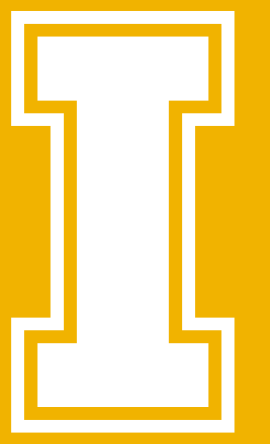


DEBALING AGRICULTURAL MATERIALS FOR BIOPROCESSING INDUSTRIES: IMPLEMENTING AN ANTI-CLOGGING ALGORITHM



BACKGROUND:

- Loose agricultural materials are used in biofuels and plastics
- Need to convert bales into the loose materials
- Current machines on the market produces fines and dust
- Project potential to debale a variety of materials autonomously

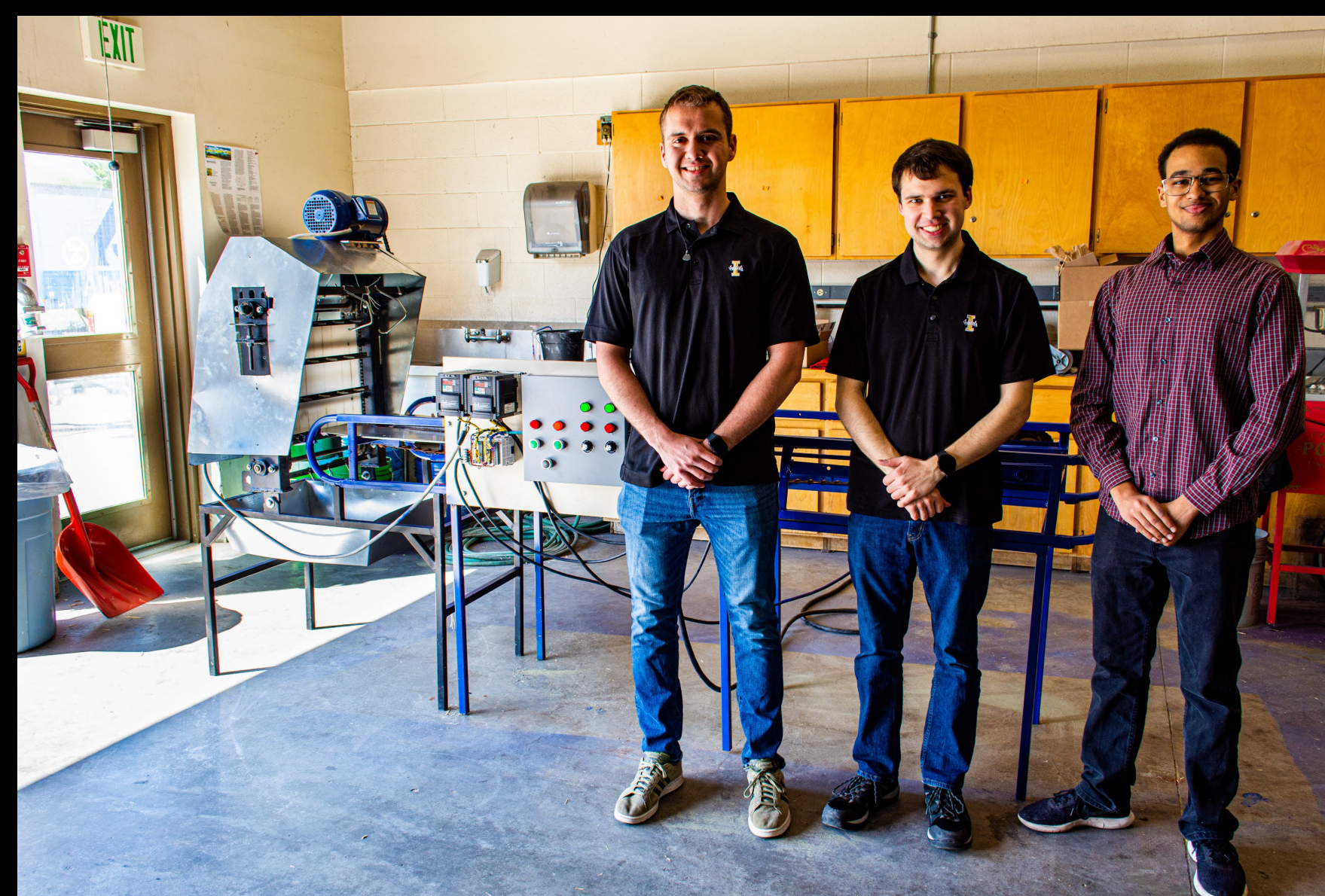
OBJECTIVE:

