Title: **Tank 1 Process Control** Project: 1

Course: Intro to Automation Unit: Manual Motor Control CLO: 1, 2

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Grade \_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall repeat the designs from the Manual Motor Control unit to automate a process tank.
2. Student shall create a hand drawn design of the process schematic.
3. Student shall render a computer aided schematic of the same design.

**Assessment**

Students shall demonstrate a comprehension of the objectives listed above by scoring a minimum of 75% on this Project. Grading shall be based on the Manual Motor Control rubric.

**Controls**

* Tank Level Control
* Hot Water Supply Control
* Water Temperature Control
* Tank Pressure Control

**Devices**

Tank Level Control

|  |  |  |  |
| --- | --- | --- | --- |
|  | Inputs | | |
|  | *Device* | *Description* | *Symbol* |
|  | Three-position Selector Switch | Mode: On, Off, Automatic | TL1\_MD |
|  | Float Switch (M-GRE-40-W) | High Level Indication | HI\_LVL1 |
|  | Float Switch (M-GRE-40-W) | Low Level Indication | LO\_LVL1 |
|  | Outputs | | |
|  | *Device* | *Description* | *Symbol* |
|  | Green Pilot Light | Water Valve Open | VLV1\_OPEN |
|  | Red Pilot Light | Water Valve Closed | VLV1\_CLSD |
|  | Blue Pilot Light | Tank High Level Indication | TK1\_FULL |
|  | Eleven-Pin Relay | Valve Control Relay | VC1 |
|  | 120VAC Valve | Normally Closed Solenoid Valve | VLV1 |

Hot Water Supply Control

|  |  |  |  |
| --- | --- | --- | --- |
|  | Inputs | | |
|  | *Device* | *Description* | *Symbol* |
|  | Two-position Selector Switch | Mode: On, Automatic | WS1\_MD |
|  | Float Switch (M-GRE-40-W) | Low Level Indication | LO\_LVL1 |
|  | Flow Switch () | Low Flow Indication | LO\_FLO1 |
|  | Outputs | | |
|  | *Device* | *Description* | *Symbol* |
|  | Green Pilot Light | Pump is Running | VLV\_OPEN |
|  | Red Pilot Light | Pump is Off | VLV\_CLSD |
|  | Time-Off Relay | Low Flow Interlock | ILK1 |
|  | Motor Starter | 3-Phase Motor Starter w/aux. contacts | PC1 |
|  | 208VAC Motor | Three Phase 5HP Motor | PMP1 |

Water Temperature Control

|  |  |  |  |
| --- | --- | --- | --- |
|  | Inputs | | |
|  | *Device* | *Description* | *Symbol* |
|  | Two-position Selector Switch | Mode: Off, Automatic | TMP1\_MD |
|  | Temperature Switch () | High Temperature Indication | HI\_TMP1 |
|  | Temperature Switch () | Low Temperature Indication | LO\_TMP1 |
|  | Float Switch (M-BLU-40-W) | Water Level Indication | LVL1 |
|  | Outputs | | |
|  | *Device* | *Description* | *Symbol* |
|  | Green Pilot Light | Steam Valve Open | STM1\_OPEN |
|  | Red Pilot Light | Steam Valve Closed | STM1\_CLSD |
|  | Yellow Pilot Light | Tank Level Indication | LEVEL1 |
|  | Eleven-Pin Relay | Steam Control Relay | SC1 |
|  | 120VAC Valve | Normally Closed Solenoid Valve | STM1 |

Tank Pressure Control

|  |  |  |  |
| --- | --- | --- | --- |
|  | Inputs | | |
|  | *Device* | *Description* | *Symbol* |
|  | Two-position Selector Switch | Mode: On, Automatic | PS1\_MD |
|  | Pressure Switch () | High Pressure Indication | HI\_PRS1 |
|  | Outputs | | |
|  | *Device* | *Description* | *Symbol* |
|  | Green Pilot Light | Vent is Open | VNT\_OPEN |
|  | Red Pilot Light | Vent is Closed | VNT\_CLSD |
|  | Eight-pin Control Relay | Vent Valve Control Relay | VTC1 |
|  | 120VAC Valve | Normally Open Solenoid Valve | VT1 |

**Instructions**

Design a forward/reverse motor control circuit using the devices listed above. One pushbutton shall be a START button. When the START button is pressed, the motor shall start and continue to run even if the START button is no longer pressed. Another pushbutton shall be a JOG pushbutton. If JOG is pressed, the motor shall start and run only while the button is pressed. Once the JOG button is released, the motor shall stop. If the STOP button is pressed, the motor shall stop regardless of direction. The selector switch shall determine if the motor is to rotate FORWARD (CCW) or REVERSE (CW). If the motor is running and the selector switch is changed, the motor shall stop running. The operator shall be required to press the START button to engage the motor in the newly selected direction. While the motor is running in either direction, the green light shall illuminate, and the red light shall be off. If the REV option is selected, the blue light shall illuminate when the motor is running. When the motor is not running, only the red light shall illuminate. BONUS: Add a yellow light that illuminates when the motor is running and FWD is selected. Use the space on the opposite side of this page to design the circuit. Once complete, review the design with the instructor. After obtaining approval, wire the circuit ensuring to label all wires with the appropriate wire numbers. Have the instructor review all wiring before energizing the circuit. Render the schematic using a CAD type software package. Post the schematic to the *student share* folder using filename *MMC Project 1 – name.ext.*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Discussed design \_\_\_\_\_\_\_\_ Checked wiring \_\_\_\_\_\_\_\_ Energized Test \_\_\_\_\_\_\_\_