}} \]

\[ + \sum_{c=C12+} M_{\text{Fred, inlet, c}} \]

\[ \rightarrow 192.299 + 0 + 2.515 + 4.097 + 25.730 + 208.552 + 125.054 + 347.951 + 259.266 \]

\[ + 288.251 + 682.797 + 960.490 + 1.001.897 + 751.775 + 772.462 + 625.489 \]

\[ + 14.004.055 = 20.252.679 \text{ kg} \]

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

\[ M_{\text{Initial}_{A,\text{Pipeline stock},H_2O}} = M_{\text{Close}_{A,\text{Pipeline stock},H_2O,d-1}} + M_{\text{Adj}_{A,\text{Pipeline stock},H_2O}} + M_{A,\text{Crude Pet},H_2O} \rightarrow 158.939 + 0 + 63.575 = 222.514 \text{ kg} \]

\[ (M_{A,\text{Crude Pet},H_2O} \text{ from Eqn. 2-1}) \]

\[ M_{\text{Initial}_{A,\text{Pipeline stock},C_1}} = M_{\text{Close}_{A,\text{Pipeline stock},C_1,d-1}} + M_{\text{Adj}_{A,\text{Pipeline stock},C_1}} + M_{A,\text{Crude Pet},C_1} \rightarrow 10.290 + 0 + 4.116 = 14.406 \text{ kg} \]

\[ (M_{A,\text{Crude Pet},C_1} \text{ from Eqn. 3-1}) \]

\[ M_{\text{Initial}_{B,\text{Pipeline stock},H_2O}} = M_{\text{Close}_{B,\text{Pipeline stock},H_2O,d-1}} + M_{\text{Adj}_{B,\text{Pipeline stock},H_2O}} + M_{B,\text{Crude Pet},H_2O} \rightarrow 149.399 + 0 + 59.760 = 209.158 \text{ kg} \]

\[ (M_{B,\text{Crude Pet},H_2O} \text{ from Eqn. 3-1}) \]

\[ M_{\text{Initial}_{B,\text{Pipeline stock},C_1}} = M_{\text{Close}_{B,\text{Pipeline stock},C_1,d-1}} + M_{\text{Adj}_{B,\text{Pipeline stock},C_1}} + M_{B,\text{Crude Pet},C_1} \rightarrow 421 + 0 + 168 = 589 \text{ kg} \]

\[ (M_{B,\text{Crude Pet},C_1} \text{ from Eqn. 3-1}) \]

The same for all components \( H_2O \) to \( C_{12+} \)

Pipeline Stock wet Eqn. 4-6

\[ M_{\text{Initial}_{A,\text{Pipeline stock},\text{wet}}} = \sum_{c=C_{12+}} M_{\text{Initial}_{A,\text{Pipeline stock},c}} \rightarrow 222.514 + 0 + 8.311 + 14.406 + 60.395 + 303.637 + 371.442 + 903.982 + 613.369 + 564.055 + 1.679.977 + 2.720.545 + 2.837.942 + 2.129.455 + 2.188.052 + 1.771.740 + 39.238.675 = 55.628.496 \text{ kg} \]

\[ M_{\text{Initial}_{B,\text{Pipeline stock},\text{wet}}} = \sum_{c=C_{12+}} M_{\text{Initial}_{B,\text{Pipeline stock},c}} \rightarrow 209.158 + 0 + 0 + 589 + 34.327 + 459.810 + 199.924 + 657.377 + 302.317 + 477.932 + 712.330 + 630.159 + 657.351 + 493.245 + 506.818 + 410.387 + 9.188.159 = 14.939.884 \text{ kg} \]

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 \( F\text{Stock}_A = 0 \)

\[ \text{Then } M_{T,A,\text{inlet, wet}} = M_{A,\text{Crude Pet, wet}} \rightarrow 15.893.856 = 15.893.856 \text{ kg} \]

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

\( H\text{ejr} = \text{If } F\text{Stock}_B = 0 \)

\[ \text{Then } M_{T,B,\text{inlet, wet}} = M_{B,\text{Crude Pet, wet}} \rightarrow 4.268.538 = 4.268.538 \text{ kg} \]

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

\[ (M_{A,\text{Crude Pet, wet}} - M_{B,\text{Crude Pet, wet}} \text{ from Eqn. 1-1}) \]
Initial Entrant inlet rate Eqn. 4-8

\[ MI_{A,\text{inlet,wet}} = \frac{MT_{A,\text{inlet,wet}}}{\sum E MT_{E,\text{inlet,wet}}} \times 20.252.679 \times \frac{15.893.856}{15.893.856 + 4.268.538} = 15.965.027 \text{ kg} \]

\[ MI_{B,\text{inlet,wet}} = \frac{MT_{B,\text{inlet,wet}}}{\sum E MT_{E,\text{inlet,wet}}} \times 20.252.679 \times \frac{4.268.538}{15.893.856 + 4.268.538} = 4.287.652 \text{ kg} \]

Initial Entrant inlet Component masses Eqn. 4-9

\[ MI_{A,\text{inlet,H}_2\text{O}} = MI_{A,\text{inlet,wet}} \times \frac{M_{\text{Initial}_{A,\text{Pipestock,H}_2\text{O}}}}{M_{\text{Initial}_{A,\text{Pipestock,wet}}}} = 15.965.027 \times \frac{222.514}{55.628.496} = 63.860 \text{ kg} \]

\[ MI_{B,\text{inlet,H}_2\text{O}} = MI_{B,\text{inlet,wet}} \times \frac{M_{\text{Initial}_{B,\text{Pipestock,H}_2\text{O}}}}{M_{\text{Initial}_{B,\text{Pipestock,wet}}}} = 4.268.652 \times \frac{209.158}{14.939.884} = 60.027 \text{ kg} \]

\[ MI_{\text{Fred,inlet,H}_2\text{O}} = MI_{A,\text{inlet,H}_2\text{O}} + MI_{B,\text{inlet,H}_2\text{O}} = 63.860 + 60.027 = 123.887 \text{ kg} \]

