SUPPORTING INFORMATION

Simulation of an Offshore Natural Gas Purification Process for CO₂ Removal with Gas-Liquid Contactors Employing Aqueous Solutions of Ethanolamines

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Appendix A: Jacobian Matrices for Newton-Raphson Method on RVLE-H

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■ APPENDIX A: JACOBIAN MATRICES FOR NEWTON-RAPHSON METHOD ON RVLE-H

Jacobian matrices are written taking into account Eqs. (14), (16) and (17). Thermodynamic properties are analytically differentiated according to the EOS in use. The relevant jacobians comprises

$\underline{\underline{J}}_{E/U} : (2n + 2n_c + 3) \times (n + 2)$, $\underline{\underline{J}}_E : (2n + 2n_c + 3) \times (2n + 2n_c + 3)$, $\underline{\underline{J}}_U : (2n + 2n_c + 3) \times (n + 2)$ which are written via gradient operations ($\underline{\nabla}(\cdot)$) interpreted column-wise:

$$\underline{\underline{J}}_E = \left[\underline{\nabla}_E \underline{F}^T \right]^T = \begin{bmatrix} \left[\underline{\nabla}_{\theta_x} \underline{F}^T \right]^T & \left[\underline{\nabla}_{\theta_y} \underline{F}^T \right]^T & \left[\underline{\nabla}_{\theta_c} \underline{F}^T \right]^T & \left[\underline{\nabla}_\eta \underline{F}^T \right]^T & \frac{\partial \underline{F}}{\partial L_L} & \frac{\partial \underline{F}}{\partial L_V} & \frac{\partial \underline{F}}{\partial T_L} \end{bmatrix} \quad (\text{A1})$$

$$\underline{\underline{J}}_U = \left[\underline{\nabla}_U \underline{F}^T \right]^T = \begin{bmatrix} \frac{\partial \underline{F}}{\partial P_L} & \frac{\partial \underline{F}}{\partial \Sigma_L} & \left[\underline{\nabla}_L \underline{F}^T \right]^T \end{bmatrix} \quad (\text{A2})$$

$$\underline{\underline{J}}_{E/U} = - \left[\underline{\underline{J}}_E \right]^I \underline{\underline{J}}_U \quad (\text{A3})$$

$$\left[\underline{\nabla}_{\theta_x} \underline{F}^T \right]^T = \begin{bmatrix} L_L \underline{\underline{diag}}(\underline{X}) \\ \underline{\underline{0}} \\ \underline{X}^T \\ \underline{0}^T \\ -\underline{I} - \left[\underline{\nabla}_X \ln \hat{\phi}^{L_L^T} \right]^T \underline{\underline{diag}}(\underline{X}) \\ \underline{\Pi}^T \left(\underline{I} + \left[\underline{\nabla}_X \ln \hat{\phi}^{L_L^T} \right]^T \underline{\underline{diag}}(\underline{X}) \right) \\ L_L \left[\underline{\nabla}_X \overline{H}_{L_L} \right]^T \underline{\underline{diag}}(\underline{X}) \end{bmatrix} \quad (\text{A4})$$

$$\left[\underline{\nabla}_{\theta_y} \underline{F}^T \right]^T = \begin{bmatrix} L_V \underline{\underline{diag}}(\underline{Y}) \\ \underline{\underline{0}} \\ \underline{0}^T \\ \underline{Y}^T \\ \underline{I} + \left[\underline{\nabla}_Y \ln \hat{\phi}^{L_V^T} \right]^T \underline{\underline{diag}}(\underline{Y}) \\ \underline{\underline{0}} \\ L_V \left[\underline{\nabla}_Y \overline{H}_{L_V} \right]^T \underline{\underline{diag}}(\underline{Y}) \end{bmatrix} \quad (\text{A5})$$

$$\left[\underline{\nabla}_{\theta_c} \underline{F}^T \right]^T = \begin{bmatrix} \underline{\underline{0}} \\ L_L \underline{\underline{diag}}(\underline{X}_C) \\ \underline{X}_C^T \\ \underline{\underline{0}}^T \\ - \left[\underline{\nabla}_{X_c} \ln \hat{\underline{\phi}}^{\underline{L}_L^T} \right]^T \underline{\underline{diag}}(\underline{X}_C) \\ \underline{\underline{I}} + \underline{\underline{\Pi}}^T \left[\underline{\nabla}_{X_c} \ln \hat{\underline{\phi}}^{\underline{L}_L^T} \right]^T \underline{\underline{diag}}(\underline{X}_C) \\ L_L \left[\underline{\nabla}_{X_c} \overline{H}_{L_L} \right]^T \underline{\underline{diag}}(\underline{X}_C) \end{bmatrix} \quad (\text{A6})$$

