

# ORVS™



Original Rubber Vulcanization System (Patent Pending)

# Innovation

- Focus on developing technologies that will make a difference. Innovation is about more than solving problems, it is about realizing possibilities, leading us to a better way of doing things.
- Is there better way of making rubber lining repairs? Yes.
- Introducing the ORVS™ (Original Rubber Vulcanization System). It is a Permanent repair system that will change how our industry makes repairs.

# Repair Concerns

- Is there an increased awareness of repairs made to Rail cars and Storage Tanks?
- How do we know when a repair is fully cured?
- How long will it take for a repair to achieve full strength?
- How strong is the adhesion of the Rubber repair to base material?
- How soon can the rail car or storage tank be put back into service?

# Vulcanization

Vulcanization is a chemical process that modifies the polymer (rubber) by the formation of cross links (3D network) and crosslink density between individual polymer chains.

Vulcanization sets the following physical properties of rubber,

- Tensile strength
- Resistance to swelling and abrasion
- Elastic over a greater range of temperatures.

# Parameters Influencing Vulcanization

- Time
- Temperature
- Pressure

# Repair Methods

	ORVS™	Internal Pressure Steam	Chemical Cure
Temperature (°F)	250	250	80 to 212
Pressure (Psia)	12	15	0
Time	3 – 5 hrs	> 6 hrs	> 12 hrs
Localized Area	YES	YES	YES
Direct Temp Ctrl	YES	NO	NO
Original Material	YES	YES	NO
Pull Strength	Excellent	Excellent	Good
Repairs on In use Lining	YES	NO	YES

# Original Rubber Vulcanization System

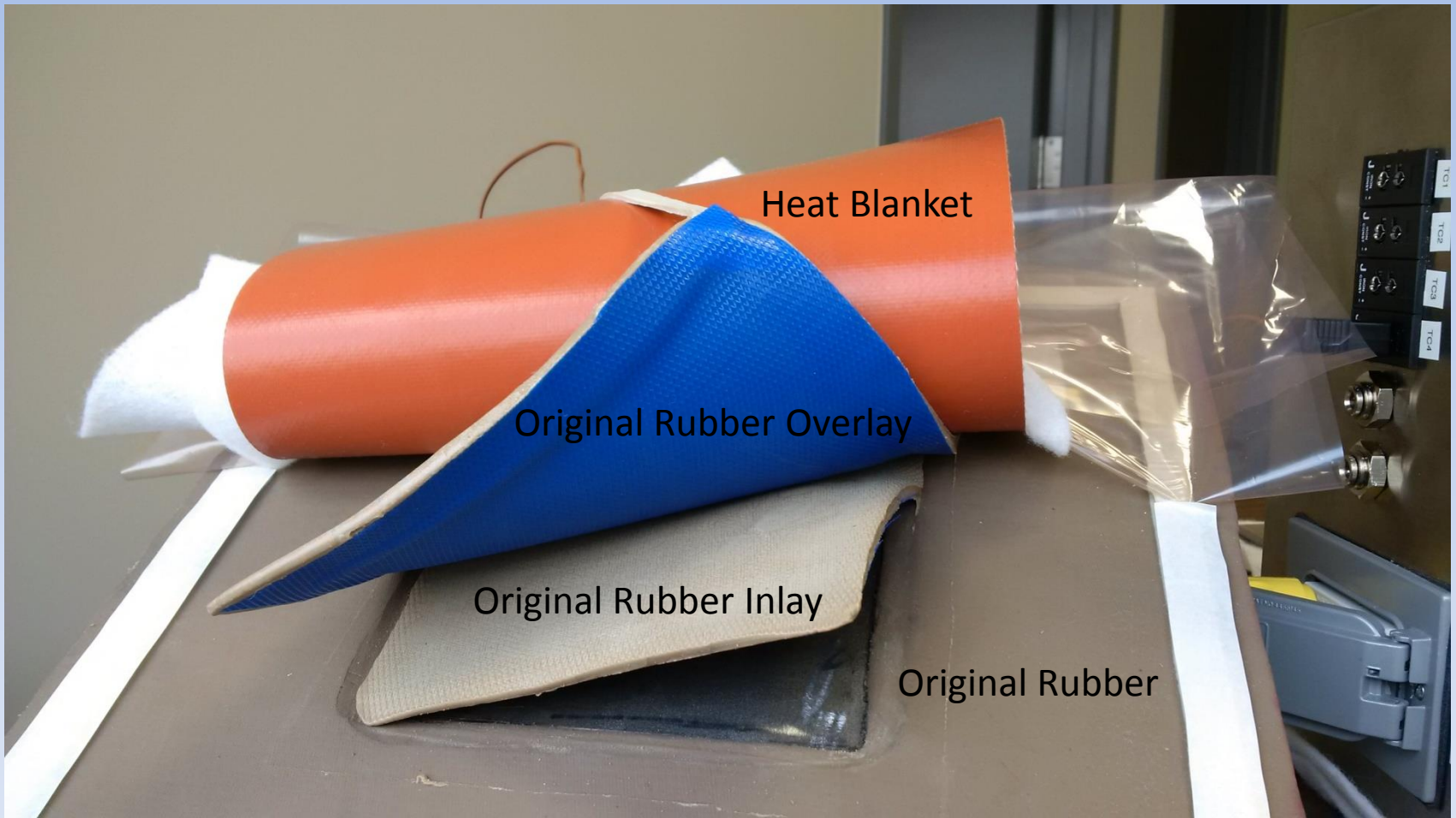
- Touch Screen Interface
- PLC (closed loop feed back control)
  - Cure Temperature control
  - Vacuum monitoring
- Heating Blanket
- Vacuum Pump
- Thermocouples