The same for all Components H2O to C12+

Allocated Entrant inlet Component masses Eqn. 4-10

If \( MI_{A,\text{inlet,H}_2\text{O}} = 0 \)

Then \( MI_{A,\text{inlet,H}_2\text{O}} + MI_{B,\text{inlet,H}_2\text{O}} = 0 \)

Else \( MI_{A,\text{inlet,H}_2\text{O}} = MI_{\text{Fred,inlet,H}_2\text{O}} \times \frac{MI_{A,\text{inlet,wet}}}{\sum E MI_{E,\text{inlet,wet}}} \)

\[ MI_{A,\text{inlet,H}_2\text{O}} \neq 0 \rightarrow MT_{A,\text{inlet,H}_2\text{O}} = MI_{\text{Fred,inlet,H}_2\text{O}} \times \frac{MI_{A,\text{inlet,wet}}}{MI_{\text{Fred,inlet,H}_2\text{O}}} = 192.229 \times \frac{63.860}{123.887} = 99.124 \text{ kg} \]

If \( MI_{B,\text{inlet,H}_2\text{O}} = 0 \)

Then \( MI_{A,\text{inlet,H}_2\text{O}} + MI_{B,\text{inlet,H}_2\text{O}} = 0 \)

Else \( MI_{B,\text{inlet,H}_2\text{O}} = MI_{\text{Fred,inlet,H}_2\text{O}} \times \frac{MI_{B,\text{inlet,wet}}}{\sum E MI_{E,\text{inlet,wet}}} \)

\[ MI_{B,\text{inlet,H}_2\text{O}} \neq 0 \rightarrow MT_{B,\text{inlet,H}_2\text{O}} = MI_{\text{Fred,inlet,H}_2\text{O}} \times \frac{MI_{B,\text{inlet,wet}}}{MI_{\text{Fred,inlet,H}_2\text{O}}} = 192.299 \times \frac{60.027}{123.887} = 93.175 \text{ kg} \]

The same for all Components H2O to C12+

The sum of Allocated inlet Component masses Eqn. 4-12
\[ M_{A,\text{inlet,dry}} = \sum_{c=C^{12+}}^{c=N^{2}} M_{A,\text{inlet,c}} = 0 + 2.515 + 3.936 + 16.405 + 82.945 + 81.297 + 201.454 + 173.668 + 156.038 + 479.488 + 779.853 + 813.472 + 610.390 + 627.187 + 507.854 + 11.347.026 = 15.883.530 \text{ kg} \]

\[ M_{B,\text{inlet,wet}} = \sum_{c=C^{12+}}^{c=N^{2}} M_{B,\text{inlet,c}} = 0 + 0 + 161 + 9.325 + 125.607 + 43.757 + 146.497 + 85.598 + 132.213 + 203.309 + 180.637 + 188.424 + 141.384 + 145.275 + 117.634 + 2.657.029 = 4.176.850 \text{ kg} \]

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

\[ M_{A,\text{inlet,wet}} = M_{A,\text{inlet,dry}} + M_{A,\text{inlet,H}_{2}O} \rightarrow 15.883.530 + 99.124 = 15.982.654 \text{ kg} \]

\[ M_{B,\text{inlet,wet}} = M_{B,\text{inlet,dry}} + M_{B,\text{inlet,H}_{2}O} \rightarrow 4.176.850 + 93.175 = 4.270.025 \text{ kg} \]

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

\[ M_{\text{Close,}A,\text{pipestock,C1}} = M_{\text{Initial,}A,\text{pipestock,C1}} - M_{A,\text{inlet,C1}} \rightarrow 222.514 - 99.124 = 123.390 \text{ kg} \]

\[ M_{\text{Close,}B,\text{pipestock,C1}} = M_{\text{Initial,}B,\text{pipestock,C1}} - M_{B,\text{inlet,C1}} \rightarrow 209.158 - 93.175 = 115.984 \text{ kg} \]

The same for all components H\textsubscript{2}O to C\textsubscript{12+}

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

\[ M_{\text{Close,}A,\text{pipestock,wet}} = \sum_{c=C^{12+}}^{c=H^{2}O} M_{\text{Close,}A,\text{pipestock,c}} = 123.390 + 0 + 5.796 + 10.470 + 43.989 + 220.692 + 290.145 + 702.528 + 439.700 + 408.018 + 1.200.488 + 1.940.692 + 2.024.470 + 1.519.064 + 1.560.865 + 1.263.886 + 27.891.648 = 39.645.842 \text{ kg} \]

\[ M_{\text{Close,}B,\text{pipestock,wet}} = \sum_{c=C^{12+}}^{c=H^{2}O} M_{\text{Close,}B,\text{pipestock,c}} = 115.984 + 0 + 0 + 428 + 25.003 + 334.203 + 156.167 + 510.880 + 216.719 + 345.719 + 509.021 + 449.522 + 468.927 + 351.860 + 361.543 + 292.753 + 6.531.130 = 10.669.859 \text{ kg} \]

Warning on Pipeline Stock Eqn. 4-15
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

\[
M_{A,\text{Off Spec inc,H}_2\text{O}} = M_{\text{Fred,Off Spec inc,H}_2\text{O}} \cdot \frac{M_{A,\text{inlet,H}_2\text{O}}}{M_{\text{Fred,inlet,H}_2\text{O}}} \rightarrow 0 \cdot \frac{99.124}{192.299} = 0 \text{ kg/d}
\]

\[
M_{B,\text{Off Spec inc,H}_2\text{O}} = M_{\text{Fred,Off Spec inc,H}_2\text{O}} \cdot \frac{M_{B,\text{inlet,H}_2\text{O}}}{M_{\text{Fred,inlet,H}_2\text{O}}} \rightarrow 0 \cdot \frac{93.175}{192.299} = 0 \text{ kg/d}
\]

