

Automation Upgrade to Master Control Center

Cultivated Cocktails



INTRODUCTION

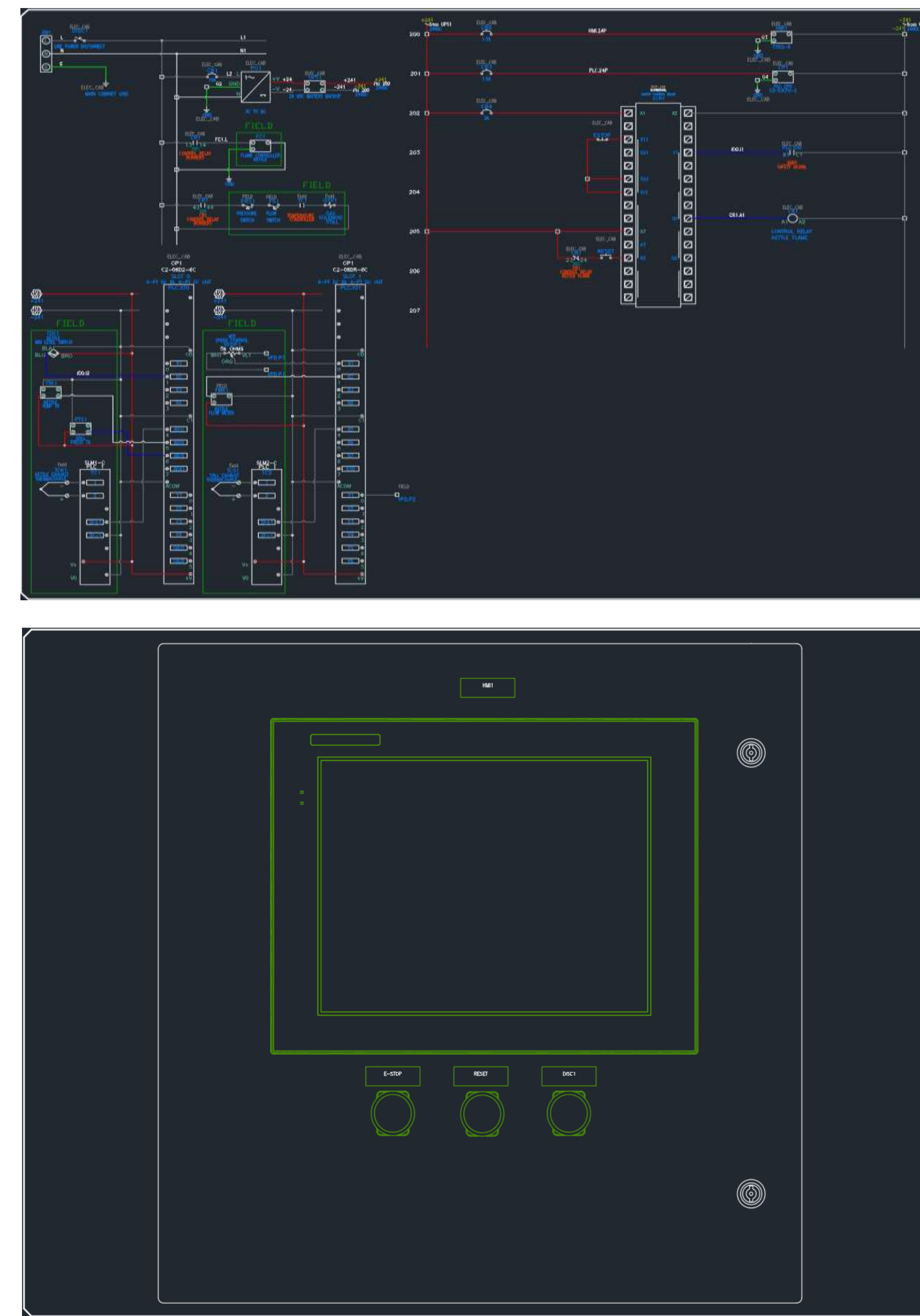
The distillery operates with existing automation devices but requires an upgraded control system to enhance operational efficiency and safety. The new system must increase automation while preserving essential manual tasks to maintain flexibility and ensure employee convenience. The objective is to design a semi-automated control system for the distillery, integrating a Programmable Logic Controller (PLC) and Human-Machine Interface (HMI) to automate and monitor production processes, including mash tun and distillation, and to implement robust safety shutdown protocols.