# Equipment





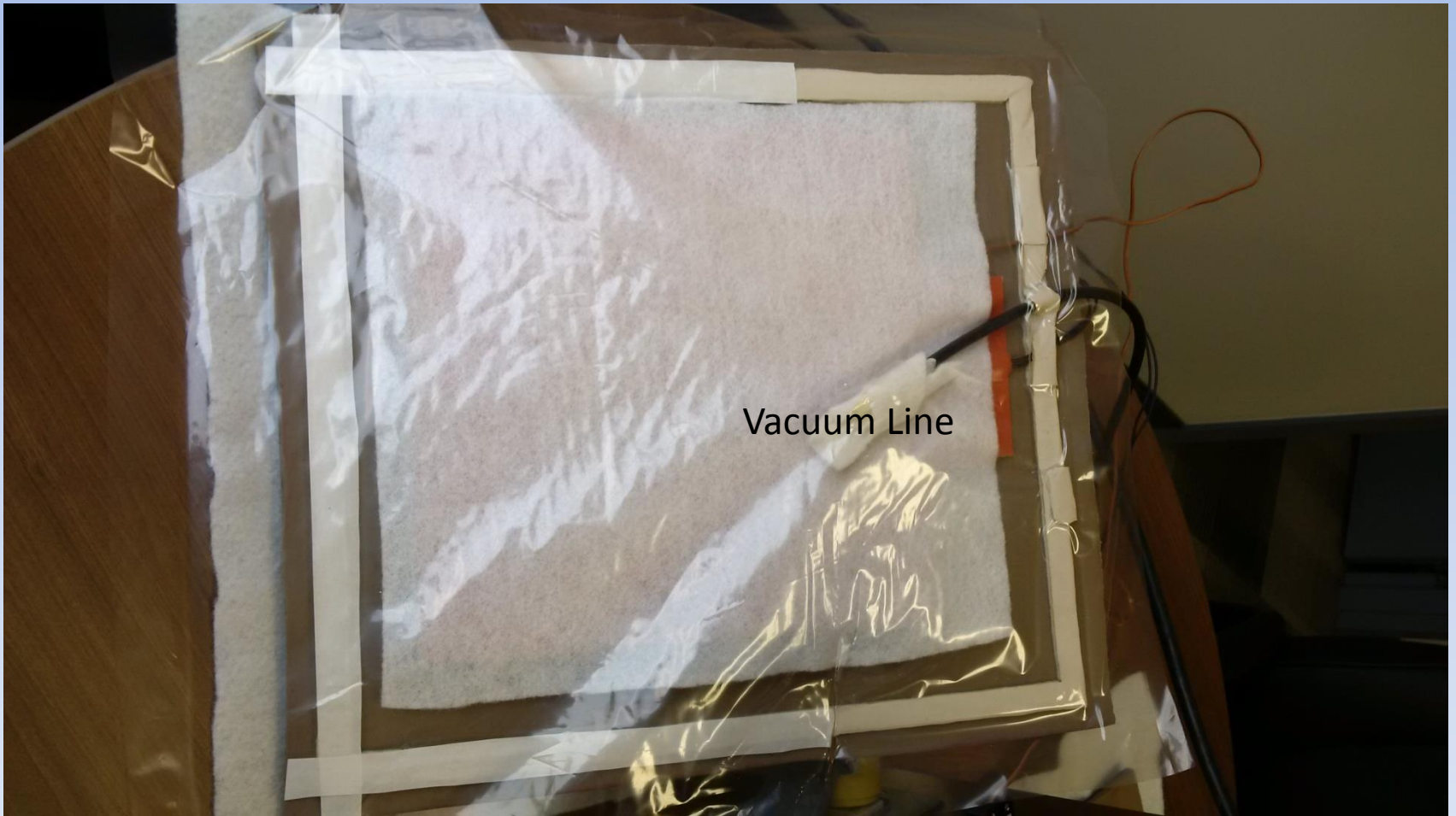
# Rubber Layers



# Heating Blanket



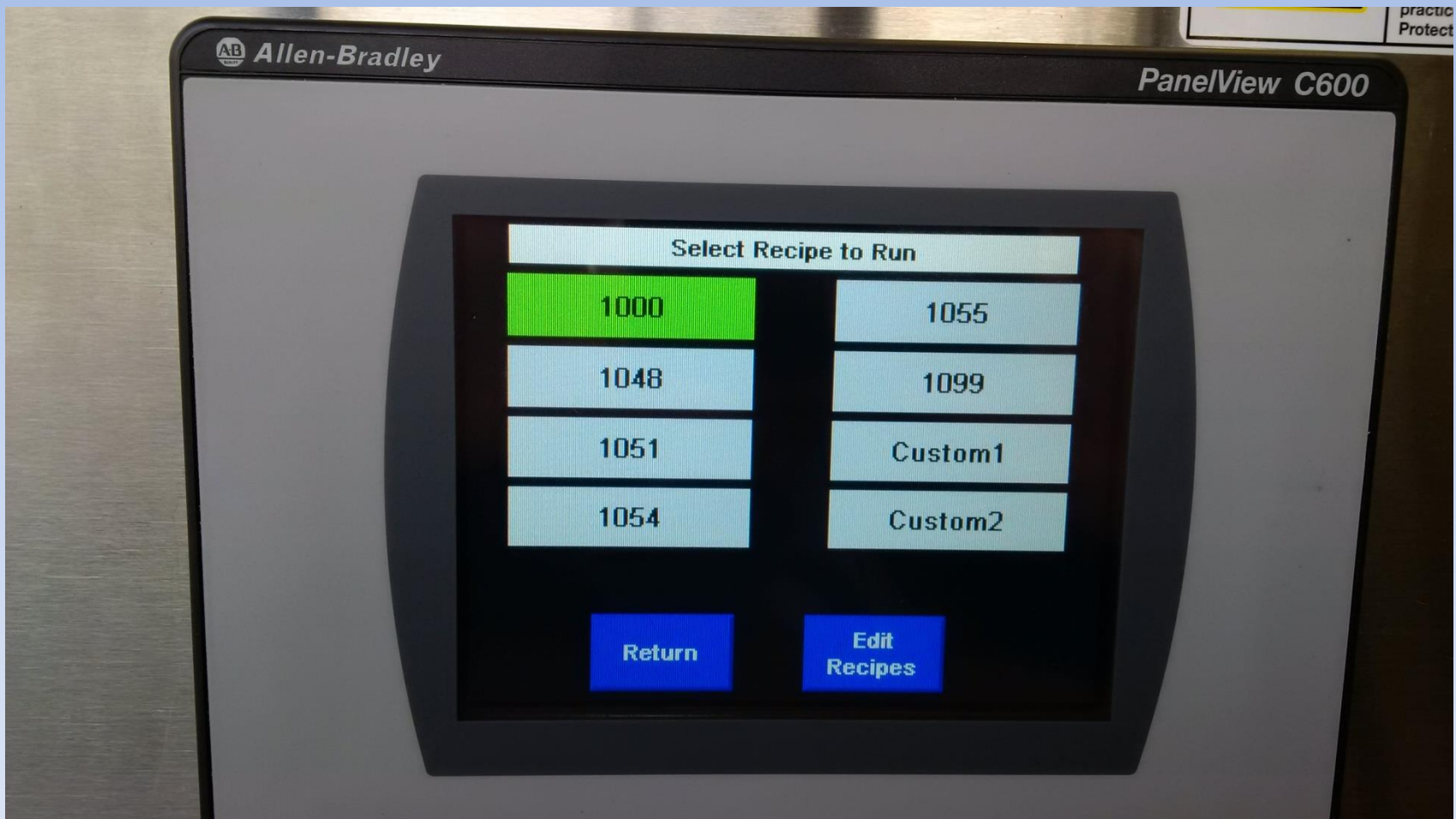
# Repair Setup



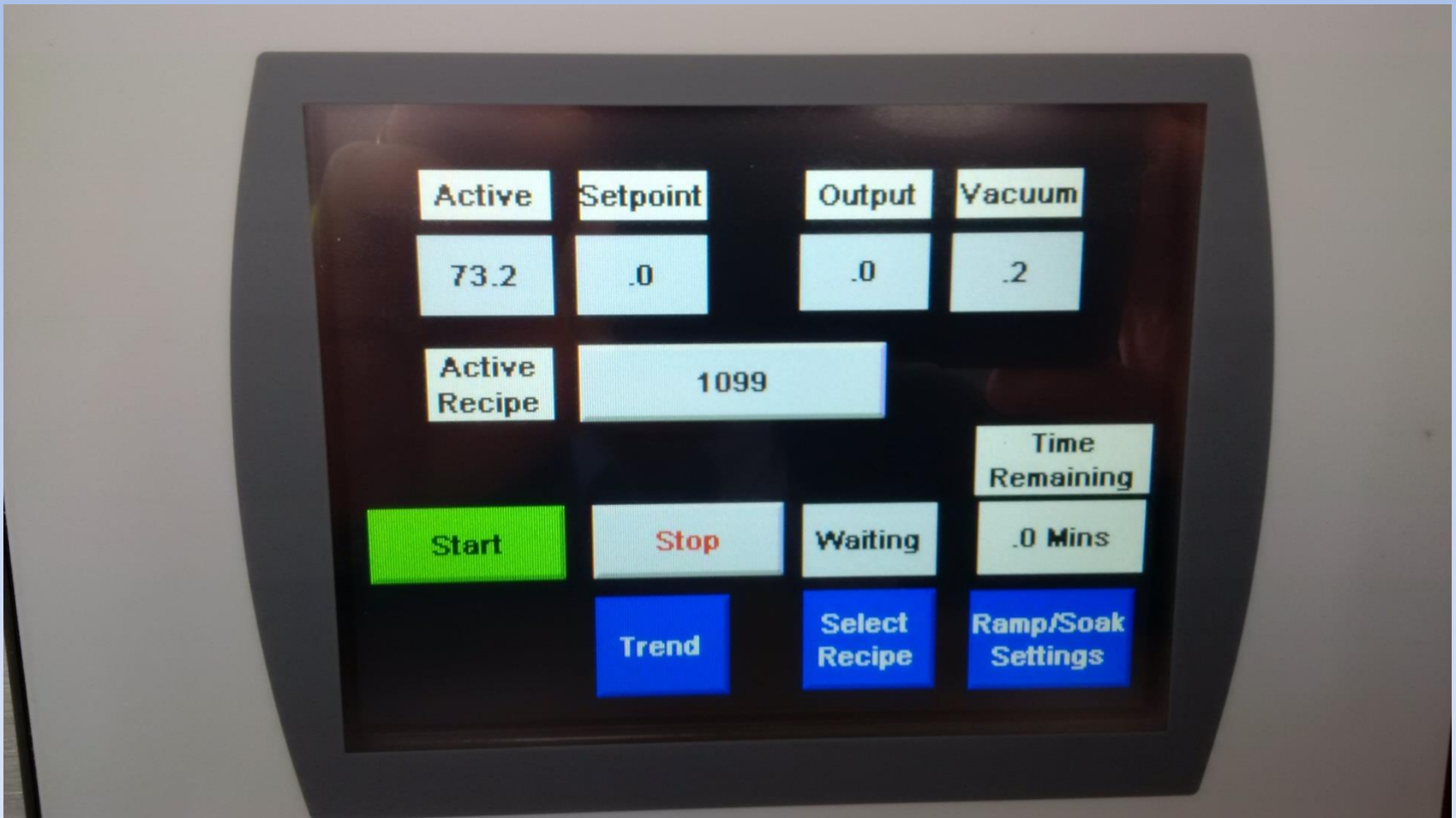