The same for all Components H$_2$O to C$_{12+}$

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

\[
M_{\text{Fred,treated water,wet}} = M_{\text{Fred,dewater water,wet}} + M_{\text{Fred,degas water,wet}} = 98.520 + 83.151 = 181.671 \text{ kg}
\]

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

\[
A M_{A,\text{treated water}} = M_{\text{Fred,treated water,wet}} \cdot \frac{M_{A,\text{inlet,H}_2\text{O}}}{M_{\text{Fred,inlet,H}_2\text{O}}} = 181.671 \cdot \frac{99.124}{192.299} = 93.646 \text{ kg}
\]

\[
A M_{B,\text{treated water}} = M_{\text{Fred,treated water,wet}} \cdot \frac{M_{B,\text{inlet,H}_2\text{O}}}{M_{\text{Fred,inlet,H}_2\text{O}}} = 181.671 \cdot \frac{93.175}{192.299} = 88.025 \text{ kg}
\]

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

\[
M_{\text{Fred,inlet avail,H}_2\text{O}} = M_{\text{Fred,inlet,H}_2\text{O}} - M_{\text{Fred,treated water,wet}} - M_{\text{Fred,Off Spec inc,H}_2\text{O}} = 192.299 - 181.671 - 0 = 10.628 \text{ kg}
\]

Allocated inlet available Component Eqn. 4-19

\[
M_{\text{Fred,inlet avail,C}_2\text{O}_2} = M_{\text{Fred,inlet,C}_2\text{O}_2} - M_{\text{Fred,Off Spec inc,C}_2\text{O}_2} = 2.515 - 0 = 2.515 \text{ kg}
\]

The same for all Components N$_2$ to C$_{12+}$
Allocated inlet available water to Entrant Eqn. 4-21

\[ M_{A,\text{inlet avail},H_2O} = M_{A,\text{inlet},H_2O} - A M_{A,\text{treated water}} - M_{A,\text{off Spec inc},H_2O} = 99.124 - 93.645 - 0 = 5.478 \text{ kg} \]

\[ M_{B,\text{inlet avail},H_2O} = M_{B,\text{inlet},H_2O} - A M_{B,\text{treated water}} - M_{B,\text{off Spec inc},H_2O} = 93.175 - 88.025 - 0 = 5.149 \text{ kg} \]

Allocated inlet available Component to Entrant Eqn. 4-22

\[ M_{A,\text{inlet avail},CO_2} = M_{A,\text{inlet},CO_2} - M_{A,\text{off Spec inc},CO_2} = 2.515 - 0 = 2.515 \text{ kg} \]

\[ M_{B,\text{inlet avail},C_1} = M_{B,\text{inlet},C_1} - M_{B,\text{off Spec inc},C_1} = 161 - 0 = 161 \text{ kg} \]

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

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

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

\[ = 0 + 2.515 + 3.936 + 16.405 + 82.945 + 81.297 + 201.454 + 173.668 + 156.038 \]

\[ + 479.488 + 779.853 + 813.472 + 610.390 + 627.187 + 507.854 + 11.347.026 \]

\[ = 15.883.530 \text{ kg} \]

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

\[ = 0 + 0 + 161 + 9.325 + 125.607 + 43.757 + 146.497 + 85.598 + 132.213 + 203.309 \]

\[ + 180.637 + 188.424 + 141.384 + 145.275 + 117.634 + 2.657.029 = 4.176.850 \text{ kg} \]
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

\[
\text{If } M_{\text{Fred, inlet avail}_c} < 0 \rightarrow 0 \text{ to } 10.628 > 0
\]

\[
\text{Then } IM_{A, ACO, H_2O} = M_{\text{Fred, CO}_2, H_2O} \times \frac{M_{A, \text{inlet avail}, H_2O}}{\sum E M_{\text{Fred, inlet avail}, H_2O}} \rightarrow 10.466 \times \frac{5.478}{10.628} = 5.395 \text{ kg}
\]

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

\[
\text{Hejre } = \text{If } M_{\text{Fred, inlet avail}_c} < 0 \rightarrow 0 \text{ to } 10.628 \text{ > 0}
\]

\[
\text{Then } IM_{B, ACO, H_2O} = M_{\text{Fred, CO}_2, H_2O} \times \frac{M_{B, \text{inlet avail}, H_2O}}{\sum E M_{\text{Fred, inlet avail}, H_2O}} \rightarrow 10.466 \times \frac{5.149}{10.628} = 5.071 \text{ kg}
\]

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

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

\[M_{\text{Fred, inlet avail}_c} \text{ from Eqn. 4-18 and 4-19, } M_{\text{Fred, CO}_2} \text{ from Eqn. 3-2 and 2-3 and } M_{E, \text{inlet avail, dry}} \text{ from Eqn. 4-21 and 4-22}\]

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**

\[
\text{If } M_{\text{Fred, inlet avail}_c} < 0 \rightarrow 0 \text{ to } 10.628 > 0
\]

\[
\text{Then } IM_{A, \text{ Fuel Gas}, H_2O} = M_{\text{Fred, Fuel Gas}, H_2O} \times \frac{M_{A, \text{inlet avail}, H_2O}}{\sum E M_{\text{Fred, inlet avail}, H_2O}} \rightarrow 161 \times \frac{5.478}{10.628} = 83 \text{ kg}
\]

\[
\text{Else } IM_{A, ACO, c} = M_{\text{Fred, Fuel Gas}, H_2O} \times \frac{M_{E, \text{inlet avail, dry}}}{\sum E M_{E, \text{inlet avail, dry}}}
\]

\[
\text{If } M_{\text{Fred, inlet avail}_c} < 0 \rightarrow 0 \text{ to } 10.628 > 0
\]

\[
\text{Then } IM_{B, \text{ Fuel Gas}, H_2O} = M_{\text{Fred, Fuel Gas}, H_2O} \times \frac{M_{B, \text{inlet avail}, H_2O}}{\sum E M_{\text{Fred, inlet avail}, H_2O}} \rightarrow 161 \times \frac{5.149}{10.628} = 78 \text{ kg}
\]

\[
\text{Else } IM_{B, ACO, c} = M_{\text{Fred, Fuel Gas}, H_2O} \times \frac{M_{E, \text{inlet avail, dry}}}{\sum E M_{E, \text{inlet avail, dry}}}
\]
The same for all Components H2O to C12+

