

PLC Control System for the Amine Stripper

17/06/2025

1. Address Assignment

The amine stripper system also uses the same PLC CPU and HMI, to avoid duplication with the slope bottom reactor system, new I/O addresses for the amine stripper system defined. The slope bottom reactor used addresses like I0.0 to I0.9 for inputs, Q0.0 to Q2.0 for outputs, IW100 to IW114 for analog inputs, and M0.1 to M3.4 for memory bits. Non-overlapping addresses assigned for amine stripper.

- Digital Inputs (DI): Start from I2.0.
- Digital Outputs (DO): Start from Q3.0.
- Analog Inputs (AI): Start from IW200.
- Memory Bits (M): Start from M5.0.
- Motor Valves (MVs): Represented as digital outputs (e.g., Q3.0 for HA-100).

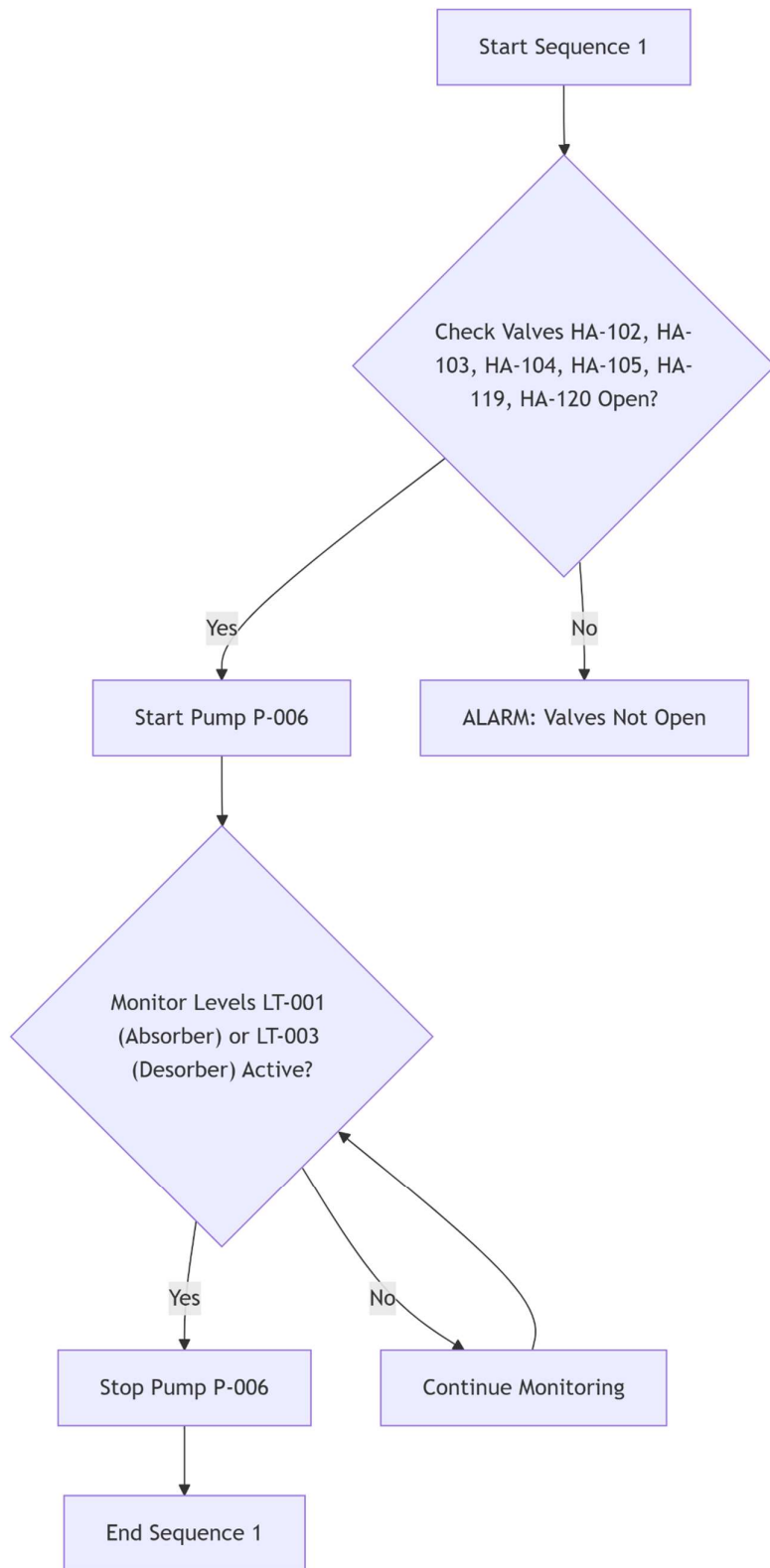
1.2. Tag Mapping

Component	Type	Address	Description
HA-100 to HA-120	Output	Q3.0 to Q4.4	Motor valves (open/close)
P-001 to P-006	Output	Q5.0 to Q5.5	Pumps (on/off)
V-001	Output	Q5.6	Blower (on/off)
W-001	Output	Q5.7	Cooler (on/off)
D-001	Output	Q6.0	Boiler (on/off)
LT-001 (Absorber)	Analog Input	IW200	Absorber level measurement
LT-003 (Desorber)	Analog Input	IW202	Desorber level measurement
LI-001 (Absorber)	Analog Input	IW204	Absorber level indicator
LI-002 (Desorber)	Analog Input	IW206	Desorber level indicator
CH4_Sensor	Analog Input	IW208	Methane content in biomethane (%)
Temp_Desorber	Analog Input	IW210	Desorber temperature
Temp_Absorbent	Analog Input	IW212	Absorbent temperature after cooler
Start_Seq1 to Start_Seq4	Input	I2.0 to I2.3	Start sequence buttons
Stop_Seq1 to Stop_Seq4	Input	I2.4 to I2.7	Stop sequence buttons
Seq_1_Active to Seq_4_Active	Memory	M5.0 to M5.3	Sequence active flags