$$\left[\underline{\nabla}_\eta \underline{F}^T \right]^T = \begin{bmatrix} -\underline{\underline{\Pi}} \\ -\underline{\underline{I}} \\ \underline{\underline{0}}^T \\ \underline{\underline{0}}^T \\ \underline{\underline{0}} \\ \underline{\underline{0}} \\ \underline{\underline{0}}^T \end{bmatrix}, \quad \frac{\partial \underline{F}}{\partial L_L} = \begin{bmatrix} \underline{X} \\ \underline{X}_C \\ 0 \\ 0 \\ 0 \\ 0 \\ \overline{H}_{L_L} \end{bmatrix}, \quad \frac{\partial \underline{F}}{\partial L_V} = \begin{bmatrix} \underline{Y} \\ \underline{\underline{0}} \\ 0 \\ 0 \\ 0 \\ 0 \\ \overline{H}_{L_V} \end{bmatrix} \quad (\text{A7})$$

$$\frac{\partial \underline{F}}{\partial T_L} = \begin{bmatrix} \underline{\underline{0}} \\ \underline{\underline{0}} \\ 0 \\ 0 \\ \frac{\partial \ln \hat{\underline{\phi}}^{\underline{L}_V}}{\partial T_L} - \frac{\partial \ln \hat{\underline{\phi}}^{\underline{L}_L}}{\partial T_L} \\ -\frac{\partial \ln \underline{K}}{\partial T_L} + \underline{\underline{\Pi}}^T \frac{\partial \ln \hat{\underline{\phi}}^{\underline{L}_L}}{\partial T_L} \\ L_L \overline{Cp}_{L_L} + L_V \overline{Cp}_{L_V} \end{bmatrix}, \quad \frac{\partial \underline{F}}{\partial P_L} = \begin{bmatrix} \underline{\underline{0}} \\ \underline{\underline{0}} \\ 0 \\ 0 \\ \frac{\partial \ln \hat{\underline{\phi}}^{\underline{L}_V}}{\partial P_L} - \frac{\partial \ln \hat{\underline{\phi}}^{\underline{L}_L}}{\partial P_L} \\ \underline{\underline{\Pi}}^T \frac{\partial \ln \hat{\underline{\phi}}^{\underline{L}_L}}{\partial P_L} + \left(\underline{\underline{\Pi}}^T \underline{1} \right) \left(\underline{1} / P_L \right) \\ L_L \frac{\partial \overline{H}_{L_L}}{\partial P_L} + L_V \frac{\partial \overline{H}_{L_V}}{\partial P_L} \end{bmatrix} \quad (\text{A8})$$

$$\frac{\partial \underline{F}}{\partial \Sigma_L} = \begin{bmatrix} \underline{\underline{0}} \\ \underline{\underline{0}} \\ 0 \\ 0 \\ \underline{\underline{0}} \\ \underline{\underline{0}} \\ -\underline{1} \end{bmatrix}, \quad \left[\underline{\nabla}_L \underline{F}^T \right]^T = \begin{bmatrix} -\underline{\underline{I}} \\ \underline{\underline{0}} \\ \underline{\underline{0}}^T \\ \underline{\underline{0}}^T \\ \underline{\underline{0}} \\ \underline{\underline{0}} \\ \underline{\underline{0}}^T \end{bmatrix} \quad (\text{A9})$$

■ APPENDIX B: DIFFERENTIAL INFLUENCE TERMS FROM JACOBIAN TERMS.

Examples of influence coefficients are written for RVLE-H and RVLE-T modes. In a first way of representation, used in the left terms in the RHS of Eqs. (B1) to (B5), indexes or index ranges (:) refer to positions in the corresponding jacobians and can be understood in terms of the positions of vector $\underline{U}$ and vector $\underline{E}$ of state variables (see Eqs. (15a) and (17a)). In a second, more direct, more informal, and more clear way of representation, index ranges are “replaced” by the symbols of variables themselves that were assigned to those positions, as used in the right terms in the RHS of Eqs. (B1) to (B16).