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

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

\[
IM_{A, \text{Res Off Gases}, C_2} = M_{A, \text{inlet avail}, C_2} - IM_{A, \text{ACO}, C_2} - IM_{A, \text{Fuel Gas}, C_2} \rightarrow 16.405 - 3.022 - 12.055 = 1.328 \text{ kg}
\]

\[
IM_{B, \text{Res Off Gases}, C_2} = M_{B, \text{inlet avail}, C_2} - IM_{B, \text{ACO}, C_2} - IM_{B, \text{Fuel Gas}, C_2} \rightarrow 9.325 - 1.718 - 6.852 = 755 \text{ kg}
\]

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**

\[
X_{Fred, CO, C_4-} = \frac{\sum_{c=G1}^{c} X_{Fred, CO, dry}}{\sum_{c=G1, N2}^{c} X_{Fred, CO, c, dry}} \rightarrow 0.0002 + 0.0042 + 0.0037 + 0.0118 = 2.00 \%
\]

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

\[
IX_{A, \text{ACO}, C_4-} = \frac{\sum_{c=G1}^{c} IM_{A, \text{ACO}, c}}{\sum_{c=G1, N2}^{c} IM_{A, \text{ACO}, c}} \rightarrow \frac{190 + 3.022 + 33.145 + 47.886 + 134.916}{15.711.792} = 1.39 \%
\]

\[
IX_{B, \text{ACO}, C_4-} = \frac{\sum_{c=G1}^{c} IM_{B, \text{ACO}, c}}{\sum_{c=G1, N2}^{c} IM_{B, \text{ACO}, c}} \rightarrow \frac{8 + 1.718 + 50.192 + 25.774 + 98.111}{4.025.853} = 4.37 \%
\]

(SUM_{IM_{A,ACO,c}, IM_{B,ACO,c} 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**

\[
If \ IX_{B,\text{ACO},C_4-} < X_{Fred,CO,C_4-} \rightarrow 2.00 \% < 1.39 \%
\]

Then \text{LETy}\text{p}_A = "\text{LEReceiver}"

Else \text{LETy}\text{p}_A = "\text{LEDonor}"

If \( IX_{B,ACO,CA^-} < X_{Fred,CO,CA^-} \rightarrow 2,00 \% < 4,37 \% \)

Then \( LEType_E = LERcvr \)

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.

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

\[ \text{If } LType_B = \text{LEDonor Then } IM_{B,\text{Off Gases},C2} = IM_{B,\text{Off Gases},C2} = 755 \text{ kg} \]
\[ \text{Else } IM_{LRecvr_{B,\text{Off Gases},C2}} = IM_{B,\text{Off Gases},C2} \]

\[ \text{If } LType_B = \text{LEDonor Then } IM_{B,\text{ACO,H2O}} = IM_{B,\text{ACO,H2O}} = 5.071 \text{ kg} \]
\[ \text{Else } IM_{LRecvr_{B,\text{ACO,H2O}}} = IM_{B,\text{ACO,H2O}} \]

The same for all Components H2O to C_{12+}

\[(IM_{B,\text{ACO,H2O}} \text{ from Eqn. 5-1 and } IM_{B,\text{Off Gases,H2O}} \text{ from Eqn. 5-3)}\]

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

\[ \text{If } LType_A = \text{LEDonor Then } IM_{A,\text{Off Gases,C2}} = IM_{A,\text{Off Gases,C2}} = 1.328 \text{ kg} \]
\[ \text{Else } IM_{LRecvr_{A,\text{Off Gases,C2}}} = IM_{A,\text{Off Gases,C2}} = 1.328 \text{ kg} \]

\[ \text{If } LType_A = \text{LEDonor Then } IM_{A,\text{ACO,H2O}} = IM_{A,\text{ACO,H2O}} = 5.395 \text{ kg} \]
\[ \text{Else } IM_{LRecvr_{A,\text{ACO,C2}}} = IM_{A,\text{ACO,C2}} = 5.395 \text{ kg} \]

The same for all Components H2O to C_{12+}

\[(IM_{A,\text{ACO,H2O}} \text{ from Eqn. 5-1 and } IM_{A,\text{Off Gases,H2O}} \text{ from Eqn. 5-3)}\]

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

\[ MSwapMax_{C2} = \text{Min} \left[ \sum_{A} IM_{LRecvr_{DUC,\text{Off Gases,C2}}} \text{ or } \sum_{B} IM_{LEDonor_{Hejre,\text{Off Gases,C2}}} \right] \]
\[ \rightarrow 1.328 + 0 \text{ or } 0 + 1.718 = 1.328 \text{ kg} \]

The same for all Components N2 to C_{12+}
Total mass that can be swapped for C₄ Component Eqn. 7A-3

\[ M_{SwapMaxC₄} = \sum_{c=Cl₅}^{c=nC₄} M_{SwapMax,c} + c → 0 + 1.328 + 39.138 + 25.774 + 61.043 = 127.284 \text{ kg} \]

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

\[ IM_{A,ACO,C₄} = \sum_{c=Cl₅}^{c=nC₄} IM_{A,ACO,c} \rightarrow 190 + 3.022 + 33.145 + 47.886 + 134.916 = 219.159 \text{ kg} \]
\[ IM_{B,ACO,C₄} = \sum_{c=Cl₅}^{c=nC₄} IM_{B,ACO,c} \rightarrow 8 + 1.718 + 50.192 + 25.772 + 98.111 = 175.803 \text{ kg} \]