PURPOSE

The distillery's current automation devices may not fully meet modern operational or safety standards, necessitating a new system. By integrating advanced PLC and HMI technologies, the project aims to streamline production, reduce manual workload, and enhance safety through automated emergency responses. The emphasis on simulation and testing ensures reliability, minimizing risks during deployment in an active production environment.

- **PLC Integration:** Implement PLC-based control for production processes (mash tun, distillation) and safety protocols.
- **HMI Development:** Develop an intuitive HMI for user-friendly monitoring of sensor readings, measurements, and alerts.
- **Design Software:** Utilize AutoCAD Electrical, Click PLC, C-More HMI, and Creo 3D Modeling.
- **Simulation and Testing:** Conduct simulations and stress tests on a mock-up to validate system functionality and safety features, such as emergency shutoffs for overheating or over pressurization.
- **Troubleshooting:** Perform comprehensive troubleshooting to ensure the system is fully operational prior to implementation.

FINAL DESIGN



Electrical Schematic (top), Panel Exterior Drawing (bottom).

CODE

Mash Tun Code

Address	Data Type	Nickname	Used	Initial Value	Retentive	Address Comment
X001	R:BIT	I_Safety_Signal_Lost	Yes	Off	No	Physical input for Flow Meter pulse signal
X002	R:BIT	I_Kettle_Min_Lvl	Yes	Off	No	Physical input for kettle minimum fill level
X003	R:BIT	I_Kettle_Min_Flow	No	Off	No	Physical input for kettle minimum flow level
X004	R:BIT	I_Kettle_Fill_Flow_Mtr	No	Off	No	Physical input for kettle water fill valve
X005	R:BIT	I_Still_Flame_Detect	No	Off	No	Physical input for still pilot flame detection
X006	R:BIT	I_Still_Temp_1	No	Off	No	Physical input for still temperature
X007	R:BIT	I_Still_PSI	Yes	Off	No	Physical input still safety valve pressure
X008	R:BIT	I_Coolant_Temp_1	No	Off	No	Physical input for coolant temperature supply flow
X009	R:BIT	I_Coolant_Temp_2	No	Off	No	Physical input for coolant temperature return flow
X010	R:BIT	I_Coolant_FS_1	No	Off	No	Physical input for coolant supply flow switch
X011	R:BIT	I_Coolant_FS_2	No	Off	No	Physical input for coolant return flow switch
X012	R:BIT	I_Still_Flow_Switch	No	Off	No	Physical input for still flow switch
X013	R:BIT	I_Flow_Cnt_1	Yes	Off	No	Physical input for still flow switch

