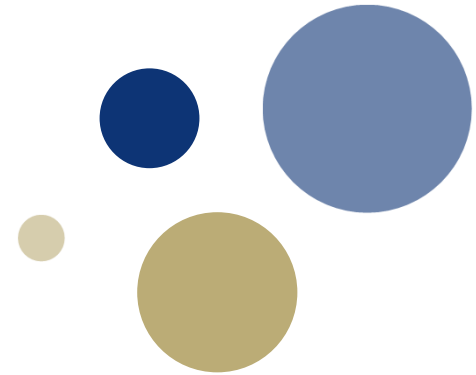




**NTNU – Trondheim**  
Norwegian University of  
Science and Technology



# **TPG 4135 Production Technology**

Field Processing and Systems

Postdoc Mariana Díaz  
01 /21/2019

# Plan



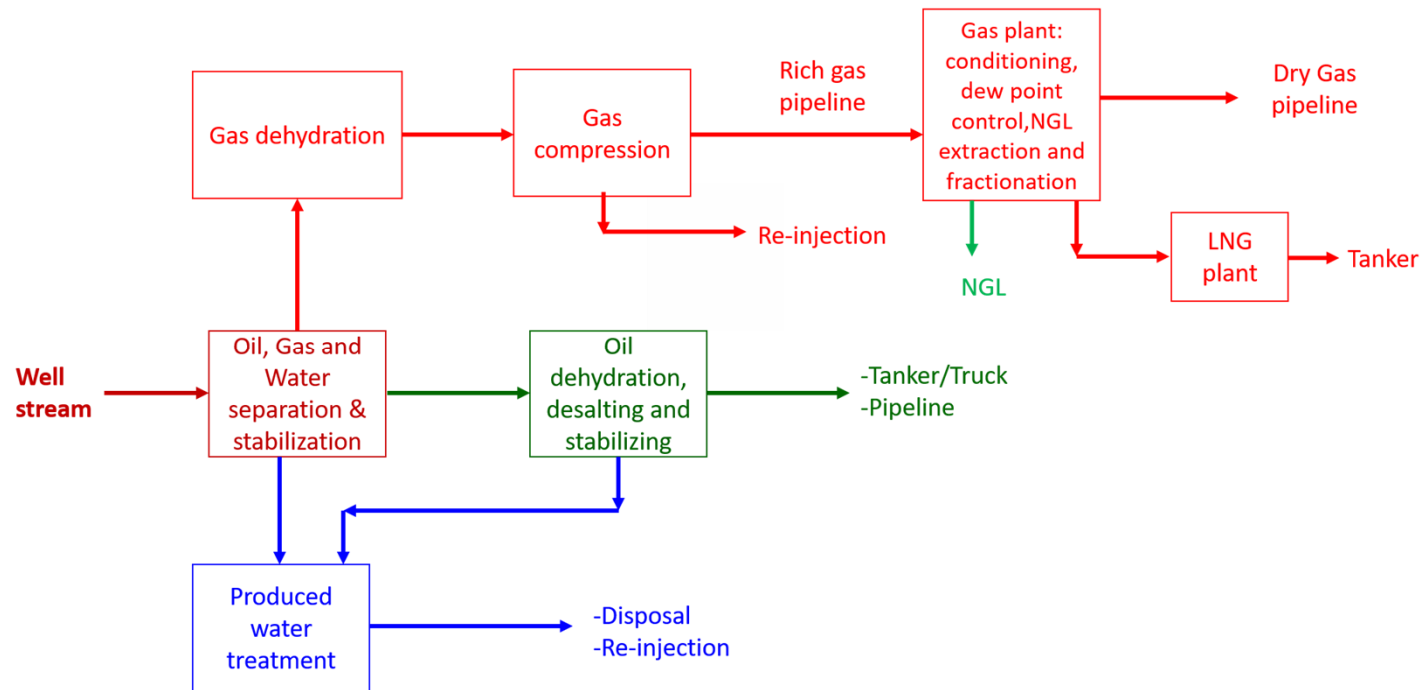
| Week Nr. | Week starts | Topic                                                                 | Lecturer |
|----------|-------------|-----------------------------------------------------------------------|----------|
| 2        | 07.jan.19   | Course introduction. Overview of field processing. Product specs.     | MS       |
| 3        | 14.jan.19   | Oil-Gas sep (VLE), Rachford Rice, EOS calculations.                   | MS       |
| 4        | 21.jan.19   | Oil-Gas Separation . Introduction to process simulation (Hysys).      | MD       |
| 5        | 28.jan.19   | Oil-Gas Separation. Bubble and droplet dynamics. Separation capacity. | MD       |
| 6        | 04.feb.19   | Oil-water separation                                                  | MD       |
| 7        | 11.feb.19   | Water content in Natural gas. Gas dehydration (TEG)                   | MS       |
| 8        | 18.feb.19   | Gas dehydration (TEG)                                                 | MS       |
| 9        | 25.feb.19   | Pressure calculations in pipe (single and two-phase)                  | HA       |
| 10       | 04.mar.19   | Pressure calculations in pipe (single and two-phase)                  | HA       |
| 11       | 11.mar.19   | Heat transfer, pipe calculations, heat exchangers                     | HA       |
| 12       | 18.mar.19   | Heat transfer, pipe calculations, heat exchangers                     | HA       |
| 13       | 25.mar.19   | Pumping                                                               | MD       |
| 14       | 01.apr.19   | Pumping/Compression                                                   | MD/HA    |
| 15       | 08.apr.19   | Compression                                                           | HA       |
| 16       | 15.apr.19   | Påskeferie                                                            | -        |
| 17       | 22.apr.19   | Compression (probably one lecture only)                               | HA       |
| 18       | 29.apr.19   | Spørretime                                                            | All      |