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

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

\[ IM_{A,ACO,C₄} = \sum_{c=Cl₅}^{c=nC₄} IM_{A,ACO,c} \rightarrow 0 + 197 + 190 + 3.022 + 33.145 + 47.886 + 134.916 + 171.834 + 155.435 + 479.415 + 779.821 + 813.472 + 610.390 + 627.187 + 507.854 + 113.470 \text{ kg} \]
\[ = 15.711.792 \text{ kg} \]
\[ IM_{B,ACO,C₄} = \sum_{c=Cl₅}^{c=nC₄} IM_{B,ACO,c} \rightarrow 0 + 0 + 8 + 1.718 + 50.192 + 25.774 + 98.111 + 84.694 + 131.702 + 203.278 + 180.630 + 188.424 + 141.384 + 145.275 + 117.634 + 2.657.029 = 4.025.853 \text{ kg} \]

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

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

\[ IM_{A,Res Off Gases,C₄} = \sum_{c=Cl₅}^{c=nC₄} IM_{A,Off Gases,c} \rightarrow 0 + 1.326 + 39.138 + 29.950 + 61.403 = 131.460 \text{ kg} \]
\[ IM_{B,Res Off Gases,C₄} = \sum_{c=Cl₅}^{c=nC₄} IM_{B,Off Gases,c} \rightarrow 0 + 755 + 59.269 + 16.120 + 44.391 = 120.535 \text{ kg} \]

(\(IM_{B,Off Gases,c}, IM_{A,Off Gases,c}\) from Eqn. 5-3)

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

\[ IM_{A,Res Off Gases,inerts} = \sum_{c=Cl₅}^{c=nC₅} IM_{A,Res Off Gases,c} \rightarrow 0 + 0 + 2 + 1.505 + 409 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 1.916 \text{ kg} \]
\[ IM_{B,Res Off Gases,inerts} = \sum_{c=Cl₅}^{c=nC₅} IM_{B,Res Off Gases,c} \rightarrow 0 + 0 + 0 + 0 + 742 + 347 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 1.089 \text{ kg} \]

(\(IM_{B,Res Off Gases,c}, IM_{A,Res Off Gases,c}\) from Eqn. 5-3)
Target mass \( C_4 \) to be moved into Allocated Crude Oil Eqn. 7A-8

If \( LETYPE_A = \text{LERcvr} \) Then \[
MSwap_{DUC,C4-} = \frac{\left( IM_{A,Res Off Gases,C4-} \cdot X_{Fred,CO,C4-} - IM_{A,ACO,C4-} \right)}{\left( IM_{A,Res Off Gases,C4-} \cdot (1 - X_{Fred,CO,C4-}) - X_{Fred,CO,C4-} \cdot IM_{A,Res Off Gases,Inerts} \right)}
\]
\[
= \frac{131.460 \cdot (1 - 2.00) - 2 \cdot 1.916}{131.460 \cdot (1 - 2.00) - 2 \cdot 1.916} = 97.217 \text{ kg}
\]
Else \( MTSwap_{DUC,C4-} = 0 \)

If \( LETYPE_B = \text{LERcvr} \) Then \[
MSwap_{B,C4-} = \frac{\left( IM_{B,Res Off Gases,C4-} \cdot X_{Fred,CO,C4-} - IM_{B,ACO,C4-} \right)}{\left( IM_{B,Res Off Gases,C4-} \cdot (1 - X_{Fred,CO,C4-}) - X_{Fred,CO,C4-} \cdot IM_{B,Res Off Gases,Inerts} \right)}
\]
\[
= \frac{131.460 \cdot (1 - 2.00) - 2 \cdot 1.916}{131.460 \cdot (1 - 2.00) - 2 \cdot 1.916} = 97.217 \text{ kg}
\]
Else \( MTSwap_{B,C4-} = 0 \)

For an Entrant designated as a Light End Receiver, each of the \( C_4 \) Components shall be distributed to the Allocated Crude Oil in proportion to the mass of the Component in the total \( C_4 \) Components to be moved.

Total mass of \( C_4 \) to be moved into LE Receivers’ Crude Oil Eqn. 7A-9

\[
MSwap_{Fred,C4-} = \text{Minimum} \left( MSwapMax_{C4-} \cdot \sum_E MTSwap_{E,C4-} \right) \rightarrow 112.284 \text{ or } 97.217 + 0 = 97.217 \text{ kg}
\]

Mass of \( C_4 \) Components to be moved into Allocated Crude Oil Eqn. 7A-10

\[
MSwap_{Fred,C2} = MSwap_{Fred,C4-} \cdot \frac{MSwapMax_{Fred,C2}}{\sum_E MSwapMax_{C4-}} \rightarrow 97.217 \cdot \frac{1.328}{127.284} = 1.014 \text{ kg}
\]

The same for \( C_1 \) to \( nC_4 \)

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

\[
MSwap_{N_{A,ACO,C2}} = MSwap_{Fred,C2} \cdot \frac{IM \ LETYPE_{A,Res Off Gases,C2}}{\sum_E IM \ LETYPE_{E,Res Off Gases,C2}} \rightarrow 1.014 \cdot \frac{1.328}{1.328 + 0} = 1.014 \text{ kg}
\]

The same for \( C_1 \) to \( nC_4 \)

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

\[
MSwapOut_{A,Res Off Gases,C2} = -MSwap_{N_{A,ACO,C2}} = -1.014 \text{ kg}
\]

The same for \( C_1 \) to \( nC_4 \)