2. Function Charts

2.1. Sequence 1 - Liquid Filling

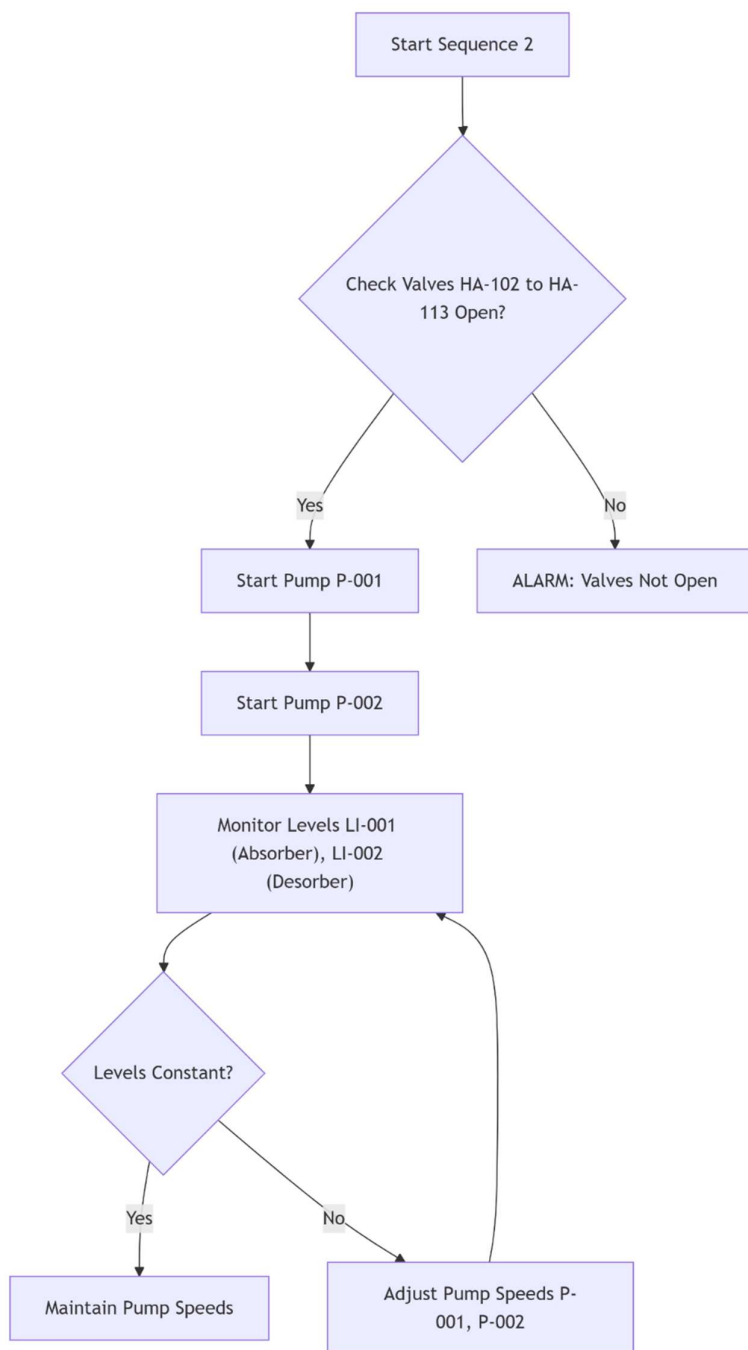
Fill the system with amine solution until levels are reached.



- Check that valves HA-102, HA-103, HA-104, HA-105, HA-119 and HA-120 are open
- Start pump P-006
- Run until level LT-001 or LT-003 becomes active

2.2. Sequence 2 - Main Operation, Liquid Circulation

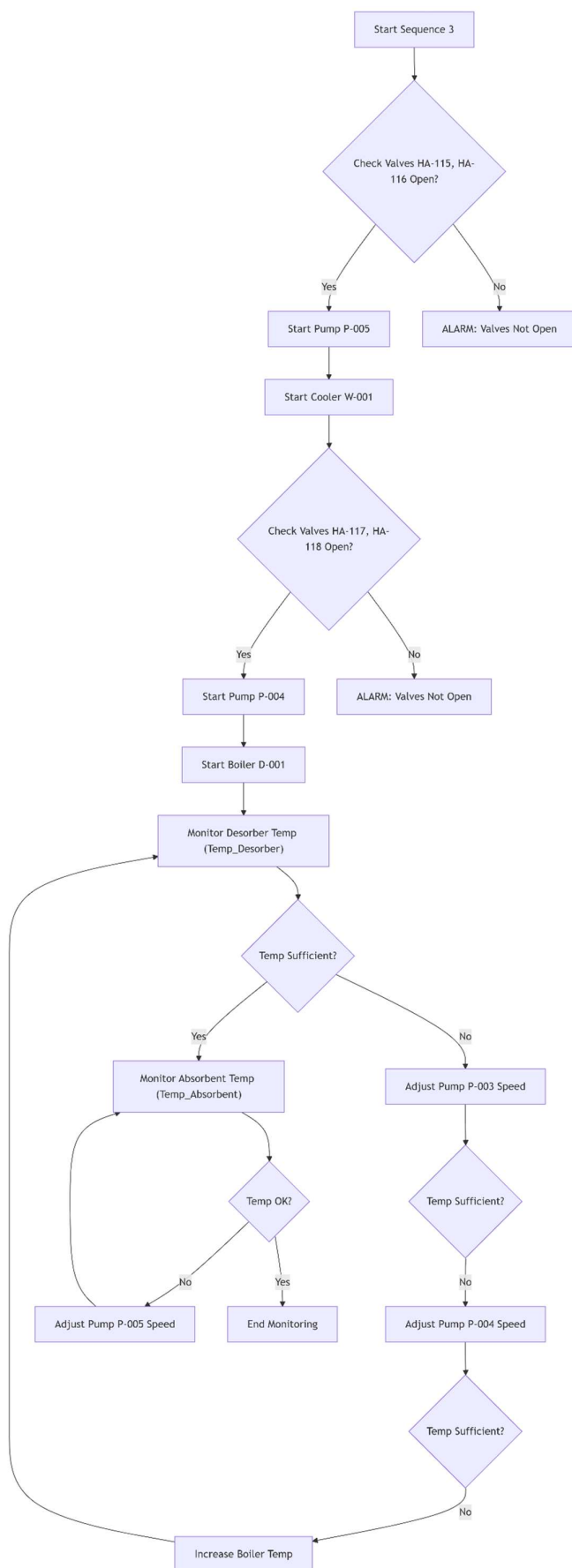
Circulate liquid between absorber and desorber.