Monday: 12:15-14:00 (P12 PTS)  
 Tuesday: 14:15-16:00 (VG13 NHL)  
 Exercise: 16:15-18:00

Exam: 29.05, 15:00-19:00

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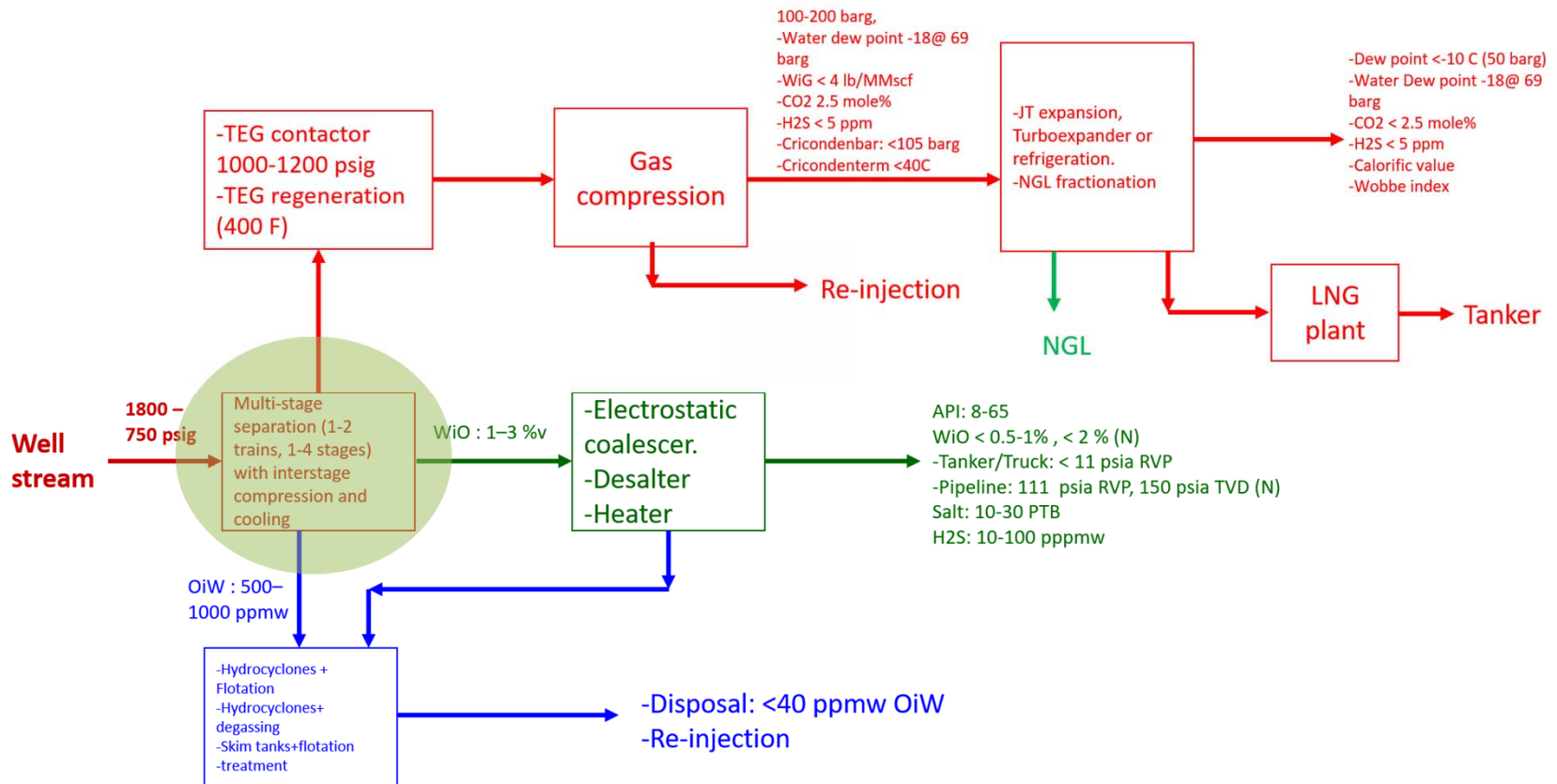
# Processing Block Diagram