Fraction of \( C_4 \) moved from LE Receiver’s dry Residual Off Gases Eqn. 7A-13

\[
FOut_{A,Res Off Gases,C4-} = \frac{-\sum_{C=C1}^{C=C4} IM \ ARes Off Gases \cdot MSwapOut_{A,Res Off Gases,C}}{\sum_{C=C1}^{C=C4} IM \ ARes Off Gases \cdot MSwapOut_{A,Res Off Gases,C}} \rightarrow -99.999 + -59.999 + -29.999 + -18.999 + -6.664 = 0.740\%
\]
Target of remaining Components to move out of LE Receivers Off Gases Eqn. 7A-14

\[ M_{\text{SwapOut}_{A,\text{Res Off Gases},iCS}} = -IM_{\text{LERecvr}_{A,\text{Res Off Gases},iCS}} \times F_{\text{Out}_{A,\text{Res Off Gases},C4-}} \rightarrow -1.505 \times 0.740\% = -1.113 \text{ kg} \]

The same for N\textsubscript{2} to CO\textsubscript{2} and for nC\textsubscript{5} to C\textsubscript{12+}

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

\[ \text{Abs} \left( \sum B M_{\text{SwapOut}_{A,\text{Res Off Gases},iCS}} \right) < M_{\text{SwapMax}_{iCS}} \]

Then \( M_{\text{SwapOut}_{A,\text{Res Off Gases},iCS}} = M_{\text{SwapOut}_{A,\text{Res Off Gases},iCS}} = -1.113 \text{ kg} \)

Else \( M_{\text{SwapOut}_{A,\text{Res Off Gases},iCS}} = -M_{\text{SwapMax}_{iCS}} \times \frac{M_{\text{SwapOut}_{A,\text{Res Off Gases},iCS}}}{\sum B M_{\text{SwapOut}_{E,\text{Res Off Gases},iCS}}} \)

The same for N\textsubscript{2} to CO\textsubscript{2} and for nC\textsubscript{5} to C\textsubscript{12+}

In order to maintain mass balance, an equivalent mass of C\textsubscript{4} 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

\[ M_{\text{SwapIn}_{A,\text{Res Off Gases},iCS}} = -M_{\text{SwapOut}_{A,\text{ACO},iCS}} = 1.113 \text{ kg} \]

The same for N\textsubscript{2} to CO\textsubscript{2} and for nC\textsubscript{5} to C\textsubscript{12+}

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

\[ M_{\text{SwapOut}_{B,\text{ACO},iCS}} = \sum E M_{\text{SwapIn}_{B,\text{ACO},iCS}} \times \frac{IM_{\text{LEDonor}_{B,\text{ACO},iCS}}}{\sum E IM_{\text{LEDonor}_{E,\text{ACO},iCS}}} - 1.113 \times \frac{84.694}{0 + 84.694} = -1.113 \text{ kg} \]

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

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

\[ M_{\text{SwapIn}_{B,\text{Off Gases},iCS}} = -M_{\text{SwapOut}_{B,\text{ACO},iCS}} = 1.113 \text{ kg} \]

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

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
\[ AM_{A,\text{Res Off Gases},C2} = IM_{A,\text{Res Off Gases},C2} + M_{\text{Swap In} A,\text{Res Off Gases},C2} + M_{\text{Swap Out} A,\text{Res Off Gases},C2} \]
\[ \rightarrow 1.328 + (-1.014) + 0 = 0.314 \text{ kg} \]
\[ AM_{B,\text{Res Off Gases},C2} = IM_{B,\text{Res Off Gases},C2} + M_{\text{Swap In} B,\text{Res Off Gases},C2} + M_{\text{Swap Out} B,\text{Res Off Gases},C2} \]
\[ \rightarrow 755 + 0 + 1.014 = 756.014 \text{ kg} \]

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 mass to Non-User**

\[ \text{If User = No} \]
\[ \text{Then } AM_{\text{NonUser} A,\text{Res Off Gases},H2O} = AM_{A,\text{Res Off Gases},H2O} \]
\[ \text{Else } AM_{\text{User} A,\text{Off Gases}} = AM_{A,\text{Res Off Gases},H2O} + IM_{A,\text{Fuel Gas}} \rightarrow 0 + 83 = 83 \text{ kg} \]

\[ \text{If User = No} \]
\[ \text{Then } AM_{\text{NonUser} B,\text{Res Off Gases},H2O} = AM_{B,\text{Off Gases},H2O} \]
\[ \text{Else } AM_{\text{User} B,\text{Off Gases}} = AM_{B,\text{Res Off Gases},H2O} + IM_{B,\text{Fuel Gas}} \rightarrow 0 + 78 = 78 \text{ kg} \]

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

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

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

\[ M_{\text{Fred},\text{LPG},C2} = M_{\text{Fred},\text{Propane},C2} + M_{\text{Fred},\text{Butane},C2} \rightarrow 2.083 + 0 = 2.083 \text{ kg} \]

\((M_{\text{Fred},\text{Propane},C2}, M_{\text{Fred},\text{Butane},C2} \text{ from Eqn. 3-2})\)

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

\[ A = \text{If User = Yes} \]
\[ \text{Then } M_{A,\text{LPG},C2} = \min \left( \frac{B}{\sum B \text{ AM}_{E,\text{Off Gases},C2}} \right) \]
\[ \rightarrow 12.369 \text{ or } 2.083 * \frac{12.369}{12.369 + 8.621} = 1.227 \text{ kg} \]
\[ \text{Else } M_{A,\text{LPG},C2} = 0 \]

\[ B = \text{If User = Yes} \]
\[ \text{Then } M_{B,\text{LPG},C2} = \min \left( \frac{B}{\sum B \text{ AM}_{E,\text{Off Gases},C2}} \right) \]
\[ \rightarrow 8.621 \text{ or } 2.083 * \frac{8.621}{12.369 + 8.621} = 0.856 \text{ kg} \]
\[ \text{Else } M_{B,\text{LPG},C2} = 0 \]

**Unallocated LPG Eqn. 7B-4**

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Appendix 3b to Exhibit G User - Allocation Procedure 28.04.2014