- Fully automate the debaling process
- Determine the optimal operational parameters
- Implement an anti-clogging algorithm

REQUIREMENTS:

- Autonomous control and operation
- User interface with manual override
- Constant outflow of material

DESIGN TEAM:



Ahmed Almahie (ME), Austin Crofoot (EE), Kevin Russell (EE)

Faculty Advisor: Dr. Feng Li (ECE)

Graduate Mentors: Abdallah Smadi (EE),
Anthony DeSantis (ME)

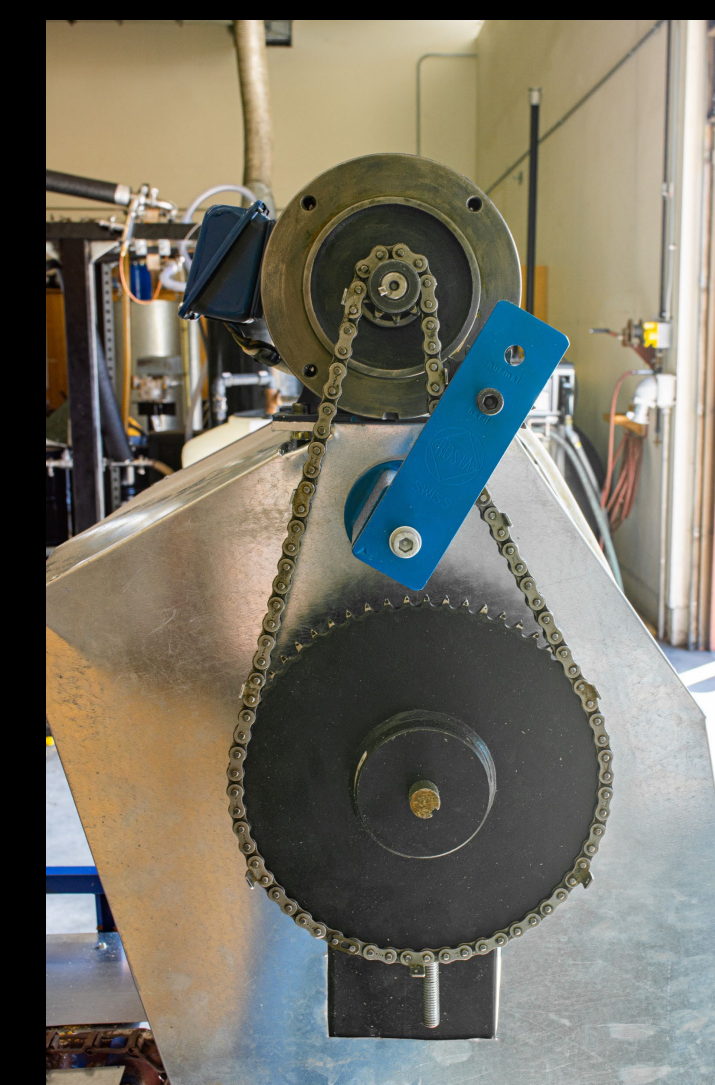
James Martin Lab Support: Chad Dunkel

Sponsor: David Lanning, Forest Concepts

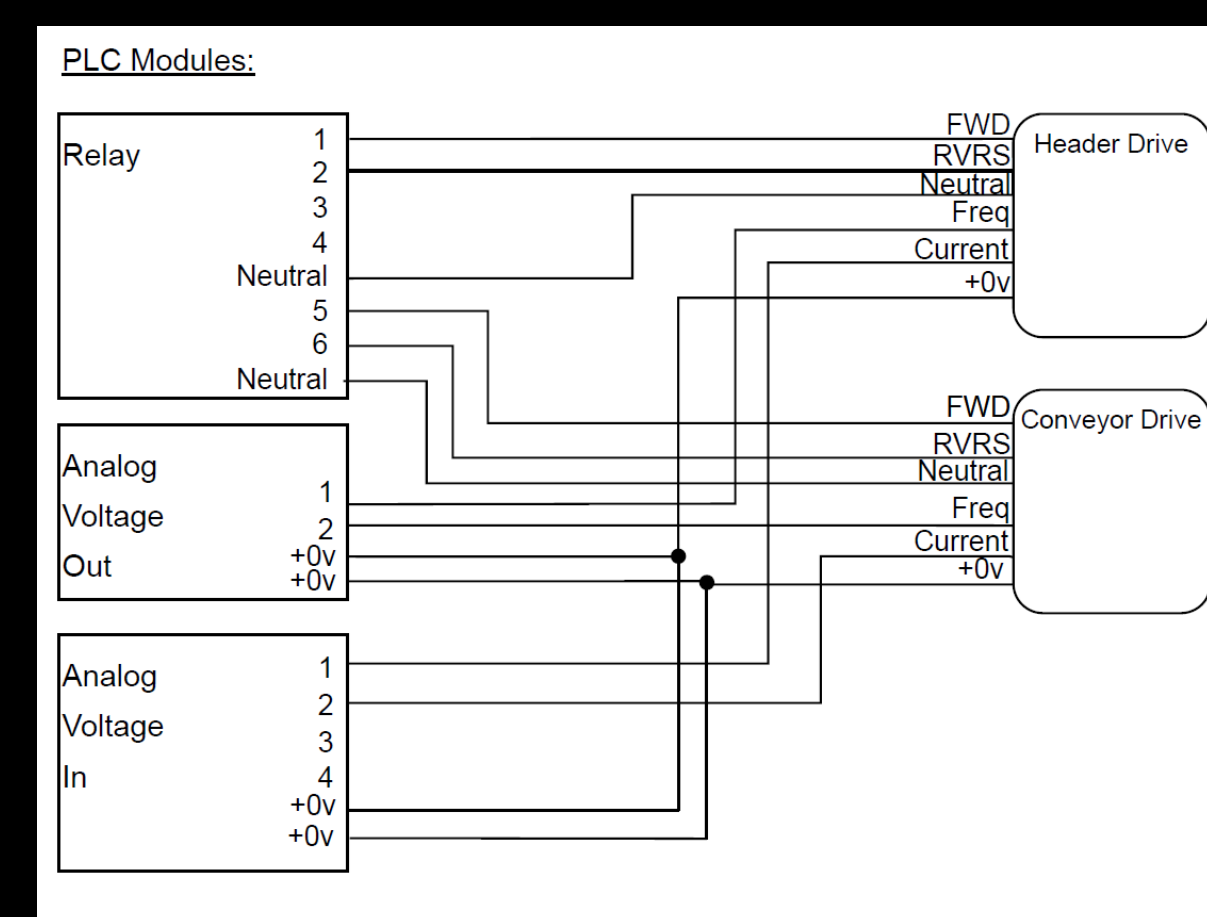


SOLUTION:

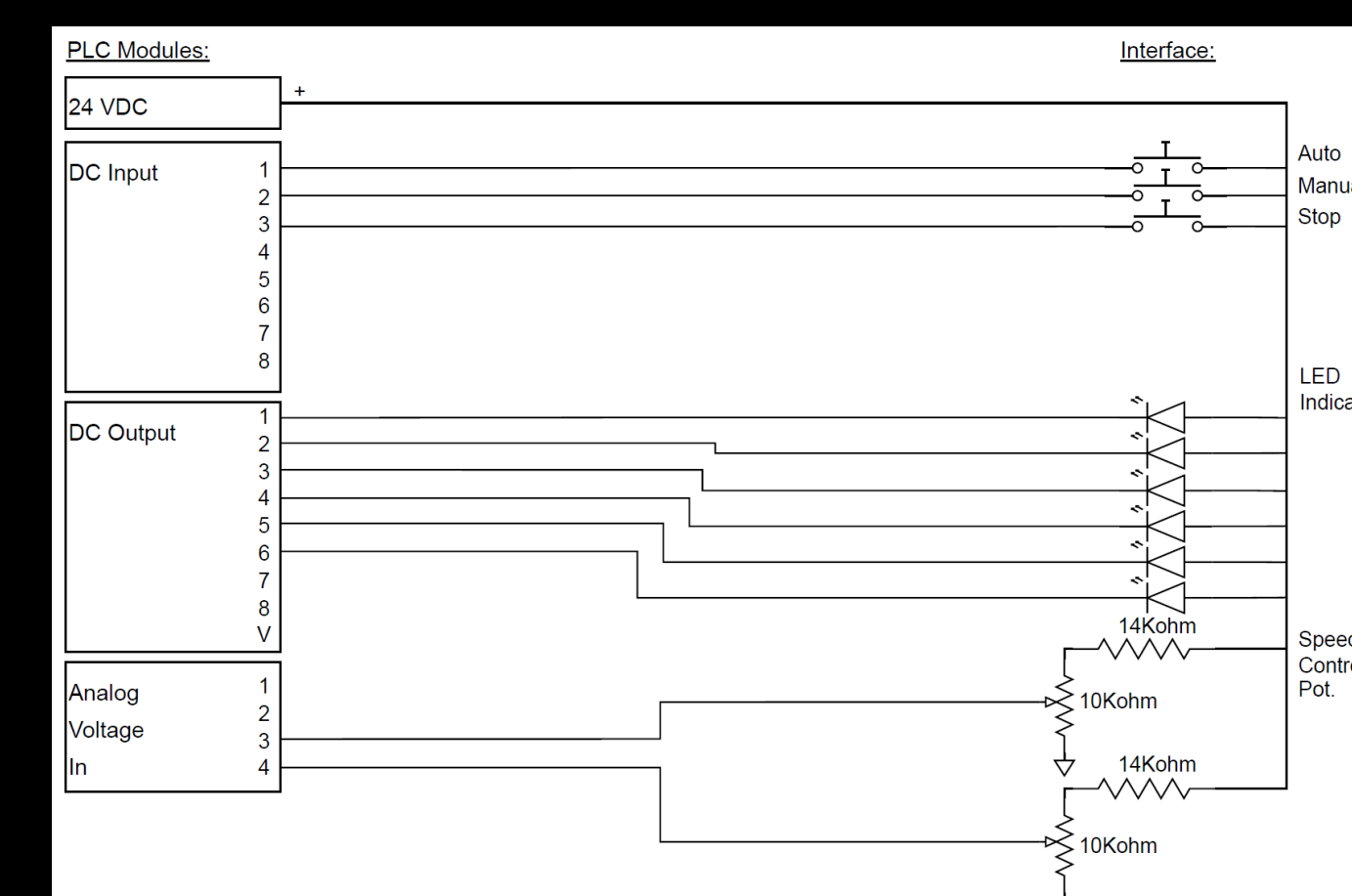
- Incorporate CLICK PLC for central processing
- Connect motor drives to PLC for computerized control
- Design user interface for control and operation
- Add power deliver system to supply entire machine
- Relocate header motor for increased adjustability
- Testing of optimal operation parameters
- Begin designing anti-clogging algorithm in ladder logic