Stanko Milan (2018)

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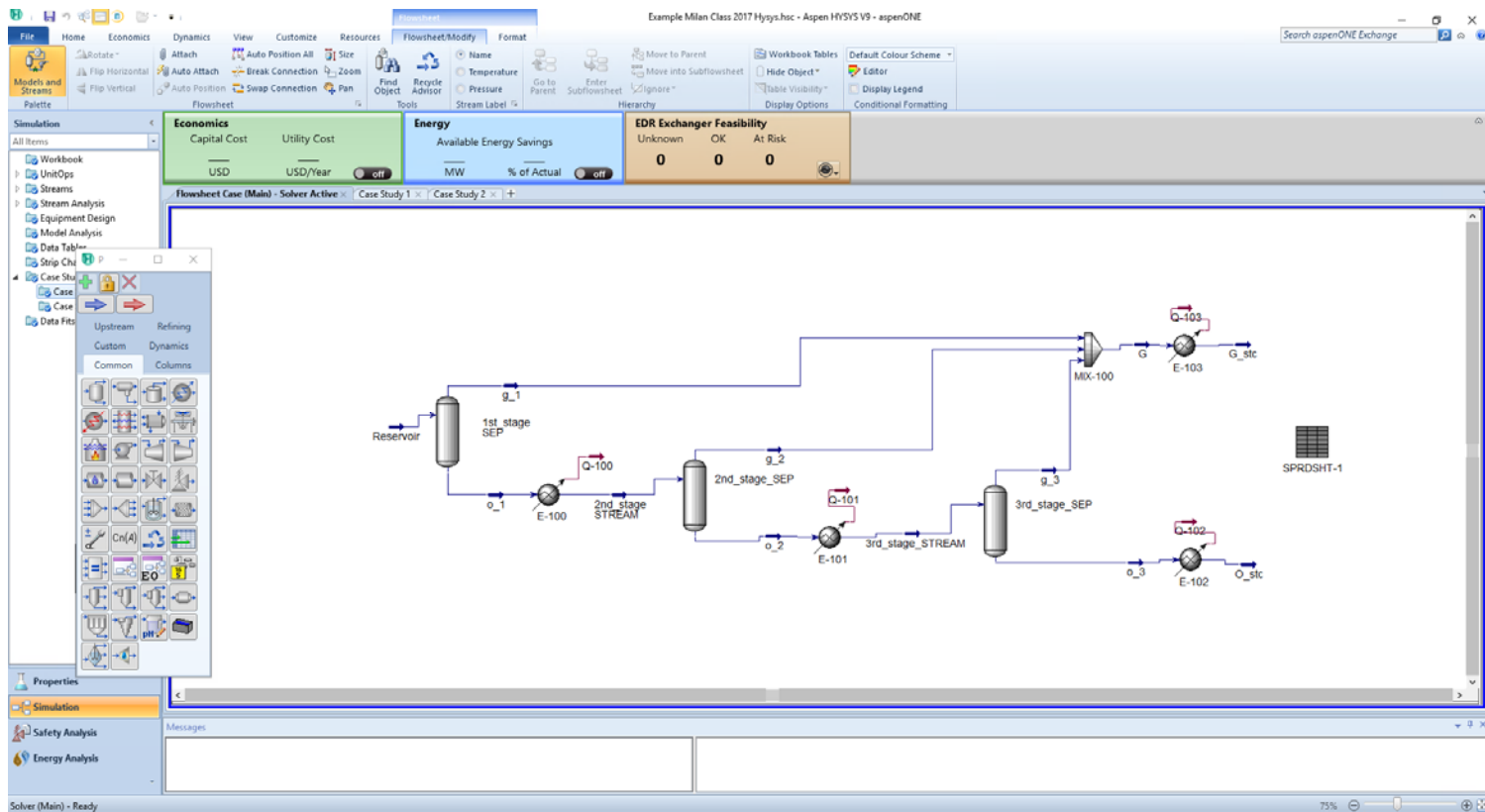
# Processing Block Diagram