- Check that valves HA-102, HA-103, HA-104, HA-105, HA-106, HA-107, HA-108, HA-109, HA-110, HA-111, HA-112 and HA-113 are open
- Start pump P-001
- Start pump P-002
- Follow levels LI-001 and LI-002, adjust pump speeds so that both levels stay constant.

2.3. Sequence 3 - Main Operation, Heating and Cooling

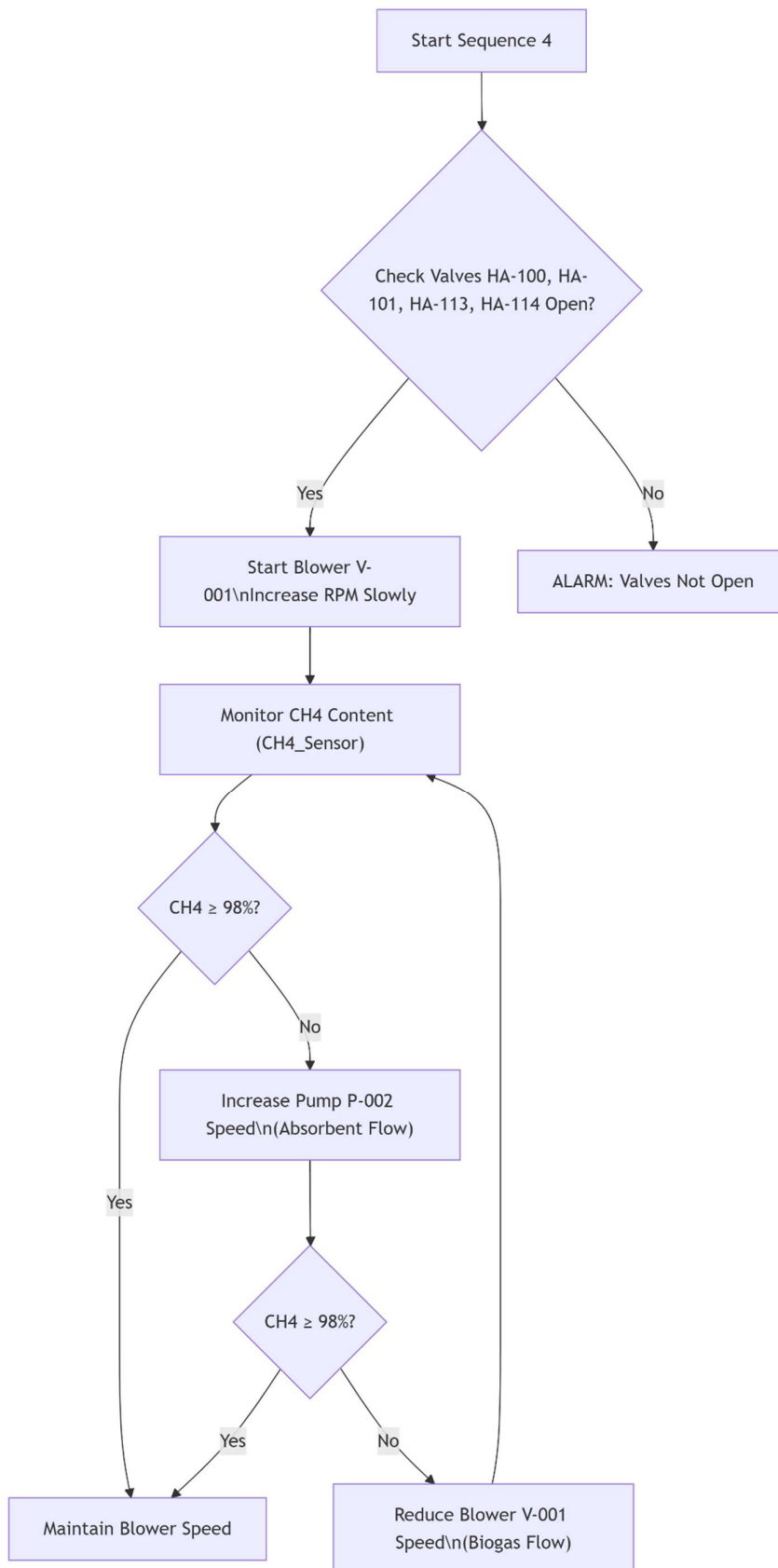
Manage heating and cooling for desorption and absorbent temperature control.