The same for all Components H₂O to C₁₂⁺

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

If User = Yes
Then \( AM_{A,LPG,C1} = M_{A,LPG,C1} \rightarrow 1.227 \)
Else \( AM_{A,LPG,C1} = M_{\text{Fred,LPG Rem,C1}} \cdot \frac{AM_{\text{NonUser A,Off Gases,C1}}}{\sum E AM_{\text{NonUser E,Off Gases,C1}}} \)

If User = Yes
Then \( AM_{B,LPG,C2} = M_{B,LPG,C2} \rightarrow 856 \text{ kg} \)
Else \( AM_{B,LPG,C2} = M_{\text{Fred,LPG Rem,C2}} \cdot \frac{AM_{\text{NonUser B,Off Gases,C2}}}{\sum E AM_{\text{NonUser E,Off Gases,C2}}} \)

The same for all Components H₂O to C₁₂⁺

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

\( AM_{A,Propane,C3} \cdot \frac{M_{\text{Fred,Propane,C3}}}{M_{\text{Fred,LPG,C3}}} \rightarrow 15.645 \cdot \frac{97.464}{98.407} = 15.495 \text{ kg} \)

\( AM_{B,Propane,C3} \cdot \frac{M_{\text{Fred,Propane,C3}}}{M_{\text{Fred,LPG,C3}}} \rightarrow 82.762 \cdot \frac{97.464}{98.407} = 81.969 \text{ kg} \)

The same for all Components H₂O to C₁₂⁺

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

\( AM_{A,Butane,C3} \cdot \frac{M_{\text{Fred,Butane,C3}}}{M_{\text{Fred,LPG,C3}}} \rightarrow 15.645 \cdot \frac{943}{98.407} = 150 \text{ kg} \)

\( AM_{B,Butane,C3} \cdot \frac{M_{\text{Fred,Butane,C3}}}{M_{\text{Fred,LPG,C3}}} \rightarrow 82.762 \cdot \frac{943}{98.407} = 793 \text{ kg} \)

The same for all Components H₂O to C₁₂⁺

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**

\( AM_{A,FuelGas,C1} = AM_{A,Off \text{ Gases,C1}} + IM_{A,Fuel \text{ Gas,C1}} - AM_{A,Propane,C1} - AM_{A,Butane,C1} \rightarrow 0 + 3.746 - 0 - 0 = 3.746 \text{ kg} \)

\( AM_{B,FuelGas,C1} = AM_{B,Off \text{ Gases,C1}} + IM_{B,Fuel \text{ Gas,C1}} - AM_{B,Propane,C1} - AM_{B,Butane,C1} \rightarrow 0 + 153 - 0 - 0 = 153 \text{ kg} \)

The same for all Components H₂O to C₁₂⁺
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**

\[ \sum_{c=N2}^{c=C12+} AM_{A,FuelGas,dry} = 0 + 2.316 + 3.746 + 11.142 + 4.262 + 14226 + 1.644 + 129 + 96 + 74 + 31 + 0 + 0 + 0 + 0 + 0 = 24.862 \text{ kg} \]

\[ \sum_{c=N2}^{c=C12+} AM_{B,FuelGas,dry} = 0 + 0 + 153 + 7.766 + 22.546 + 3.902 + 7.845 + 362 + 261 + 31 + 7 + 0 + 0 + 0 + 0 + 0 = 42.873 \text{ kg} \]

The same for Propane, Butane and Allocated Crude Oil

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

\[ AM_{A,F,P,H2O,rem} = AM_{A,Fuel\ Gas,H2O} + AM_{A,Propane,H2O} + AM_{A,Butane,H2O} + AM_{A,treated\ water} \]

\[ \rightarrow 83 + 0 + 0 + 93.646 = 93.729 \text{ kg} \]

\[ AM_{A,F,P,C1,rem} = AM_{A,Fuel\ Gas,C1} + AM_{A,Propane,C1} + AM_{A,Butane,C1} \rightarrow 3.746 + 0 + 0 = 3.746 \text{ kg} \]

\[ AM_{B,F,P,H2O,rem} = AM_{B,Fuel\ Gas,H2O} + AM_{B,Propane,H2O} + AM_{B,Butane,H2O} + AM_{B,treated\ water} \]

\[ \rightarrow 78 + 0 + 0 + 88.025 = 88.103 \text{ kg} \]

\[ AM_{B,F,P,C2,rem} = AM_{B,Fuel\ Gas,C2} + AM_{B,Propane,C2} + AM_{B,Butane,C2} \rightarrow 153 + 0 + 0 = 153 \text{ kg} \]

\[ AM_{A,FuelGas,H2O} - AM_{A,Propane,H2O} - AM_{A,Butane,H2O} - AM_{B,FuelGas,H2O} - AM_{B,Propane,H2O} - AM_{B,Butane,H2O} \text{ from Eqn. 7B-9 and} \]

\[ AM_{A,treated\ water} - AM_{B,treated\ water} \text{ from Eqn. 4-20} \]

The same for all Components CO₂ to nC₅

**Total sum of components redelivered Eqn. 8-3**

\[ AM_{A,red} = \sum_{c=CO2}^{c=nC5} AM_{A,F,P,C,rem} + AM_{A,F,P,H2O,rem} + \sum_{c=H2O}^{c=C12+} AM_{A,ACO,c} \]


\[ AM_{B,\text{red}} = \sum_{c=0}^{\text{c=NC5}} AM_{B,FP,c,\text{rem}} + AM_{B,FP,H_{2}O,\text{rem}} + \sum_{c=\text{C12+}}^{\text{c=H_{2}O}} AM_{B,ACO,c} \]

\[ \rightarrow 0 + 153 + 8.621 + 105.308 + 37.669 + 95.010 + 2.017 + 813 + 88.103 + 5.071 + 0 + 0 + 8 + 703 + 20.299 + 6.088 + 51.488 + 83.581 + 131.400 + 203.278 + 180.630 + 188.424 + + 141.384 + 145.275 + 117.634 + 2.657.029 = 4.269.986 \text{ kg} \]