Stanko Milan (2018)

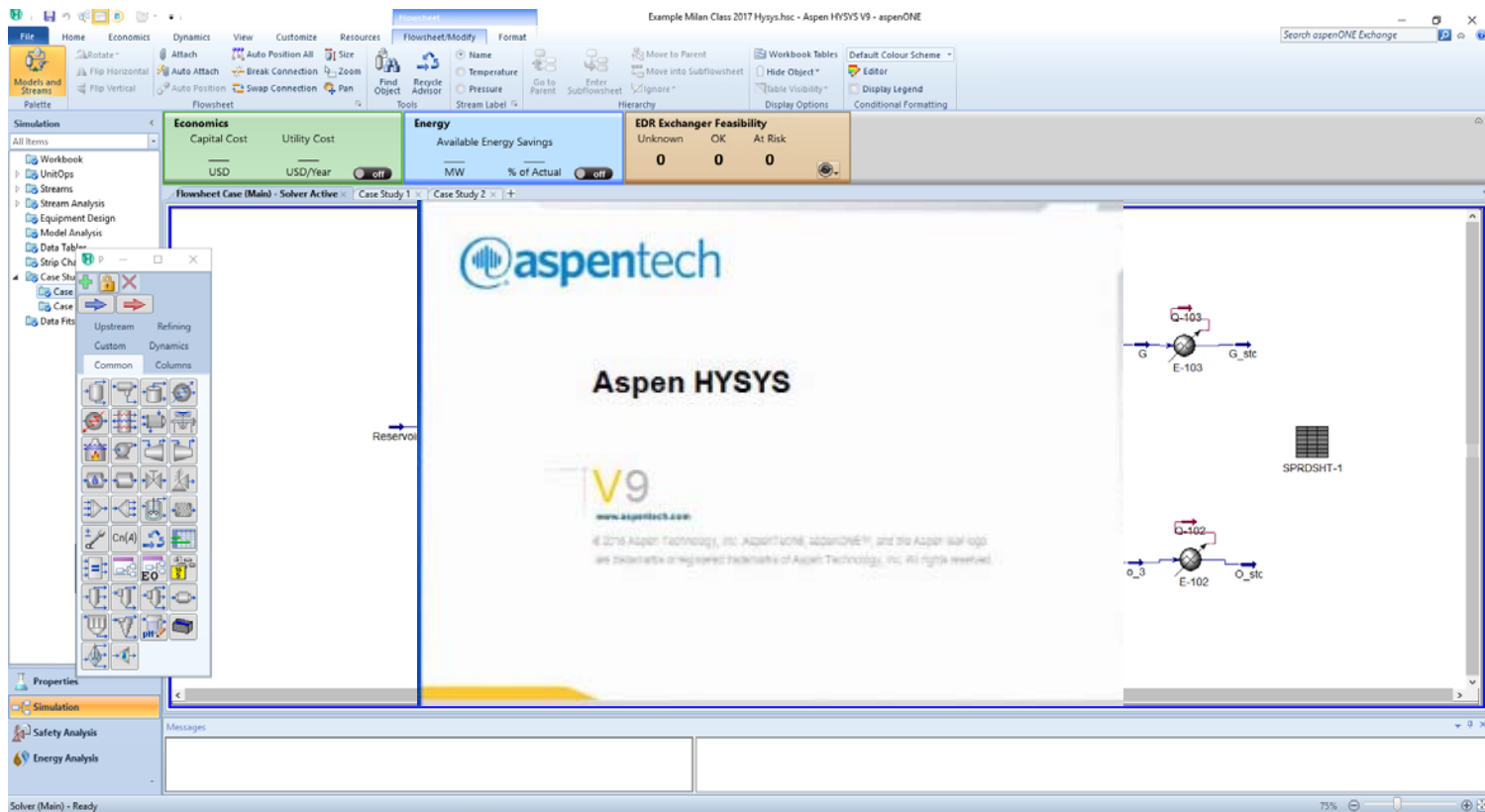
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# PROCESS SIMULATION HYSYS