- Check that valves HA-115 and HA-116 are open
- Start pump P-005
- Start cooler W-001
- Check that valves HA-117 and HA-118 are open
- Start pump P-004
- Start boiler D-001

2.4. Sequence 4 - Main Operation, Stripping

Strip CO₂ and control biomethane quality.



- Check that valves HA-100, HA-101, HA-113 and HA-114 are open
- Start blower V-001, increase rpm slowly to pre-set running point
- Follow gas composition and activate the liquid flow controller
- Reduce gas flow if CH₄ content drops below 98 %.

3. Ladder Logic (Siemens Style)

3.1. Sequence 1 - Liquid Filling

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// Rung 1: Start Sequence - Activates Seq_1_Active (M5.0) when Start
// button (I2.0) is pressed, resets with Stop button (I2.4)
    I2.0      I2.4      M5.0
--| |-----|/|-----(=M5.0)

// Rung 2: Check valves and Start Pump - Starts P-006 (Q5.5) if
// Seq_1_Active (M5.0) is on and all valves (Q3.2 to Q4.4) are open
    M5.0      Q3.2      Q3.3      Q3.4      Q3.5      Q4.3      Q4.4      Q5.5
--| |-----| |-----| |-----| |-----| |-----| |-----| |----- (=Q5.5)

// Rung 3: Stop on Level - Resets Seq_1_Active (M5.0) and stops P-006
// if LT-001 (IW200) or LT-003 (IW202) exceeds 50%
    IW200      >50      IW202      >50      M5.0
--| |-----|OR|-----| |-----|OR|----- (=0 M5.0)

// Rung 4: Alarm Trigger - Sets Alarm_Seq1 (M6.0) if any valve
// (Q3.2 to Q4.4) is not open when Seq_1_Active (M5.0) is on
    M5.0      /Q3.2      /Q3.3      /Q3.4      /Q3.5      /Q4.3      /Q4.4      M6.0
--| |-----|/|-----|/|-----|/|-----|/|-----|/|-----|/|----- (=M6.0)

// Rung 5: Alarm Latch - Keeps Alarm_Seq1 (M6.0) latched until
// reset (via HMI button I2.8)
    M6.0      I2.8      M6.0
--| |-----|/|----- (=M6.0)
```

3.2. Sequence 2 - Liquid Circulation

[illegible]

3.3. Sequence 3 - Heating and Cooling

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// Rung 1: Start Sequence - Activates Seq_3_Active (M5.2) when
//Start button (I2.2) is pressed, resets with Stop button (I2.6)
  I2.2    I2.6    M5.2
--| |-----|/|-----=(M5.2)

// Rung 2: Check Valves and Start Cooling - Starts P-005 (Q5.4)
//and w-001 (Q5.7) if Seq_3_Active (M5.2) is on and valves (Q4.0, Q4.1) are open
  M5.2    Q4.0    Q4.1    Q5.4    Q5.7
--| |-----| |-----| |-----=(Q5.4)---(Q5.7)

// Rung 3: Check Valves and Start Heating - Starts P-004 (Q5.3) and
//D-001 (Q6.0) if valves (Q4.2, Q4.3) are open
  M5.2    Q4.2    Q4.3    Q5.3    Q6.0
--| |-----| |-----| |-----=(Q5.3)---(Q6.0)

// Rung 4: Desorber Temperature Control - Monitors Temp_Desorber (IW210),
//adjusts P-003 (QW304), P-004 (QW306), and boiler temp (QW308) if below setpoint
  IW210    <Setpoint    M5.2    QW304    QW306    QW308
--|Compare|----|Adjust|----(QW304)---(QW306)---(QW308)

// Rung 5: Absorbent Temperature Control - Monitors Temp_Absorbent (IW212),
//adjusts P-005 (QW310) if below setpoint
  IW212    <Setpoint    M5.2    QW310
--|Compare|----|Adjust|----(QW310)

// Rung 6: Alarm Trigger - Sets Alarm_Seq3 (M6.2) if any
//valve (Q4.0 to Q4.3) is not open when Seq_3_Active (M5.2) is on
  M5.2    /Q4.0    /Q4.1    /Q4.2    /Q4.3    M6.2
--| |-----|/|-----|/|-----|/|-----|/|-----=(M6.2)

// Rung 7: Alarm Latch - Keeps Alarm_Seq3 (M6.2) latched
//until reset (HMI button I2.10)
  M6.2    I2.10    M6.2
--| |-----|/|-----=(M6.2)
```

3.4. Sequence 4 - Stripping

```
// Rung 1: Start Sequence - Activates Seq_4_Active (M5.3) when
//Start button (I2.3) is pressed, resets with Stop button (I2.7)
  I2.3    I2.7    M5.3
--| |-----|/|-----=(M5.3)

// Rung 2: Check Valves and Start Blower - Starts v-001 (Q5.6)
//if Seq_4_Active (M5.3) is on and valves (Q3.0, Q3.1, Q3.13, Q3.14) are open
  M5.3    Q3.0    Q3.1    Q3.13    Q3.14    Q5.6
--| |-----| |-----| |-----| |-----| |-----=(Q5.6)

// Rung 3: Biomethane Quality Control - Monitors CH4_Sensor (IW208),
//adjusts P-002 (QW302) and v-001 (QW312) if CH4 < 98%
  IW208    <98%    M5.3    QW302    QW312
--|Compare|----|Adjust|----(QW302)---(QW312)

// Rung 4: Alarm Trigger - Sets Alarm_Seq4 (M6.3) if any valve
// (Q3.0, Q3.1, Q3.13, Q3.14) is not open when Seq_4_Active (M5.3) is on
  M5.3    /Q3.0    /Q3.1    /Q3.13    /Q3.14    M6.3
--| |-----|/|-----|/|-----|/|-----|/|-----=(M6.3)

// Rung 5: Alarm Latch - Keeps Alarm_Seq4 (M6.3) latched until
//reset (HMI button I2.11)
  M6.3    I2.11    M6.3
--| |-----|/|-----=(M6.3)
```