Vacuum Line



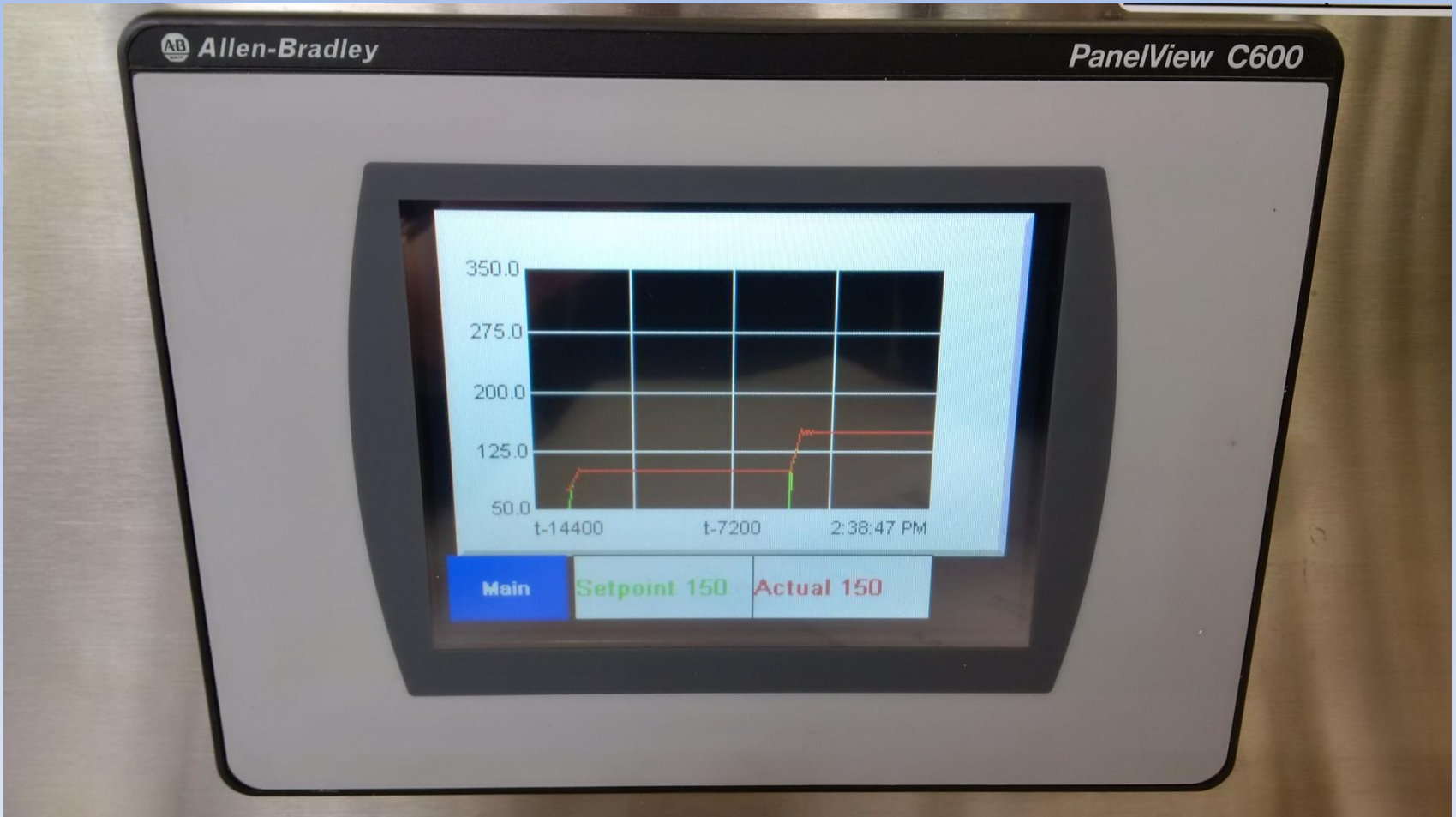
# Recipe Selection



# Operating Screen



# Temperature Curing Plot

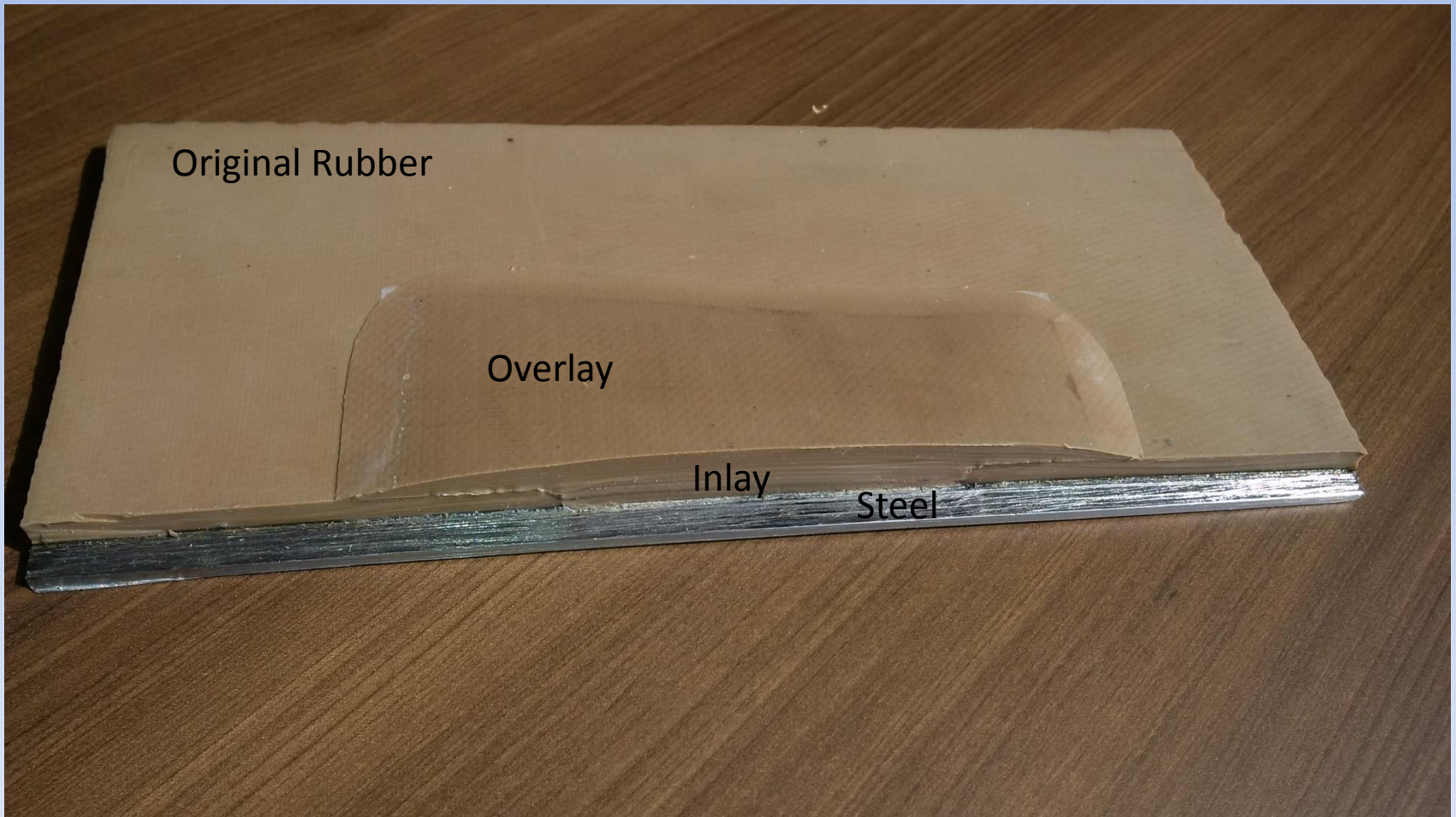


# Cured repair





# Repair Cutaway





# Benefits

- Original Rubber and Cements
- Vulcanization of Rubber, Fully cured, Permanent repair
- Repair strength equivalent to original rubber
- Beveled edges are created by the hot flow of rubber
- Repair under controlled Pressure (Vacuum) and Temperature
- Make permanent repairs in as little as 3 hours
- Localized curing, No need to steam entire rail car or storage tank
- 120 Volts / 240 Volts
- Portable for on site repairs
- Savings in Energy, Manpower, Down Time, Transportation, and Cost