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# PROCESS SIMULATION HYSYS



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# PROCESS SIMULATION HYSIS



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RemoteApps



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Security ([show explanation](#))

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Mac computer:  iPad/iPhone:  Android phone & pad:  Linux: 

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Current folder: /Scientific

|                              |                          |                              |                           |                    |                        |                                      |                                |                                    |                                 |
|------------------------------|--------------------------|------------------------------|---------------------------|--------------------|------------------------|--------------------------------------|--------------------------------|------------------------------------|---------------------------------|
| Up                           | AIM-Spice 6.0 [C]        | ANSYS AqwaGS 19.1 [C]        | ANSYS CFD-Post 19.1 [C]   | ANSYS CFX 19.1 [C] | ANSYS Fluent 19.1 [C]  | ANSYS ICEM CFD 19.1 [C]              | ANSYS Icepak 19.1 [C]          | ANSYS Mechanical APDL 19.1 [C]     | ANSYS Polyflow 19.1 [C]         |
| ANSYS SpaceClaim 19.1 [C]    | ANSYS Workbench 19.1 [C] | Aspen Energy Analyzer V9 [C] | <b>Aspen HYSYS V9 [C]</b> | Aspen Plus V9 [C]  | Cain [C]               | CASAnova [C]                         | Ceetron 3D Viewer (64 bit) [C] | ChemBio3D Ultra 14.0 [C]           | ChemBioDraw Ultra 14.0 [C]      |
| ChemBioFin... Ultra 14.0 [C] | CMG Launcher 2013.10 [C] | CoolPack [C]                 | Cytoscape [C]             | DelftShip [C]      | fap2D 4.1 [C]          | Fiji [C]                             | GLview Inova (64 bit) [C]      | GLview Report Builder (64 bit) [C] | HEC-RAS 5.0.3 [C]               |
| HSC 9 [C]                    | LISREL 9.30 Student [C]  | Neuron Studio [C]            | OlyVIA [C]                | ReluxPro [C]       | S3GRAF v7.2 [C]        | Schlumberger Simulation Launcher [C] | Sensor6k Cmd [C]               | SIMIEN [C]                         | SOLIDWORKS 2017 x64 Edition [C] |
| SOLIDWORKS Electrical        | Spartan '14 [C]          | SSIIM 1 [C]                  | SSIIM 2 [C]               | TESS 2.3.1 [C]     | UniSim Design R460 [C] | UniSim ThermoWor... [C]              | VMGSim [C]                     | WinEEG [C]                         |                                 |

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Mac computer: iPad/iPhone: Android phone & pad: Linux:

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# Fluid Composition 1

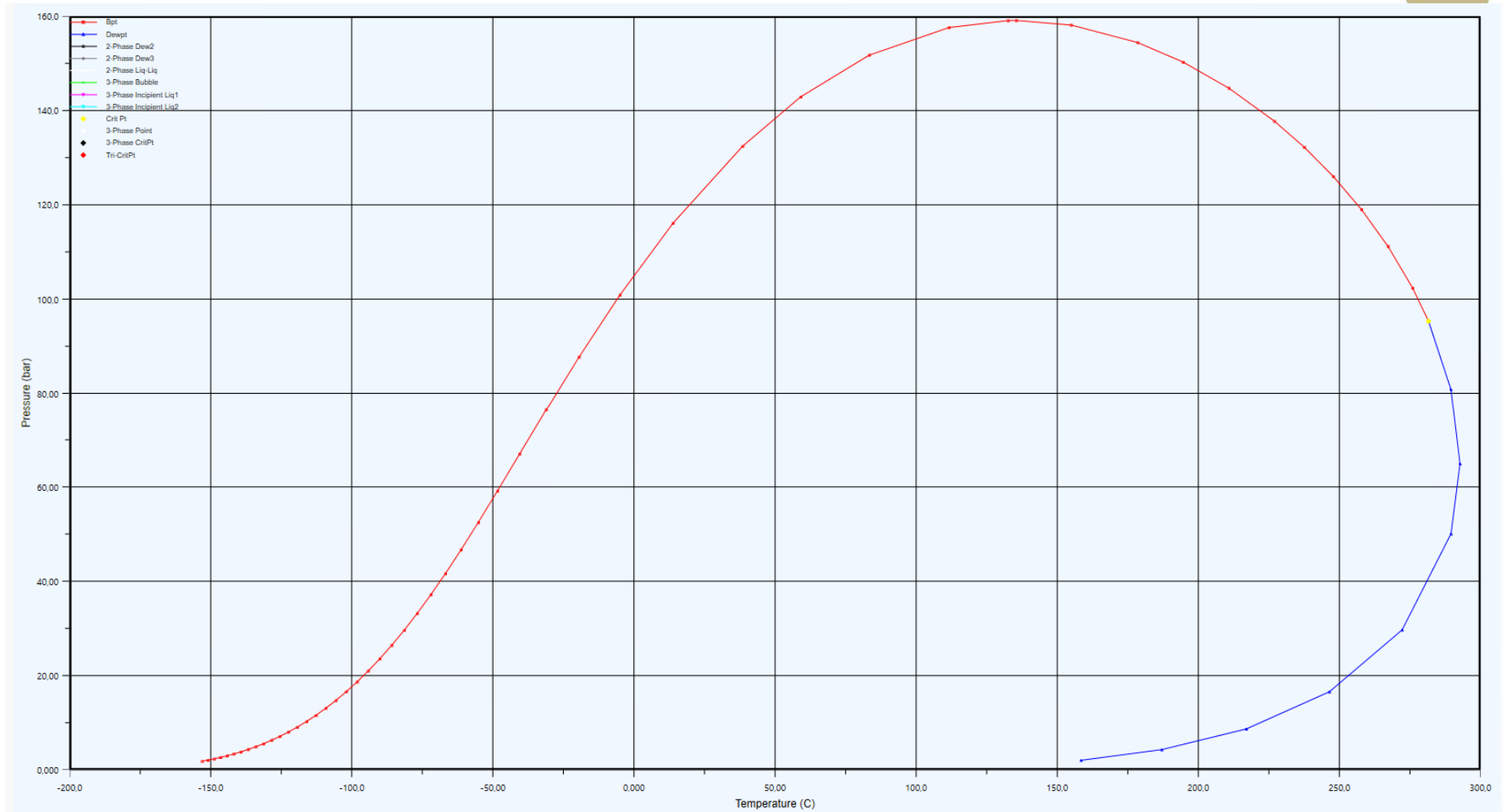


|                     | T (C) | P (bar) |
|---------------------|-------|---------|
| Stage 1             | 75    | 65      |
| Stage 2             | 65    | 20      |
| Stage 3             | 60    | 2       |
| Standard Conditions | 15.66 | 1.01325 |

| Component | Mole Fraction |
|-----------|---------------|
| Nitrogen  | 0.003672      |
| CO2       | 0.001092      |
| Methane   | 0.429256      |
| Ethane    | 0.046897      |
| Propane   | 0.029618      |
| i-butane  | 0.014919      |
| n-butane  | 0.009325      |
| i-pentane | 0.008446      |
| n-pentane | 0.005030      |
| Hexanes   | 0.018433      |
| Heptanes  | 0.041418      |
| Octanes   | 0.049891      |
| Nonanes   | 0.038403      |
| Decanes   | 0.303600      |