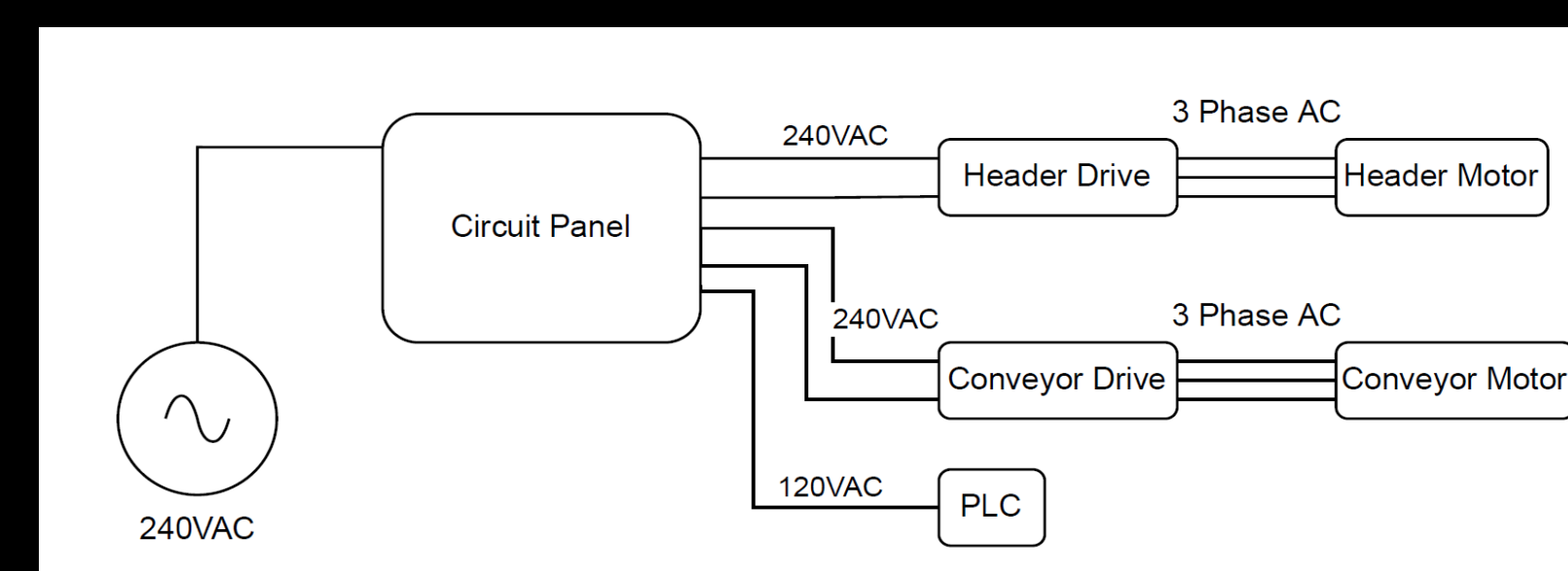
Motor Relocation



Drive-PLC Wiring Diagram



User Interface Wiring Diagram



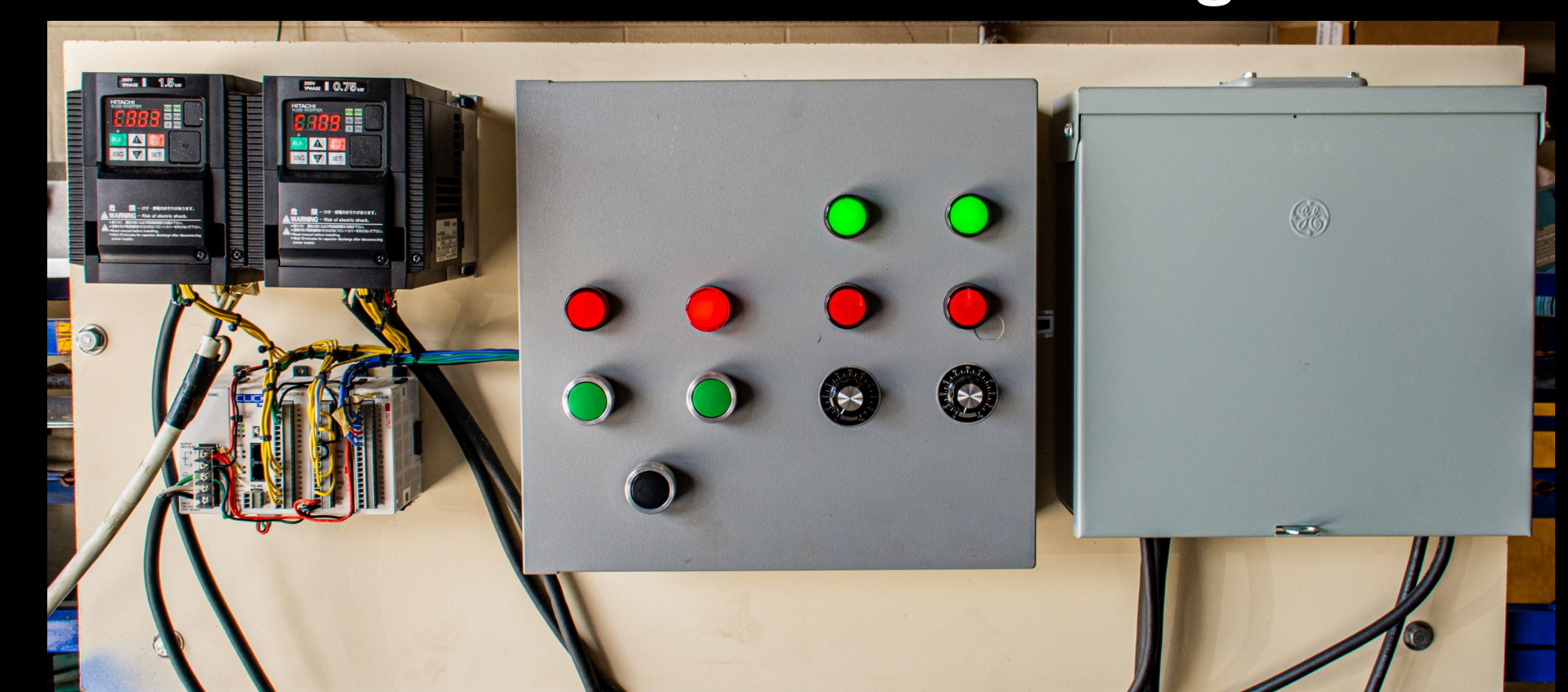
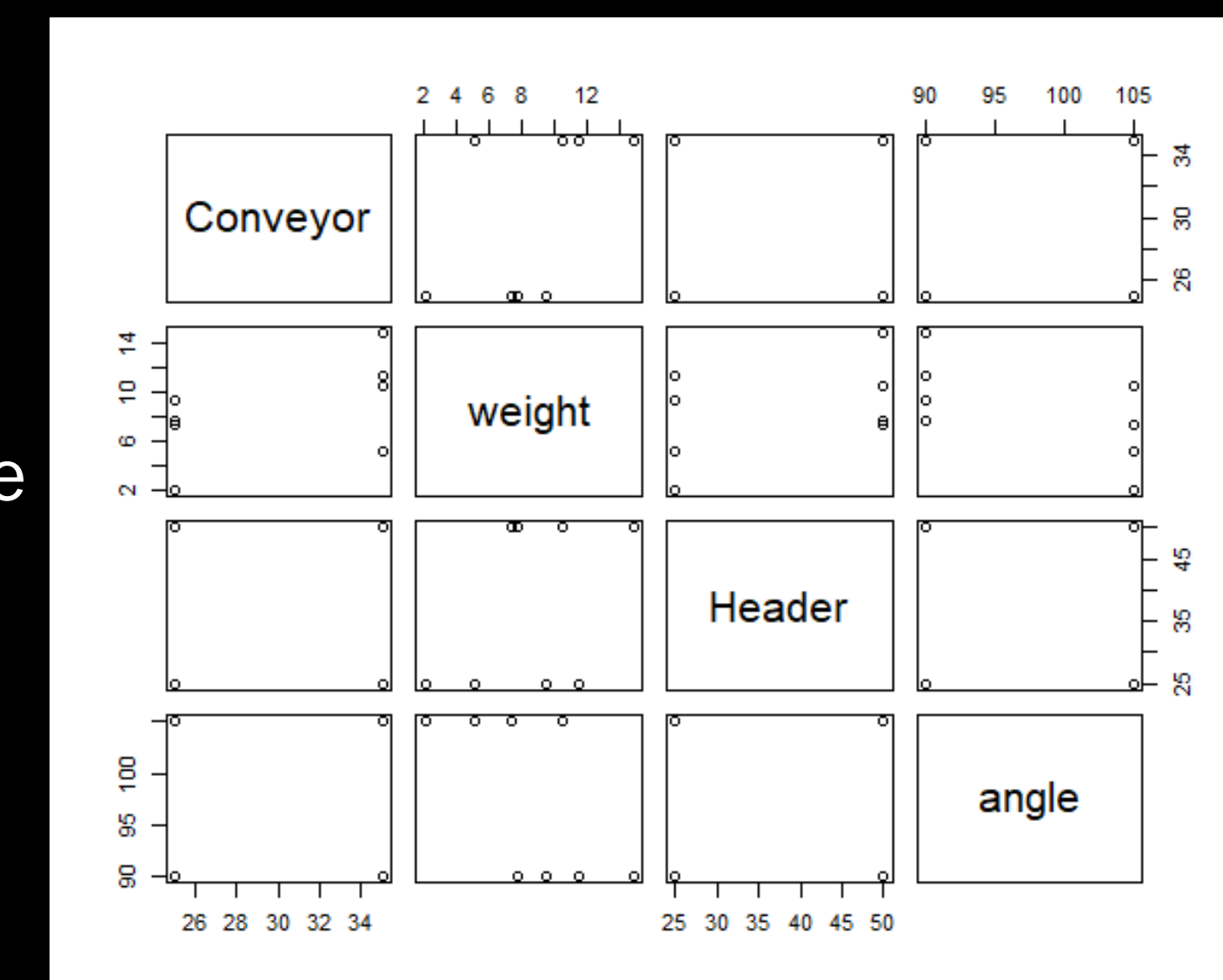
Power System Wiring Diagram

RESULTS:

- Electrical systems fully implemented
- Hay removed in flakes
- Operates best with increased header speed, slower conveyor movement
- Optimal parameters determined for barley straw hay
- Autonomous mode operates with optimal parameters and no feedback implementation

MULTIPLE REGRESSION ANALYSIS:

- Angle < Conveyor < Header
- Angle is most determinate of the weight of material debaled in each interval of time



Electrical Systems and User Interface

FUTURE WORK:

- Determine solution to not have flaking of material
- Incorporate clogging feedback into autonomous mode
- Implement emergency stop system