3.5. Combined Ladder Logic

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// Rung 1: Sequence 1 Start - Activates Seq_1_Active (M5.0) when
//Start button (I2.0) is pressed, resets with Stop button (I2.4)
  I2.0    I2.4    M5.0
--| |-----|/|-----(|=M5.0)

// Rung 2: Sequence 1 Execution - Starts P-006 (Q5.5) if
//Seq_1_Active (M5.0) is on and all valves (Q3.2 to Q4.4) are open
  M5.0    Q3.2    Q3.3    Q3.4    Q3.5    Q4.3    Q4.4    Q5.5
--| |-----| |-----| |-----| |-----| |-----| |-----| |-----(|=Q5.5)

// Rung 3: Sequence 1 Stop - Resets Seq_1_Active (M5.0) and
stops P-006 if LT-001 (IW200) or LT-003 (IW202) exceeds 50%
  IW200    >50    IW202    >50    M5.0
--| |-----|OR|-----| |-----|OR|-----(|=0 M5.0)

// Rung 4: Sequence 1 Alarm Trigger - Sets Alarm_Seq1 (M6.0)
//if any valve (Q3.2 to Q4.4) is not open when Seq_1_Active (M5.0) is on
  M5.0    /Q3.2    /Q3.3    /Q3.4    /Q3.5    /Q4.3    /Q4.4    M6.0
--| |-----|/|-----|/|-----|/|-----|/|-----|/|-----|/|-----(|=M6.0)

// Rung 5: Sequence 1 Alarm Latch - Keeps Alarm_Seq1
//(M6.0) latched until reset (I2.8)
  M6.0    I2.8    M6.0
--| |-----|/|-----(|=M6.0)

// Rung 6: Sequence 2 Start (Interlock: Seq 1 Complete) - Activates Seq_2_Active
//(M5.1) if Seq_1_Active (M5.0) is off, start (I2.1) is pressed, and Stop (I2.5) is not
  I2.1    I2.5    M5.0    M5.1
--| |-----|/|-----|/|-----(|=M5.1)

// Rung 7: Sequence 2 Execution - Starts P-001 (Q5.0) and P-002 (Q5.1) if Seq_2_Active
//(M5.1) is on and all valves (Q3.2 to Q3.13) are open
  M5.1    Q3.2    Q3.3    ...    Q3.13    Q5.0    Q5.1
--| |-----| |-----| |-----...-----| |-----(|=Q5.0)---(|=Q5.1)

// Rung 8: Sequence 2 Level Control - Compares LI-001 (IW204) and LI-002 (IW206) to
//maintain balance, adjusts pump speeds via QW300 and QW302
  IW204    IW206    M5.1    QW300    QW302
--|Compare|----|Subtract|----|Adjust|----(|QW300)---(|QW302)

// Rung 9: Sequence 2 Alarm Trigger - Sets Alarm_Seq2 (M6.1) if any valve (Q3.2 to
//Q3.13) is not open when Seq_2_Active (M5.1) is on
  M5.1    /Q3.2    /Q3.3    /Q3.4    /Q3.5    /Q3.6    /Q3.7    /Q3.8    /Q3.9    /Q3.10
/Q3.11    /Q3.12    /Q3.13    M6.1
--| |-----|/|-----|/|-----|/|-----|/|-----|/|-----|/|-----|/|-----|/|-----|/|-----|/|-----(|=M6.1)

// Rung 10: Sequence 2 Alarm Latch - Keeps Alarm_Seq2 (M6.1) latched until reset
//(I2.9)
  M6.1    I2.9    M6.1
--| |-----|/|-----(|=M6.1)

// Rung 11: Sequence 3 Start (Interlock: Seq 2 Active) - Activates Seq_3_Active (M5.2)
//if Seq_2_Active (M5.1) is off, Start (I2.2) is pressed, and Stop (I2.6) is not
  I2.2    I2.6    M5.1    M5.2
--| |-----|/|-----| |-----(|=M5.2)

// Rung 12: Sequence 3 Cooling - Starts P-005 (Q5.4) and W-001 (Q5.7) if Seq_3_Active
//(M5.2) is on and valves (Q4.0, Q4.1) are open
  M5.2    Q4.0    Q4.1    Q5.4    Q5.7
--| |-----| |-----| |-----(|=Q5.4)---(|=Q5.7)
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// Rung 13: Sequence 3 Heating - Starts P-004 (Q5.3) and D-001 (Q6.0) if valves (Q4.2,
//Q4.3) are open
M5.2    Q4.2    Q4.3    Q5.3    Q6.0
--| |-----| |-----| |-----=(Q5.3)---(=Q6.0)

// Rung 14: Sequence 3 Temp Control - Monitors Temp_Desorber (IW210), adjusts P-003
//(QW304), P-004 (QW306), and boiler temp (QW308) if below setpoint
IW210   <Setpoint    M5.2    QW304    QW306    QW308
--|Compare|----|Adjust|----(QW304)---(QW306)---(QW308)

// Rung 15: Sequence 3 Absorbent Temp - Monitors Temp_Absorbent (IW212), adjusts P-005
//(QW310) if below setpoint
IW212   <Setpoint    M5.2    QW310
--|Compare|----|Adjust|----(QW310)