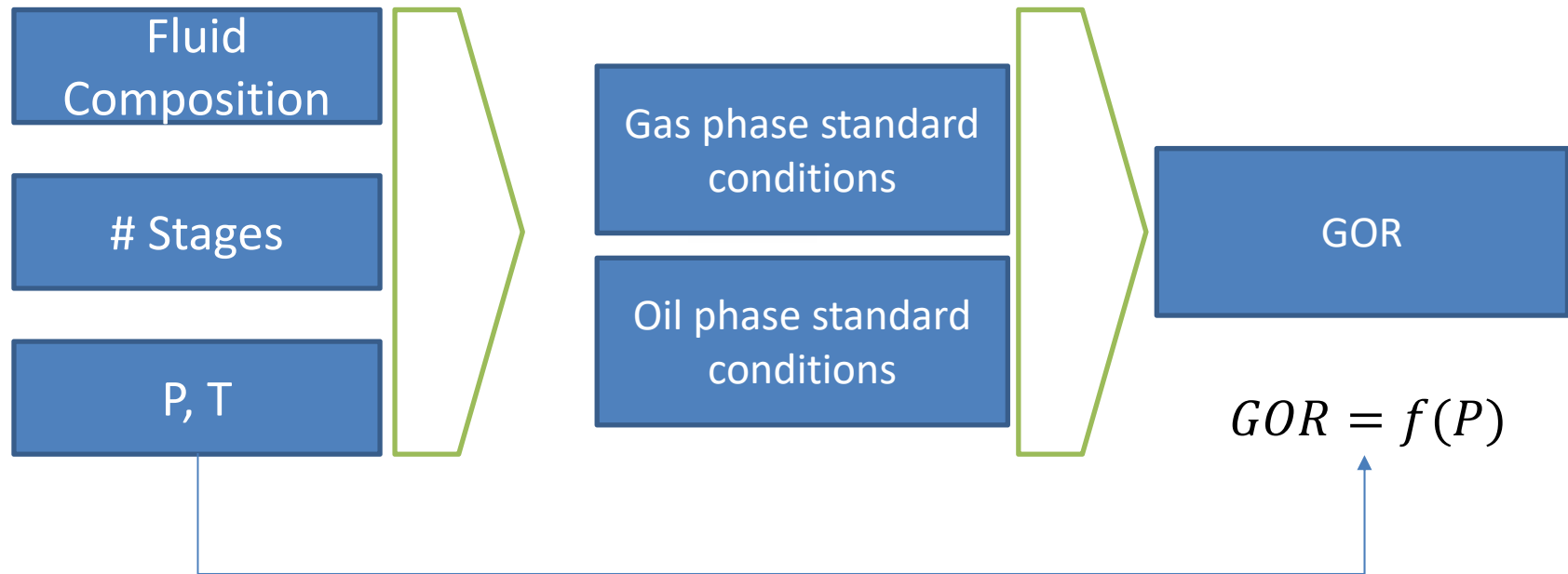
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# Fluid Composition