Tags List

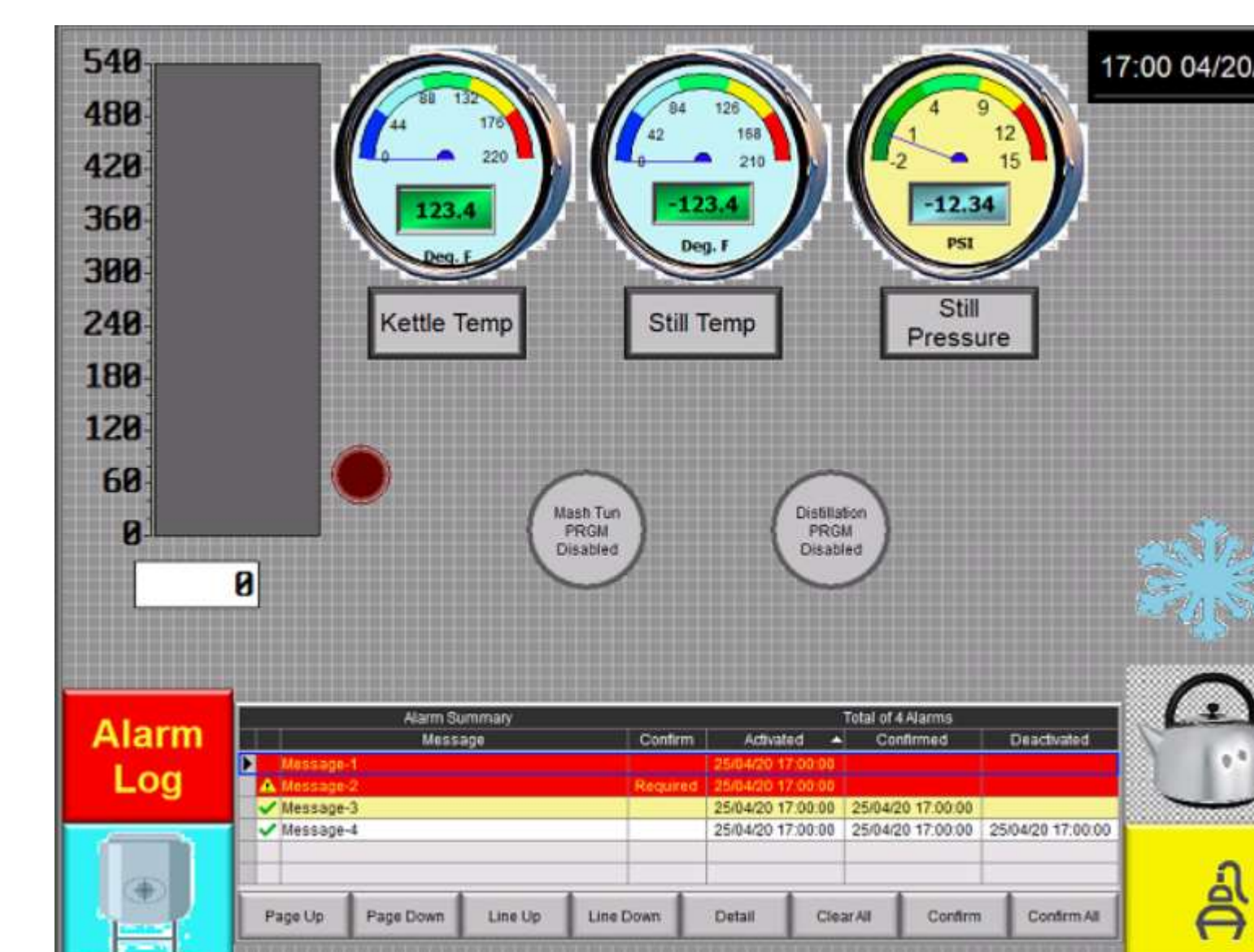
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RESULTS

