Customer Needs

- Improve current wave forms drawn by infrared paper dryers
  - The firing controller decreases THD and crest factor
  - Power quality should meet IEEE 519-1992
- Passable quality at a high speed
- Maintains current systems temperature level fluctuations
  - The firing controller runs the dryer at either 0% (off) or greater than 23%.
- Put more power through the same system
  - More power can be put through the same system without engaging system protection circuitry.
Project Background

- When manufacturing paper it is critical to insure all areas of the paper have consistent moisture content. To accomplish this Potlatch Corporation in Lewiston uses a set of high quality infrared paper dryers manufactured by Compact Engineering Ltd.
- The infrared dryers dry the paper well; however the switching algorithm creates less than ideal power quality. A previous capstone design team has created an improved control algorithm to improve power quality.
- It will be the goal of this design team to scale the algorithm up to control all dryer zones, and to integrate the controller into Potlatch’s number one paper machine.
Deliverables

- A controller capable of controlling 96 dryer zones.
- A scaled model operating on 480 volt 3 phase power to verify operation
- Schematics and drawings of the controller and model.
- Provide the Potlatch Corporation with test and verification data both before and after the new controller is installed.
Constraints and Specifications

- The new firing controller must interface completely with the current system.
  - Receives the RS 485 input from the power computer.
  - Handles external error triggers.
  - Has breaker control.
  - Operates at 480 V – 3 phase.
  - Controls 96 zones.

- The physical dimensions of the new controller must be the same as the old one.
The previous design team’s controller architecture will be insufficient to control all zones.

- Research will be done for a new controller architecture.

It may be desirable to integrate the system’s power computer with the firing controller.

- The RS 485 protocol will not have to be reverse-engineered.
- May require additional development time.
Detailed System Diagram

- Power Computer
  - Recommended Lamp Power Levels

- Phase Monitoring Unit
  - 1) Level of Lamp Supply Voltage Through PT
  - 2) Zero Crossings of All Three Phases

- Error Monitoring

- Breaker Status Monitor

- Firing Controller
  - Digital outputs (3) connection?
  - RS485
  - Analog Inputs (5)
  - Digital Inputs (3)

- Breaker Control
  - Digital outputs (3) connection?

- Gate Drivers
  - Digital outputs (96)
Infrared Dryer System Block Diagram

Moisture Content Sensor → Power Computer
Moisture Profile

Power Computer → Firing Controller
Recommended Lamp Power Levels

Firing Controller → Heating Unit
Firing Signals for Thyristors
Infrared Lamps