// Rung 16: Sequence 3 Alarm Trigger - Sets Alarm_Seq3 (M6.2) if any valve (Q4.0 to
//Q4.3) is not open when Seq_3_Active (M5.2) is on
M5.2    /Q4.0    /Q4.1    /Q4.2    /Q4.3    M6.2
--| |-----|/|-----|/|-----|/|-----|/|-----=(M6.2)

// Rung 17: Sequence 3 Alarm Latch - Keeps Alarm_Seq3 (M6.2) latched until reset
//(I2.10)
M6.2    I2.10    M6.2
--| |-----|/|-----=(M6.2)

// Rung 18: Sequence 4 Start (Interlock: Seq 3 Active) - Activates Seq_4_Active (M5.3)
//if Seq_3_Active (M5.2) is off, Start (I2.3) is pressed, and Stop (I2.7) is not
I2.3    I2.7    M5.2    M5.3
--| |-----|/|-----| |-----=(M5.3)

// Rung 19: Sequence 4 Execution - Starts V-001 (Q5.6) if Seq_4_Active (M5.3) is on
//and valves (Q3.0, Q3.1, Q3.13, Q3.14) are open
M5.3    Q3.0    Q3.1    Q3.13    Q3.14    Q5.6
--| |-----| |-----| |-----| |-----| |-----=(Q5.6)

// Rung 20: Sequence 4 CH4 Control - Monitors CH4_Sensor (IW208), adjusts P-002
//(QW302) and V-001 (QW312) if CH4 < 98%
IW208   <98%    M5.3    QW302    QW312
--|Compare|----|Adjust|----(QW302)---(QW312)

// Rung 21: Sequence 4 Alarm Trigger - Sets Alarm_Seq4 (M6.3) if any valve (Q3.0,
//Q3.1, Q3.13, Q3.14) is not open when Seq_4_Active (M5.3) is on
M5.3    /Q3.0    /Q3.1    /Q3.13    /Q3.14    M6.3
--| |-----|/|-----|/|-----|/|-----|/|-----=(M6.3)