B.1. Influence of Permeate Enthalpy Rate in RVLE-H ($\underline{U}^T=[P_L \ \Sigma_L \ L_1 \dots L_n]$):

$$\left(\frac{\partial T_L}{\partial \Sigma_L} \right)_{P_L, \underline{L}} = \underline{J}_{E/U} (2n + 2n_C + 3, 2) = \underline{J}_{E/U} (T_L, \Sigma_L) \quad (\text{B1})$$

$$\left(\frac{\partial \eta}{\partial \Sigma_L} \right)_{P_L, \underline{L}} = \underline{J}_{E/U} (2n + n_C + 1 : 2n + 2n_C, 2) = \underline{J}_{E/U} (\underline{\eta}, \Sigma_L) \quad (\text{B2})$$

$$\left(\frac{\partial L_L}{\partial \Sigma_L} \right)_{P_L, \underline{L}} = \underline{J}_{E/U} (2n + 2n_C + 1, 2) = \underline{J}_{E/U} (L_L, \Sigma_L) \quad (\text{B3})$$

$$\left(\frac{\partial \underline{X}}{\partial \Sigma_L} \right)_{P_L, \underline{L}} = [\underline{diag}(\underline{X})] \underline{J}_{E/U} (1 : n, 2) = [\underline{diag}(\underline{X})] \underline{J}_{E/U} (\underline{\Theta}_X, \Sigma_L) \quad (\text{B4})$$

$$\left(\frac{\partial \underline{Y}}{\partial \Sigma_L} \right)_{P_L, \underline{L}} = [\underline{diag}(\underline{Y})] \underline{J}_{E/U} (n + 1 : 2n, 2) = [\underline{diag}(\underline{Y})] \underline{J}_{E/U} (\underline{\Theta}_Y, \Sigma_L) \quad (\text{B5})$$

B.2. Influence of Permeate Pressure in RVLE-H ($\underline{U}^T=[P_L \ \Sigma_L \ L_1 \dots L_n]$):

$$\left(\frac{\partial T_L}{\partial P_L} \right)_{\Sigma_L, \underline{L}} = \underline{J}_{E/U} (T_L, P_L) \quad (\text{B6})$$

$$\left(\frac{\partial \eta}{\partial P_L} \right)_{\Sigma_L, \underline{L}} = \underline{J}_{E/U} (\underline{\eta}, P_L) \quad (\text{B7})$$

$$\left(\frac{\partial L_L}{\partial P_L} \right)_{\Sigma_L, \underline{L}} = \underline{J}_{E/U} (L_L, P_L) \quad (\text{B8})$$

$$\left(\frac{\partial \underline{X}}{\partial P_L} \right)_{\Sigma_L, \underline{L}} = \left[\underline{\underline{diag}}(\underline{X}) \right] \underline{\underline{J}}_{E/U}(\underline{\Theta}_X, P_L) \quad (\text{B9})$$

$$\left(\frac{\partial \underline{Y}}{\partial P_L} \right)_{\Sigma_L, \underline{L}} = \left[\underline{\underline{diag}}(\underline{Y}) \right] \underline{\underline{J}}_{E/U}(\underline{\Theta}_Y, P_L) \quad (\text{B10})$$

B.3. Influence of EMWR Rate of Real Species k in RVLE-T ($\underline{U}^T = [P_L \ T_L \ L_1 \ \dots \ L_n]$):

$$\left(\frac{\partial \underline{\eta}}{\partial L_i} \right)_{T_L, P_L, L_{k \neq i}} = \underline{\underline{J}}_{E/U}(\underline{\eta}, L_i) \quad (\text{B11})$$

$$\left(\frac{\partial L_L}{\partial L_i} \right)_{T_L, P_L, L_{k \neq i}} = \underline{\underline{J}}_{E/U}(L_L, L_i) \quad (\text{B12})$$

$$\left(\frac{\partial L_V}{\partial L_i} \right)_{T_L, P_L, L_{k \neq i}} = \underline{\underline{J}}_{E/U}(L_V, L_i) \quad (\text{B13})$$

$$\left(\frac{\partial \underline{X}}{\partial L_i} \right)_{T_L, P_L, L_{k \neq i}} = \left[\underline{\underline{diag}}(\underline{X}) \right] \underline{\underline{J}}_{E/U}(\underline{\Theta}_X, L_i) \quad (\text{B14})$$

$$\left(\frac{\partial \underline{X}_C}{\partial L_i} \right)_{T_L, P_L, L_{k \neq i}} = \left[\underline{\underline{diag}}(\underline{X}_C) \right] \underline{\underline{J}}_{E/U}(\underline{\Theta}_C, L_i) \quad (\text{B15})$$

$$\left(\frac{\partial \underline{Y}}{\partial L_i} \right)_{T_L, P_L, L_{k \neq i}} = \left[\underline{\underline{diag}}(\underline{Y}) \right] \underline{\underline{J}}_{E/U}(\underline{\Theta}_Y, L_i) \quad (\text{B16})$$

■ APPENDIX C: DERIVATION OF PARTIAL MOLAR EMWR PROPERTIES – PMP^{EMWR}.