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

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

\[ Frac \ AM_{A,FP,H_{2}O,\text{rem}} = \frac{AM_{A,FP,H_{2}O,\text{rem}}}{AM_{A,\text{red}}} \rightarrow \frac{93.729}{15.982.549} = 0.0059 \]

\[ Frac \ AM_{B,FP,H_{2}O,\text{rem}} = \frac{AM_{B,FP,H_{2}O,\text{rem}}}{AM_{B,\text{red}}} \rightarrow \frac{88.103}{4.269.986} = 0.0206 \]

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**

\[ Frac \ AM_{A,ACO} = \frac{\sum_{c=\text{C5}}^{\text{c=CO2}} AM_{A,ACO,c}}{AM_{A,\text{red}}} \rightarrow \frac{5.395 + 197 + 190 + 4.036 + 63.038 + 67.572 + 181.540 + 172.947 + 155.738 + 479.415 + 779.821 + 813.472 + 610.390 + 627.187 + 507.854 + 111.09}{15.982.549} = 0.9896 \]

\[ Frac \ AM_{B,ACO} = \frac{\sum_{c=\text{C5}}^{\text{c=CO2}} AM_{B,ACO,c}}{AM_{B,\text{red}}} \rightarrow \frac{5.071 + 0 + 8 + 703 + 20.299 + 6.088 + 51.488 + 83.581 + 131.400 + 203.278 + 180.630 + 188.424 + + 141.384 + 145.275 + 117.634 + 2.657.029}{4.269.986} = 0.9209 \]

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

If \( AM_{A,\text{red}} = M_{A,\text{inlet, wet, p}} \rightarrow 15.982.549 \neq 15.893.856 \)

Then \( Frac \ AM_{A,\text{Crude Pet}} = \frac{M_{A,\text{inlet, wet, p}}}{AM_{A,\text{red}}} \)

Else \( Frac \ AM_{A,\text{Crude Pet}} = 1.0000 \)

If \( AM_{B,\text{red}} = M_{B,\text{inlet, wet, p}} \rightarrow 4.269.986 \neq 4.268.538 \)

Then \( Frac \ AM_{B,\text{Crude Pet}} = \frac{M_{B,\text{inlet, wet, p}}}{AM_{B,\text{red}}} \)

Else \( Frac \ AM_{B,\text{Crude Pet}} = 1.0000 \)

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

\[ D_{ACO} = \frac{\text{Frac AM}_{A,\text{Crude Pet}} \cdot D_{A,\text{crude Pet, wet, d}} - (\text{Frac AM}_{A,\text{FP,H}_{2}O,\text{rem}} \cdot D_{H_{2}O} + \sum_{c=\text{CO2}}^{\text{c=C5}} \text{Frac AM}_{A,\text{FP,c,rem}} \cdot D_{C_{5}})}{\text{Frac AM}_{A,\text{ACO}} \cdot 1.0000 + 850.9 - (0.0059 \cdot 985.2 + 0.0001 \cdot 825.34 + 0.0002 \cdot 299.39 + 0.0008 \cdot 355.68 + 0.0012 \cdot 506.68 + 0.0009 \cdot 561.97 + 0.0012 \cdot 583.22 + 0.0004 \cdot 623.44 + 0.0029.73)} \rightarrow \frac{0.9896}{852.83} = 0.00093 \]

852Sm^3
Allocated ideal volume in Allocated Crude Oil

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

Water Eqn. 8-8

\[
AV_{A,ACO, H2O} = \frac{AM_{A,ACO, H2O}}{D_{Fred, dewater\ water, wet}} \rightarrow \frac{5.395}{985.2} = 5 \text{ kg}
\]

\[
AV_{B,ACO, H2O} = \frac{AM_{B,ACO, H2O}}{D_{Fred, dewater\ water, wet}} \rightarrow \frac{5.071}{985.2} = 5 \text{ kg}
\]

The same for all components C\textsubscript{1} to C\textsubscript{12+}

Ideal volume in Allocated Crude Oil Eqn. 8-9

\[
V_{ideal, dry}^{A,ACO} = \frac{AM_{A,ACO}}{D_{A,ACO}} \rightarrow \frac{15.810.425}{852} = 18.564 \text{ kg}
\]

\[
V_{ideal, dry}^{B,ACO} = \frac{AM_{B,ACO}}{D_{B,ACO}} \rightarrow \frac{3.927.220}{772} = 5.090 \text{ kg}
\]

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

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 CO Eqn. 8-10

\[
V_{Fred, CO, dry} = V_{Fred, CO, wet} - \sum_B AV_{E,ACO, H2O} \rightarrow 23.957 - (5 + 5) = 23.947 \text{ Sm}^3
\]

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

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

\[
AV_{A,ACO, dry} = V_{Fred, CO, dry} \times \frac{V_{ideal, dry}^{A,ACO}}{V_{ideal, dry}^{A,ACO} + V_{ideal, dry}^{B,ACO}} \rightarrow 23.947 \times \frac{18.564}{18.564 + 5.090} = 18.794 \text{ Sm}^3
\]

\[
AV_{B,ACO, dry} = V_{Fred, CO, dry} \times \frac{V_{ideal, dry}^{B,ACO}}{V_{ideal, dry}^{A,ACO} + V_{ideal, dry}^{B,ACO}} \rightarrow 23.947 \times \frac{5.090}{18.564 + 5.090} = 5.153 \text{ Sm}^3
\]

Allocated dry volume in bbls Eqn. 8-12
\[ AV_{A,ACO, dry, bbls} = AV_{A,ACO, dry, sm^3} \times \frac{bbls}{sm^3} \rightarrow 18.794 \times 6.292955 = 118.271 \text{ bbls} \] 

\[ AV_{B,ACO, dry, bbls} = AV_{B,ACO, dry, sm^3} \times \frac{bbls}{sm^3} \rightarrow 5.153 \times 6.292955 = 32.425 \text{ bbls} \]