// Rung 22: Sequence 4 Alarm Latch - Keeps Alarm_Seq4 (M6.3) latched until reset
//(I2.11)
M6.3    I2.11    M6.3
--| |-----|/|-----=(M6.3)
```

4. HMI Integration and Screen Layouts (WinCC)

4.1 Tag Configuration for WinCC HMI

Tag Name	PLC Address	Description	Screen Usage	Tag Type	Units
Start_Seq1	I2.0	Start button for Sequence 1 (Liquid Filling)	Seq 1, Main Screen	DI	
Stop_Seq1	I2.4	Stop button for Sequence 1	Seq 1, Main Screen	DI	
Seq_1_Active	M5.0	Sequence 1 active status	Seq 1, Main Screen	DO	
P_006	Q5.5	Pump P-006 status	Seq 1	DO	
LT_001	IW200	Absorber level measurement (0-100%)	Seq 1	AI	%
LT_003	IW202	Desorber level measurement (0-100%)	Seq 1	AI	%
HA_102	Q3.2	Valve HA-102 status	Seq 1	DO	
HA_103	Q3.3	Valve HA-103 status	Seq 1	DO	
HA_104	Q3.4	Valve HA-104 status	Seq 1	DO	
HA_105	Q3.5	Valve HA-105 status	Seq 1	DO	
HA_119	Q4.3	Valve HA-119 status	Seq 1	DO	
HA_120	Q4.4	Valve HA-120 status	Seq 1	DO	
Alarm_Seq1	M6.0	Alarm for Sequence 1 (valve failure)	Seq 1, Supervisor	DO	
Reset_Alarm_Seq1	I2.8	Reset button for Seq 1 alarm	Seq 1	DI	
Start_Seq2	I2.1	Start button for Sequence 2 (Liquid Circulation)	Seq 2, Main Screen	DI	
Stop_Seq2	I2.5	Stop button for Sequence 2	Seq 2, Main Screen	DI	
Seq_2_Active	M5.1	Sequence 2 active status	Seq 2, Main Screen	DO	
P_001	Q5.0	Pump P-001 status	Seq 2	DO	

P_002	Q5.1	Pump P-002 status	Seq 2	DO	
LI_001	IW204	Absorber level indicator (0-100%)	Seq 2	AI	%
LI_002	IW206	Desorber level indicator (0-100%)	Seq 2	AI	%
Speed_P001	QW300	Speed control for P-001 (0-1000)	Seq 2	DO	
Speed_P002	QW302	Speed control for P-002 (0-1000)	Seq 2	DO	
HA_106	Q3.6	Valve HA-106 status	Seq 2	DO	
HA_107	Q3.7	Valve HA-107 status	Seq 2	DO	
HA_108	Q3.8	Valve HA-108 status	Seq 2	DO	
HA_109	Q3.9	Valve HA-109 status	Seq 2	DO	
HA_110	Q3.10	Valve HA-110 status	Seq 2	DO	
HA_111	Q3.11	Valve HA-111 status	Seq 2	DO	
HA_112	Q3.12	Valve HA-112 status	Seq 2	DO	
HA_113	Q3.13	Valve HA-113 status	Seq 2	DO	
Alarm_Seq2	M6.1	Alarm for Sequence 2 (valve failure)	Seq 2, Supervisor	DO	
Reset_Alarm_Seq2	I2.9	Reset button for Seq 2 alarm	Seq 2	DI	
Start_Seq3	I2.2	Start button for Sequence 3 (Heating/Cooling)	Seq 3, Main Screen	DI	
Stop_Seq3	I2.6	Stop button for Sequence 3	Seq 3, Main Screen	DI	
Seq_3_Active	M5.2	Sequence 3 active status	Seq 3, Main Screen	DO	
P_003	Q5.2	Pump P-003 status	Seq 3	DO	
P_004	Q5.3	Pump P-004 status	Seq 3	DO	
P_005	Q5.4	Pump P-005 status	Seq 3	DO	
W_001	Q5.7	Cooler W-001 status	Seq 3	DO	
D_001	Q6.0	Boiler D-001 status	Seq 3	DO	

Temp_Desorber	IW210	Desorber temperature (0-100°C)	Seq 3	AI	°C
Temp_Absorbent	IW212	Absorbent temperature after cooler (0-100°C)	Seq 3	AI	°C
Speed_P003	QW304	Speed control for P-003 (0-1000)	Seq 3	DO	
Speed_P004	QW306	Speed control for P-004 (0-1000)	Seq 3	DO	
Speed_P005	QW310	Speed control for P-005 (0-1000)	Seq 3	DO	
Boiler_Temp	QW308	Boiler temperature control (0-1000)	Seq 3	DO	
HA_115	Q4.0	Valve HA-115 status	Seq 3	DO	
HA_116	Q4.1	Valve HA-116 status	Seq 3	DO	
HA_117	Q4.2	Valve HA-117 status	Seq 3	DO	
HA_118	Q4.3	Valve HA-118 status	Seq 3	DO	
Alarm_Seq3	M6.2	Alarm for Sequence 3 (valve failure)	Seq 3, Supervisor	DO	
Reset_Alarm_Seq3	I2.10	Reset button for Seq 3 alarm	Seq 3	DI	
Start_Seq4	I2.3	Start button for Sequence 4 (Stripping)	Seq 4, Main Screen	DI	
Stop_Seq4	I2.7	Stop button for Sequence 4	Seq 4, Main Screen	DI	
Seq_4_Active	M5.3	Sequence 4 active status	Seq 4, Main Screen	DO	
V_001	Q5.6	Blower V-001 status	Seq 4	DO	
CH4_Sensor	IW208	Methane content in biomethane (0-100%)	Seq 4	AI	%
Speed_V001	QW312	Speed control for V-001 (0-1000)	Seq 4	DO	
HA_100	Q3.0	Valve HA-100 status	Seq 4	DO	
HA_101	Q3.1	Valve HA-101 status	Seq 4	DO	
HA_114	Q3.14	Valve HA-114 status	Seq 4	DO	

Alarm_Seq4	M6.3	Alarm for Sequence 4 (valve failure)	Seq 4, Supervisor	DO	
Reset_Alarm_Seq4	I2.11	Reset button for Seq 4 alarm	Seq 4	DI	
Emergency_Stop	M5.4	Emergency stop command (resets all sequences)	Supervisor	DO	
Override_Mode	M5.5	Override mode activation	Supervisor	DO	
Reset_System	M5.6	System reset command (clears alarms)	Supervisor	DO	

4.2 Main Screen, Sequence Control Screens, and Supervisor

4.2.1. Main Screen :

Purpose: Overview of all sequences and system status.

Layout:

MAIN SCREEN			[Date: 2025-05-12]				
SYSTEM DIAGRAM:							
+-----+ Absorber LT-001 P-001 +-----+ HA-102 +-----+		-->	+-----+ Desorber LT-003 P-004 +-----+ HA-115 +-----+		-->	+-----+ Stripper CH4 V-001 +-----+ HA-100 +-----+	
SENSORS: [CH4:<CH4_Sensor>%] [Temp_Desorber:<Temp_Desorber>°C] [Temp_Absorbent:<Temp_Absorbent>°C]							
+-----+ CONTROLS [Seq 1 start] [Seq 2 start] [Seq 3 start] [Seq 4 start] +-----+		+-----+ ALARMS [Seq 1:<Alarm_Seq1>] [Seq 2:<Alarm_Seq2>] [Seq 3:<Alarm_Seq3>] [Seq 4:<Alarm_Seq4>] +-----+					

- Provides an overview of all sequence activation statuses (Seq_1_Active to Seq_4_Active).
- Displays a system diagram, the flow from Absorber to Desorber to Stripper, with key components (LT-001, P-001, etc.) and valves (HA-102, HA-115, HA-100).
- Real-time values for CH4_Sensor, Temp_Desorber, and Temp_Absorbent.
- Start each sequence (Seq 1 to Seq 4) via dedicated start buttons.

4.2.2. Sequence 1 - Liquid Filling Screen

Purpose: Monitor and control the liquid filling sequence.

Layout:

SEQ 1: LIQUID FILLING		
STATUS: [Seq:<Seq_1_Active>] [P-006:<P_006>]		