Since the RVLE permeate is compositionally described in terms of EMWR rates of Real species, it is relevant to derive formulae converting standard gradients of Molar Properties (via EOS) into Partial Molar EMWR Properties (PMP^{EMWR}) and Partial Molar Properties (PMP). Since PMP is a standard subject in Thermodynamics textbooks, only PMP^{EMWR} will be addressed. To handle PMP^{EMWR}, the context RVLE-T is practical because PMP^{EMWR}'s are obtained via derivatives like $(\partial(\cdot)/\partial L_k)_{T_L, P_L, L_{j \neq k}}$ where L_k is the permeate EMWR rate of Real species k . In RVLE-T, vector $\underline{U}^T = [P_L \ T_L \ L_1 \dots L_n]$ carrying EMWR rates, conveys the specification of the RVLE state vector $\underline{E}^T = [\underline{\Theta}_X^T \ \underline{\Theta}_Y^T \ \underline{\Theta}_C^T \ \underline{\eta}^T \ L_L \ L_V]$, where $\underline{Y} = \exp(\underline{\Theta}_Y)$, $\underline{X} = \exp(\underline{\Theta}_X)$ and $\underline{X}_C = \exp(\underline{\Theta}_C)$. The bridge between $\underline{U}$ and $\underline{E}$ is matrix $\underline{J}_{E/U}$ via Eq. (C1):

$$d\underline{E} = \underline{J}_{E/U} . d\underline{U} \quad (C1)$$

With const. (P_L, T_L) and the informal representation (Appendix B) to access sub-fields of $\underline{J}_{E/U}$, results:

$$d\underline{E} = \underline{J}_{E/U}(:, \underline{L}) . d\underline{L} \quad (const. P_L, T_L) \quad (C2)$$

Let a typical molar property $\overline{Q}$ like molar enthalpy. Thus, $\overline{Q}_{LL}$, $\overline{Q}_{LV}$ are the respective $\overline{Q}$ values for liquid and vapor phases in the RVLE permeate, with the dependences:

$$\overline{Q}_{LL}(\underline{X}, \underline{X}_C, P_L, T_L) \quad , \quad \overline{Q}_{LV}(\underline{Y}, P_L, T_L) \quad (C3)$$

Now consider an extensive version of $\overline{Q}$, called a RVLE “rate property” Q defined by Eq. (C4):

$$Q = L_V \overline{Q}_{LV} + L_L \overline{Q}_{LL} \quad (C4)$$

Q is analogous to the enthalpy rate Σ_L and is a state function of the RVLE variables $\underline{X}$, $\underline{X}_C$, $\underline{Y}$, $\underline{\eta}$, L_L , L_V and P_L , T_L , i.e. $Q = Q(P_L, T_L, \underline{X}, \underline{X}_C, \underline{Y}, L_L, L_V)$. But, indirectly, Q is a state function of the RVLE specification variables $\underline{U}^T = [P_L \ T_L \ L_1 \dots L_n]$, that is:

$$\begin{aligned}
dQ = & \left(\frac{\partial Q}{\partial P_L} \right)_{T_L, \underline{E}} dP_L + \left(\frac{\partial Q}{\partial T_L} \right)_{P_L, \underline{E}} dT_L + [\nabla_X Q]^T [\underline{diag}(\underline{X})] \underline{J}_{E/U}(\underline{X}, :) d\underline{U} + \\
& [\nabla_{X_C} Q]^T [\underline{diag}(\underline{X}_C)] \underline{J}_{E/U}(\underline{X}_C, :) d\underline{U} + \left(\frac{\partial Q}{\partial L_L} \right) \underline{J}_{E/U}(L_L, :) d\underline{U} + \\
& [\nabla_Y Q]^T [\underline{diag}(\underline{Y})] \underline{J}_{E/U}(\underline{Y}, :) d\underline{U} + \left(\frac{\partial Q}{\partial L_V} \right) \underline{J}_{E/U}(L_V, :) d\underline{U}
\end{aligned} \tag{C5}$$