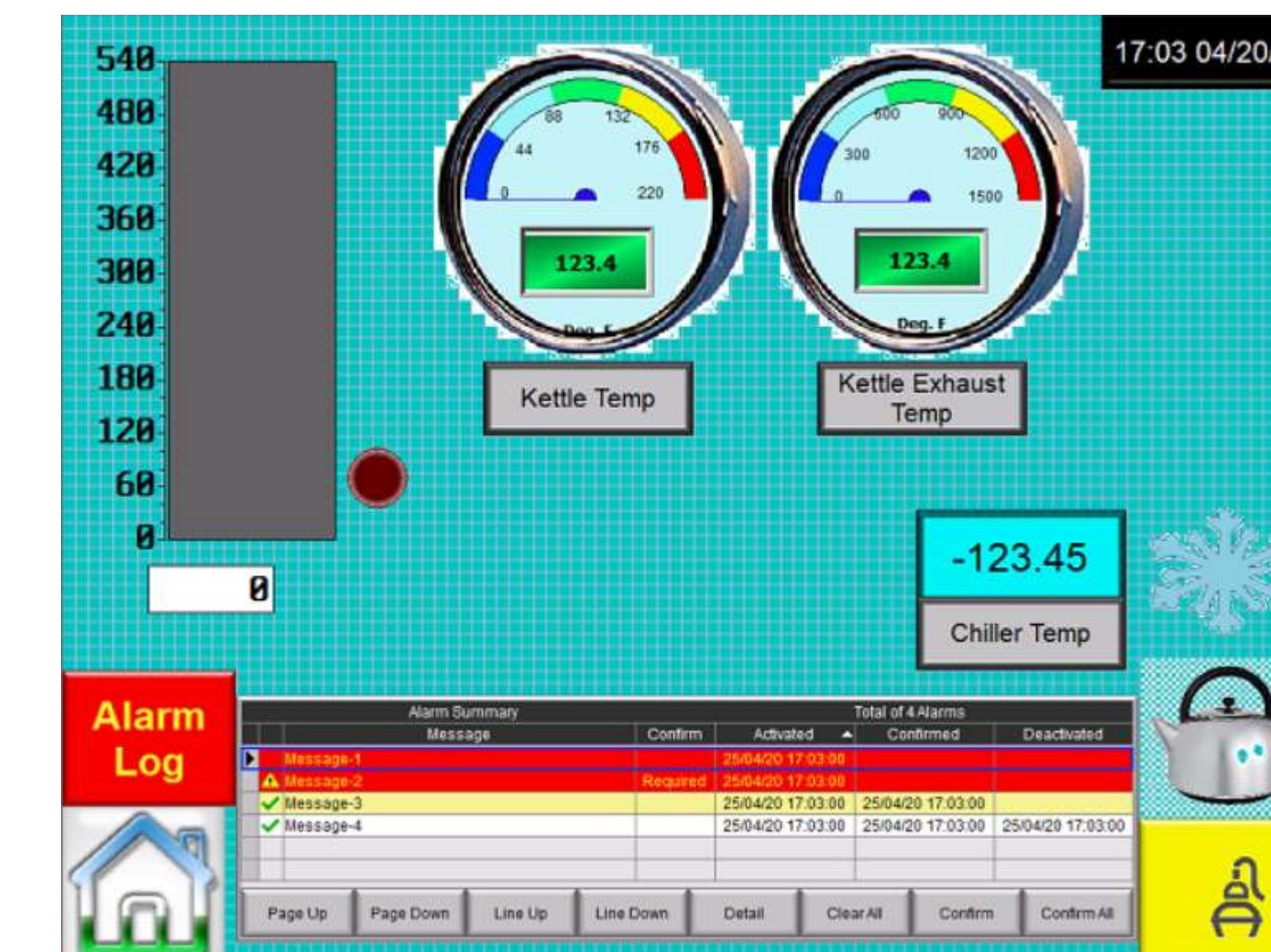
Electrical Cabinet w/ Mounted HMI



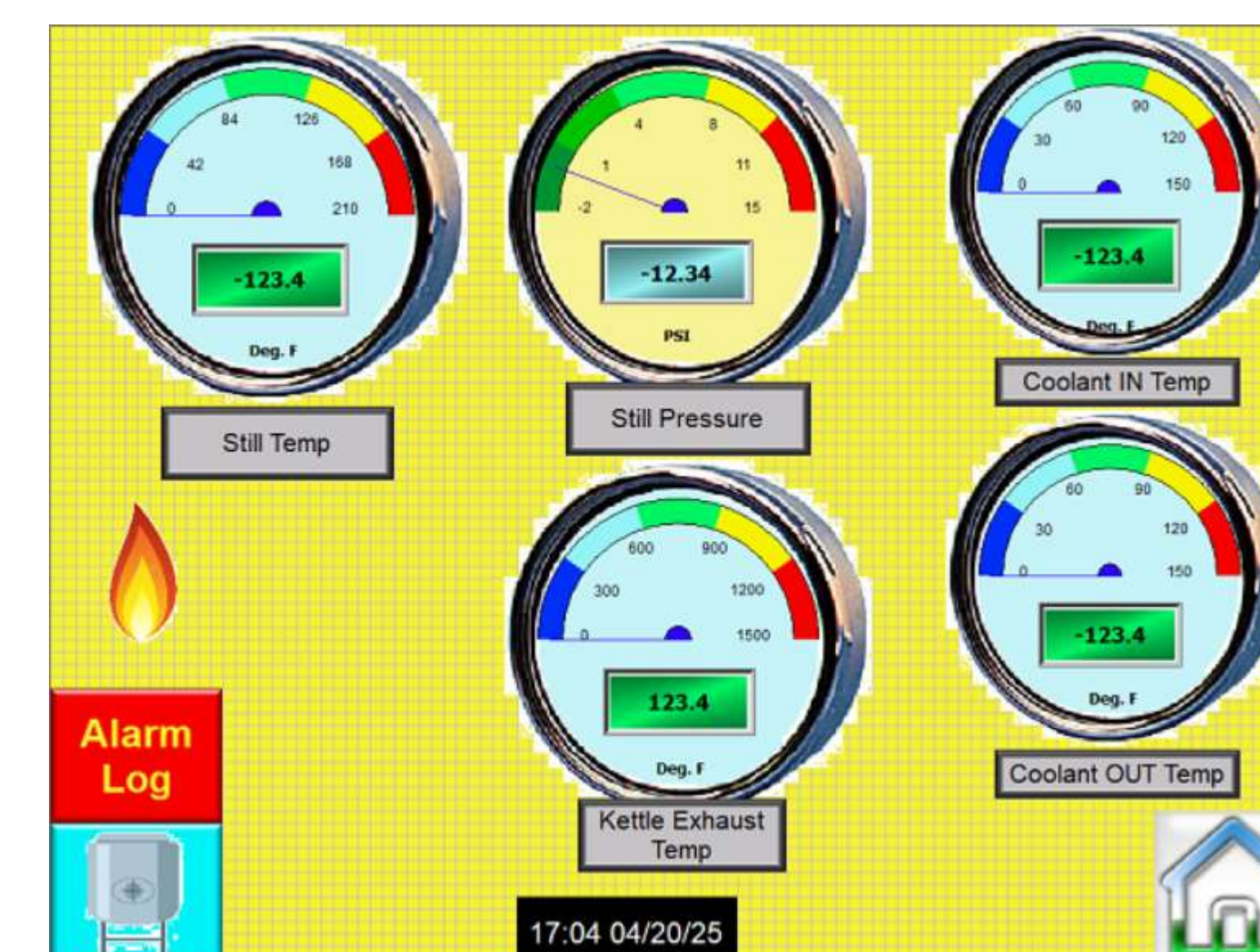
Home Screen



Mash Tun Screen



Still Screen



SUMMARY AND CONCLUSIONS

- Team was able to assemble and power control system
- Integrated the HMI system with the PLC
- developed code for PLC sensor inputs/ outputs
- Created safety routine to shut down system

FUTURE WORK

- Install design at project site & debug systems (HMI Screens, PLC code)
- Expand on overall system

TEAM & ACKNOWLEDGEMENTS

- **Student**
 - Kevin Yang (ECET)
 - Dylan Torres (ET)
 - Harry Fulbright (ECET)
 - Joe Chandler (EE)
- **Faculty**
 - Brett Banther (Faculty Mentor)
 - Shawn Lyvers (Rapid Center)
- **Sponsor Contact**
 - Taylor Howard
 - Reel Adams