LEVELS: [LT-001:<LT_001>%] [LT-003:<LT_003>%]		
CONTROLS	VALVE STATUS	LEVEL TREND
[Start]	HA-102:<HA_102>	LT-001:[=====]
[Stop]	HA-103:<HA_103>	LT-003:[=====]
[Reset Alarm]	HA-104:<HA_104>	0% 100%
	HA-105:<HA_105>	(Last 5 min)
	HA-119:<HA_119>	
	HA-120:<HA_120>	
ALARM: [Alarm_Seq1]		

- Displays the status of Sequence 1 activation and Pump P-006 operation.
- Real-time level measurements for LT-001 (absorber) and LT-003 (desorber) in percentage.
- Manual start and stop of the liquid filling sequence.
- Monitors the status of valves (HA-102 to HA-120) with indicators for open/closed states.
- Provides trend graphs for LT-001 and LT-003 levels over the last 5 minutes.
- Triggers and displays an alarm if any valve fails to open during operation.

4.2.3. Sequence 2: Liquid Circulation Screen

Purpose: Monitor liquid circulation and level control.

Layout:

SEQ 2: LIQUID CIRCULATION		
STATUS: [Seq:<Seq_2_Active>] [P-001:<P_001>] [P-002:<P_002>]		
LEVELS: [LI-001:<LI_001>%] [LI-002:<LI_002>%]		
CONTROLS	VALVE STATUS	LEVEL TREND
[Start]	HA-102:<HA_102>	LI-001:[=====]
[Stop]	HA-103:<HA_103>	LI-002:[=====]
[Reset Alarm]	...	0% 100%
P-001:[Speed]	HA-113:<HA_113>	(Last 5 min)
P-002:[Speed]		
ALARM: [Alarm_Seq2]		

- Displays the status of Sequence 2 activation and Pumps P-001 and P-002 operation.
- Real-time level indicators for LI-001 (absorber) and LI-002 (desorber) in percentage.
- Manual start and stop of the liquid circulation sequence.
- Monitors the status of valves (HA-102 to HA-113) with indicators for open/closed states.

- Adjustable speed controls for Pumps P-001 and P-002.
- Displays trend graphs for LI-001 and LI-002 levels over the last 5 minutes.
- Triggers and displays an alarm if any valve fails to open during operation.
- Enables manual reset of the sequence 2 alarm.

4.2.4. Sequence 3: Heating and Cooling Screen

Purpose: Manage heating and cooling operations.

Layout:

SEQ 3: HEATING AND COOLING			
STATUS: [Seq:<Seq_3_Active>] [P-003:<P_003>] [P-004:<P_004>] [P-005:<P_005>]			
TEMPS: [Temp_Desorber:<Temp_Desorber>°C] [Temp_Absorbent:<Temp_Absorbent>°C]			
+-----+-----+-----+			
CONTROLS	DEVICE STATUS	TEMP TREND	
[Start]	HA-115:<HA_115>	Temp_Desorber:[==]	
[Stop]	HA-116:<HA_116>	Temp_Absorbent:[=]	
[Reset Alarm]	HA-117:<HA_117>	0°C 100°C	
P-003:[Speed]	HA-118:<HA_118>	(Last 5 min)	
P-004:[Speed]	W-001:<W_001>		
P-005:[Speed]	D-001:<D_001>		
Boiler:[Temp]			
+-----+-----+-----+			
ALARM: [Alarm_Seq3]			

- Displays the status of Sequence 3 activation and Pumps P-003, P-004, P-005 operation.
- Real-time temperatures for Temp_Desorber and Temp_Absorbent.
- Manual start and stop of the heating and cooling sequence.
- Monitors the status of valves (HA-115 to HA-118) and devices (W-001, D-001) with indicators.
- Adjustable speed controls for Pumps P-003, P-004, P-005, and boiler temperature.
- Trend graphs for Temp_Desorber and Temp_Absorbent temperatures over the last 5 minutes.
- Triggers and displays an alarm if any valve fails to open during operation.
- Manual reset of the sequence 3 alarm.

4.2.5. Sequence 4: Stripping Screen

Purpose: Control stripping and biomethane quality.

Layout:

SEQ 4: STRIPPING			
STATUS: [Seq:<Seq_4_Active>] [V-001:<V_001>]			
CH4: [CH4_Sensor:<CH4_Sensor>%]			
+-----+-----+-----+			
CONTROLS	VALVE STATUS	CH4 TREND	
[Start]	HA-100:<HA_100>	CH4_Sensor:[=====]	
[Stop]	HA-101:<HA_101>	0% 100%	
[Reset Alarm]	HA-113:<HA_113>	(Last 5 min)	
V-001:[Speed]	HA-114:<HA_114>		
P-002:[Speed]			
+-----+-----+-----+			
ALARM: [Alarm_Seq4]			
+-----+-----+-----+			

- Displays the status of Sequence 4 activation and Blower V-001 operation.
- Real-time methane content from CH4_Sensor in percentage.
- Manual start and stop of the stripping sequence.
- Monitors the status of valves (HA-100, HA-101, HA-113, HA-114) with indicators for open/closed states.
- Adjustable speed controls for Blower V-001 and Pump P-002.
- Displays a trend graph for CH4_Sensor methane content over the last 5 minutes.
- Triggers and displays an alarm if any valve fails to open during operation.
- Manual reset of the sequence 4 alarm.

4.2.6. Supervisor Screen

Purpose: Provide an overview and advanced controls.

Layout:

SUPERVISOR SCREEN

[USER : SUPERVISOR]

SEQUENCE OVERVIEW:

[Seq 1:<Seq_1_Active>] [Seq 2:<Seq_2_Active>]

[Seq 3:<Seq_3_Active>] [Seq 4:<Seq_4_Active>]

ALARMS:

[Seq 1:<Alarm_Seq1>] [Seq 2:<Alarm_Seq2>]

[Seq 3:<Alarm_Seq3>] [Seq 4:<Alarm_Seq4>]

CONTROLS

[Emergency Stop]

[Override Mode]

[Reset System]

ANALYTICS

Avg CH4:<X.XX>%

Avg Temp_D:<Y°C>

Uptime:<Z hrs>

TRENDS

CH4_Sensor:[=====]

Temp_Desorber:[=]

0% 100% 0°C 100°C

(Last 5 min)

- Displays the activation status of all sequences (Seq_1_Active to Seq_4_Active).
- Emergency stop button to halt all sequences simultaneously.
- An override mode button to bypass normal interlocks if needed.
- A system reset button to clear all alarms and restore default states.
- Monitors and displays alarms for all sequences (Alarm_Seq1 to Alarm_Seq4).
- Trend graphs for CH4_Sensor and Temp_Desorber over the last 5 minutes.
- Displays analytics including average CH4 level, average desorber temperature, and total system uptime.
- Requires supervisor login for access.