Under constant (P_L, T_L) , and using (C2), Eq. (C5) becomes:

$$\begin{aligned}
dQ = & [\nabla_X Q]^T [\underline{diag}(\underline{X})] \underline{J}_{E/U}(\underline{X}, \underline{L}) d\underline{L} + \\
& [\nabla_{X_C} Q]^T [\underline{diag}(\underline{X}_C)] \underline{J}_{E/U}(\underline{X}_C, \underline{L}) d\underline{L} + \\
& [\nabla_Y Q]^T [\underline{diag}(\underline{Y})] \underline{J}_{E/U}(\underline{Y}, \underline{L}) d\underline{L} + \\
& \left(\frac{\partial Q}{\partial L_L} \right)_{\substack{\underline{X}, \underline{X}_C \\ \underline{Y}, L_V}} \underline{J}_{E/U}(L_L, \underline{L}) d\underline{L} + \left(\frac{\partial Q}{\partial L_V} \right)_{\substack{\underline{X}, \underline{X}_C \\ \underline{Y}, L_L}} \underline{J}_{E/U}(L_V, \underline{L}) d\underline{L}
\end{aligned} \tag{C6}$$

With Eqs. (C4) and (C3), Eq. (C6) gives:

$$\begin{aligned}
dQ = & L_L [\nabla_X \bar{Q}_{LL}]^T [\underline{diag}(\underline{X})] \underline{J}_{E/U}(\underline{X}, \underline{L}) d\underline{L} + \\
& L_L [\nabla_{X_C} \bar{Q}_{LL}]^T [\underline{diag}(\underline{X}_C)] \underline{J}_{E/U}(\underline{X}_C, \underline{L}) d\underline{L} + \\
& L_V [\nabla_Y \bar{Q}_{LV}]^T [\underline{diag}(\underline{Y})] \underline{J}_{E/U}(\underline{Y}, \underline{L}) d\underline{L} + \\
& \bar{Q}_{LL} \underline{J}_{E/U}(L_L, \underline{L}) d\underline{L} + \bar{Q}_{LV} \underline{J}_{E/U}(L_V, \underline{L}) d\underline{L}
\end{aligned} \tag{C7}$$

Dividing (C7) by dL_k with constant $P_L, T_L, L_{j \neq k}$, the respective PMP^{EMWR} results as shown in Eq. (C8):

$$\begin{aligned}
\bar{Q}_k^{\text{EMWR}} = & \left(\frac{\partial Q}{\partial L_k} \right)_{\substack{T_L, P_L \\ L_{j \neq k}}} = L_L [\nabla_X \bar{Q}_{LL}]^T [\underline{diag}(\underline{X})] \underline{J}_{E/U}(\underline{X}, L_k) + \\
& L_L [\nabla_{X_C} \bar{Q}_{LL}]^T [\underline{diag}(\underline{X}_C)] \underline{J}_{E/U}(\underline{X}_C, L_k) + \\
& L_V [\nabla_Y \bar{Q}_{LV}]^T [\underline{diag}(\underline{Y})] \underline{J}_{E/U}(\underline{Y}, L_k) + \\
& \bar{Q}_{LL} \underline{J}_{E/U}(L_L, L_k) + \bar{Q}_{LV} \underline{J}_{E/U}(L_V, L_k)
\end{aligned} \tag{C8}$$

Eq. (C8) produces PMP^{EMWR} using only gradients from EOS, the RVLE state $\underline{E}$, and matrix $\underline{J}_{E/U}$.

APPENDIX D: SELECTED FIGURES - SIMULATION OF GLC FLOWSHEET FOR NG PURIFICATION [GN-Contact-1]

Figure D.1: Process Flowsheet for CO₂ Removal from NG Stream GN-CONTACT-1
 GLC: Gas-Liq Contactor; MR1: Reactive Stripper; S1: Gas-Liq Separator; MR2: Reactive Mixer

Figure D.2: $\bar{C}_p$ of NG GN-CONTACT-1 vs (T, P) with Bubble, Dew and Supercritical Loci

Figure D.3: Example 1 (Sec. 3.1.5) RVLE-T for Vapor Mol Fraction of CO₂ (Y_{CO_2}) vs (T, P)