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# Summary

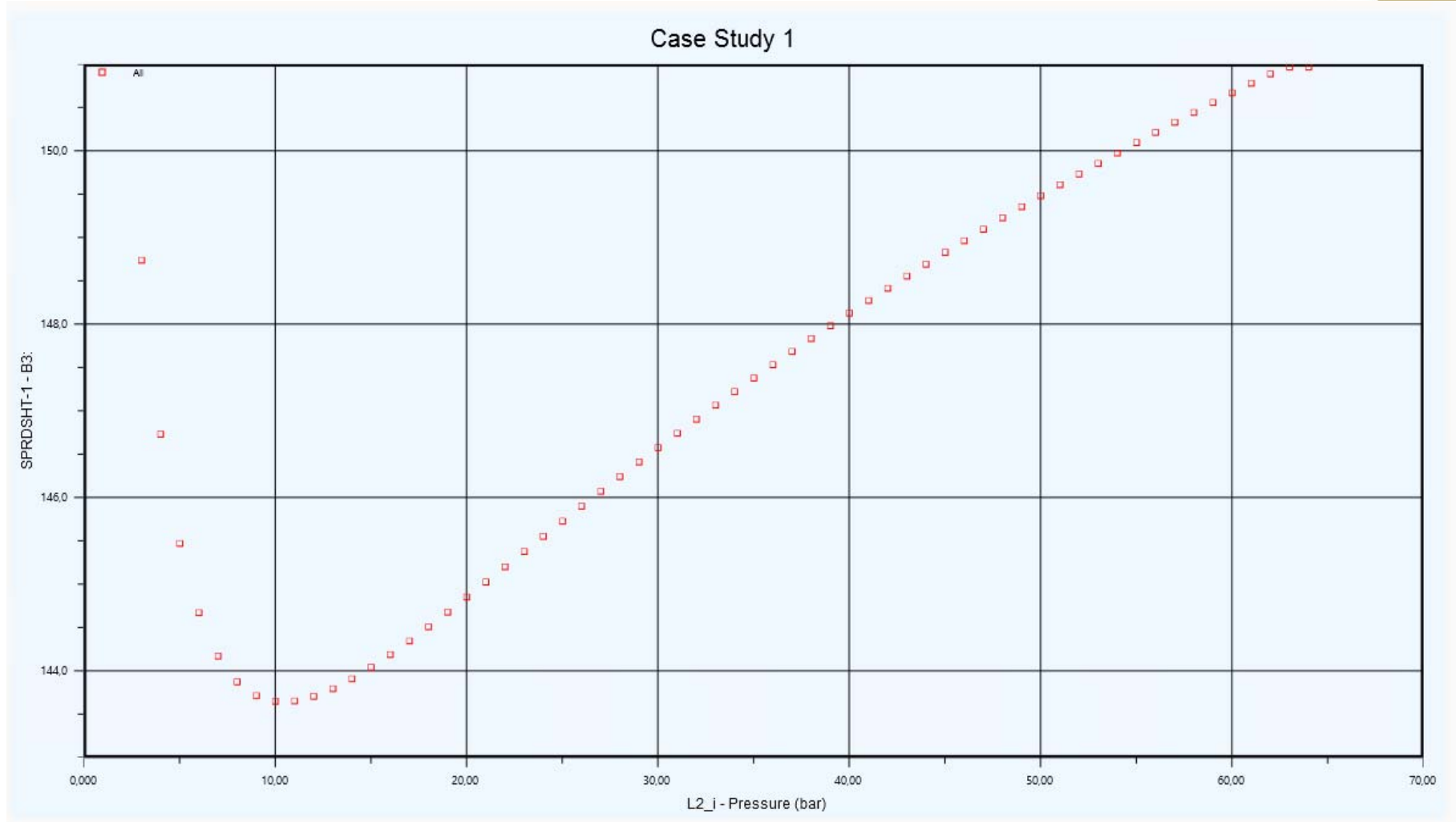


# GOR calculation

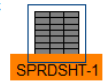


| Imported Variables |        |                                         |  |
|--------------------|--------|-----------------------------------------|--|
| Cell               | Object | Variable Description                    |  |
| B1                 | G_SC   | Phase Actual Volume Flow (Vapour Phase) |  |
| B2                 | L_SC   | Phase Actual Volume Flow (Liquid Phase) |  |
| C1                 | G_SC_i | Phase Actual Volume Flow (Vapour Phase) |  |
| C2                 | L_SC_i | Phase Actual Volume Flow (Liquid Phase) |  |

# Summary



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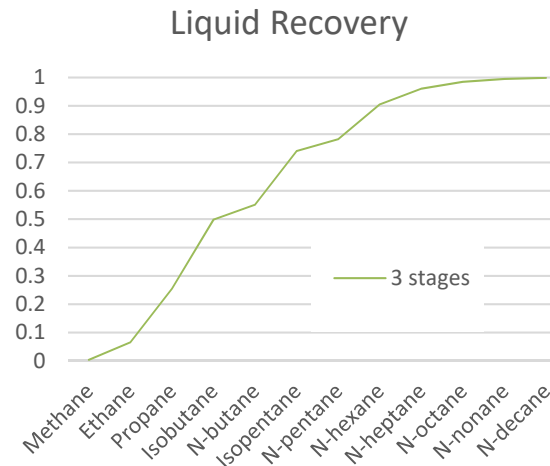
# Exercises



1. Change the number of stages: 1, 2 and 4 stages
2. Propose the temperature and pressure of the 3rd stage such the GOR is minimum when using 3 stages
3. Compare the liquid recovery at the end of the separation train for 1, 2 and 3 stages. Create a plot like Figure 1 for each case
4. Change the composition (Table 1)
5. Sensibility analysis of the first stage, P (80 to 30)

**Table 1**

|           |           |
|-----------|-----------|
| Nitrogen  | 0.0024005 |
| CO2       | 0.0157031 |
| Methane   | 0.8687738 |
| Ethane    | 0.0560112 |
| Propane   | 0.0212042 |
| i-Butane  | 0.0029006 |
| n-Butane  | 0.0065013 |
| i-Pentane | 0.0020004 |
| n-Pentane | 0.0026005 |
| n-Hexane  | 0.0032006 |
| n-Heptane | 0.0023005 |
| n-Octane  | 0.0024005 |
| n-Nonane  | 0.0018004 |
| n-Decane  | 0.0122024 |



**FIGURE1**

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