Figure D.4: Example 1 (Sec. 3.1.5) RVLE-T for Loading of CO₂ ($\text{mol/mol}_{\text{AMINE}}$) vs (T, P)

Figure D.5: Example 1 (Sec. 3.1.5) RVLE-T for L_L (mol/s) vs (T, P)

Figure D.6: Example 1 (Sec. 3.1.5) RVLE-T for $\left(\frac{\partial \bar{H}}{\partial T}\right)_{P,L}$ (kJ/mol.K) vs (T, P)

Figure D.7: Example 1 (Sec. 3.1.5) RVLE-H for Vapor Mol Fraction of CO₂ (Y_{CO_2}) vs (Σ_L , P)

Figure D.8: Example 1 (Sec. 3.1.5) RVLE-H for Mol Frc. CO₂-H₂O-MEA ($X_{CO_2-H_2O-MEA}$) vs (Σ_L , P)

Figure D.11: GLC Profiles (Sec. 4.1) Retentate *Mol/s* of CO_2 & CH_4 vs $X(m)$

Figure D.12: GLC Profiles (Sec. 4.1) Retentate *%Mol* of CO_2 & CH_4 vs $X(m)$

Figure D.13: GLC Profiles (Sec. 4.1) Permeate Mol/s^{EMWR} of CO_2 & CH_4 vs $X(m)$

Figure D.14: GLC Profiles (Sec. 4.1) Permeate $\%Mol^{EMWR}$ of CO_2 & CH_4 vs $X(m)$

Figure D.15: GLC Profiles (Sec. 4.1) Temperatures ($^{\circ}C$) of Retentate & Permeate vs $X(m)$

Figure D.16: GLC Profiles (Sec. 4.1) Permeate Rates of Reaction Extensions (Mol/s) vs $X(m)$

Figure D.17: GLC Profiles (Sec. 4.1) Permeate Liquid Mol Fractions ($\underline{X}$, $\underline{X}_C$) vs $X(m)$

Figure D.18: GLC Profiles (Sec. 4.1) Permeate Vapor Mol Fractions ($\underline{Y}$) vs $X(m)$

Figure D.19: GLC Profiles (Sec. 4.1) Permeate Fugacities (*bar*) vs $X(m)$

Figure D.20: GLC Profiles (Sec. 4.1) Retentate Fugacities (*bar*) vs $X(m)$

Results CTR{1} Contactor 2FR				
	GN_CONTACT_1 Feed1	mrSOLV3 Solvent4	V@GN_CONTACT_1 Retentate6	L@GN_CONTACT_1 Permeate7
Phase	Vapor	Liquid	Vapor	Two-Phase
P(bar)	50	4.9448	49.886	4.8816
T(C)	26.85	26.874	38.749	38.756
kg/h	42635	17651	33737	26549
ROH(kg/m3)	55.877	947.79	50.115	19.745
MMstm3/d	1.0732	0.21738	0.88978	0.32341
mol/s	516.42	104.6	428.15	155.62
HFLUX(kW)	-58322	-33279	-39310	-52386
Cp(kJ/mol.K)	0.052334	0.14603	0.053092	0.20949
Vapor Fraction	1	-4.7802e-005	1	0.45086
Viscosity(Pa.s)	1.6142e-005	0.00085085	1.4356e-005	0.0016982
%mol MDEA	0	19.984	0	6.135
%mol MEA	0	19.997	0	8.771
%mol C2H6	9.091	0.002	10.957	0.023
%mol C3H8	4.247	0.001	5.12	0.009
%mol C4H10	1.784	0	2.15	0.003
%mol C5H12	1.465	0	1.766	0.002
%mol CH4	73.221	0.02	76.516	32.479
%mol CO2	10.193	0	3.49	12.254
%mol CO2H2OMDEA	0	0.017	0	7.309
%mol CO2H2OMEA	0	0.004	0	4.673
%mol H2O	0	59.974	0	28.343
%mol iC4H10	0	0	0	0
%mol iC5H12	0	0	0	0

Figure D.21: GN-CONTACT-1 Flowsheet Results (Sec. 4.2) – GLC Stream Summary

Results Mist2FR{1} [L@GN_CONTACT_1-->mrL@GN_CONTACT_1] [HEAT(kW) = 4300]		
	L@GN_CONTACT_1 Feed7	mrL@GN_CONTACT_1 Prod8
Phase	Two-Phase	Two-Phase
P(bar)	4.8816	1
T(C)	38.756	100.51
kg/h	26549	26549
ROH(kg/m3)	19.745	1.5841
MMstm3/d	0.32341	0.39987
mol/s	155.62	192.41
HFLUX(kW)	-52386	-48086
Cp(kJ/mol.K)	0.20949	0.21793
Vapor Fraction	0.45086	0.78129
Viscosity(Pa.s)	0.0016982	0.0003343
%mol MDEA	6.135	10.869
%mol MEA	8.771	10.747
%mol C2H6	0.023	0.019
%mol C3H8	0.009	0.007
%mol C4H10	0.003	0.003
%mol C5H12	0.002	0.002
%mol CH4	32.479	26.268
%mol CO2	12.254	19.472
%mol CO2H2OMDEA	7.309	0.004
%mol CO2H2OMEA	4.673	0.126
%mol H2O	28.343	32.484
%mol iC4H10	0	0
%mol iC5H12	0	0

Figure D.22: GN-CONTACT-1 Flowsheet Results (Sec. 4.2) – MR1 Stream Summary

Results SEP(5) [mrL@GN_CONTACT_1-->V@mrL@GN_CONTACT_1]			
	mrL@GN_CONTACT_1 Feed8	V@mrL@GN_CONTACT_1 Prod9	L@mrL@GN_CONTACT_1 Prod10
Phase	Two-Phase	Vapor	Liquid
P (bar)	1	1	1
T (C)	100.51	100.51	100.51
kg/h	26549	13835	12714
ROH (kg/m3)	1.5841	0.82615	964.69
MMstm3/d	0.39987	0.31242	0.087456
mol/s	192.41	150.33	42.083
HFLUX (kW)	-48086	-32963	-15124
Cp (kJ/mol.K)	0.21793	0.040471	0.24832
Vapor Fraction	0.78129	1	0
Viscosity (Pa.s)	0.0003343	1.4296e-005	0.00062606
%mol MDEA	10.869	0.07	49.444
%mol MEA	10.747	3.857	35.362
%mol C2H6	0.019	0.024	0
%mol C3H8	0.007	0.009	0
%mol C4H10	0.003	0.003	0
%mol C5H12	0.002	0.002	0
%mol CH4	26.268	33.616	0.021
%mol CO2	19.472	24.895	0.096
%mol CO2H2OMDEA	0.004	0	0.02
%mol CO2H2OMEA	0.126	0	0.575
%mol H2O	32.484	37.523	14.482
%mol iC4H10	0	0	0
%mol iC5H12	0	0	0

Figure D.23: GN-CONTACT-1 Flowsheet Results (Sec. 4.2) – S1 Stream Summary

Results Mist2FR(1) [L@GN_CONTACT_1-->mrL@GN_CONTACT_1] [HEAT (kW) = -460]				
	L@mrL@GN_CONTACT_1 Feed10	AGUA Feed11	MEA mrL@mrL@GN_CONTACT_1 Feed12	Prod13
Phase	Liquid	Liquid	Liquid	Liquid
P (bar)	1	1	1	5
T (C)	100.51	26.85	26.85	27.375
kg/h	12714	3675.3	1284.2	17673
ROH (kg/m3)	964.69	849.53	855.48	953.86
MMstm3/d	0.087456	0.11777	0.012137	0.2172
mol/s	42.083	56.67	5.84	104.52
HFLUX (kW)	-15124	-16297	-1546	-33426
Cp (kJ/mol.K)	0.24832	0.081207	0.17362	0.14906
Vapor Fraction	0	0	0	-0.00010603
Viscosity (Pa.s)	0.00062606	0.0004952	0.00084396	0.0008546
%mol MDEA	49.444	0	0	19.692
%mol MEA	35.362	0	100	20.005
%mol C2H6	0	0	0	0
%mol C3H8	0	0	0	0
%mol C4H10	0	0	0	0
%mol C5H12	0	0	0	0
%mol CH4	0.021	0	0	0.009
%mol CO2	0.096	0	0	0.002
%mol CO2H2OMDEA	0.02	0	0	0.224
%mol CO2H2OMEA	0.575	0	0	0.052
%mol H2O	14.482	100	0	60.016
%mol iC4H10	0	0	0	0
%mol iC5H12	0	0	0	0

Figure D.24: GN-CONTACT-1 Flowsheet Results (Sec. 4.2) – MR2 Stream Summary