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Automation Summit
A User Conference

Las Vegas, NV, June 22-25, 2015

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2015 Automation Summit

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Title
- **Upgrading Legacy Control Equipment and Software to TIA Portal and WinCC**

Track
- Best Practices & Novel Approaches

Presenter
- Robert "Bobby" Brignac

Company
- Braeden Engineering and Consulting

Connect
- Connect Event badge ID (use this # to connect with me): **S2Q**

Session #
- **1.5**

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Company Introduction/Overview

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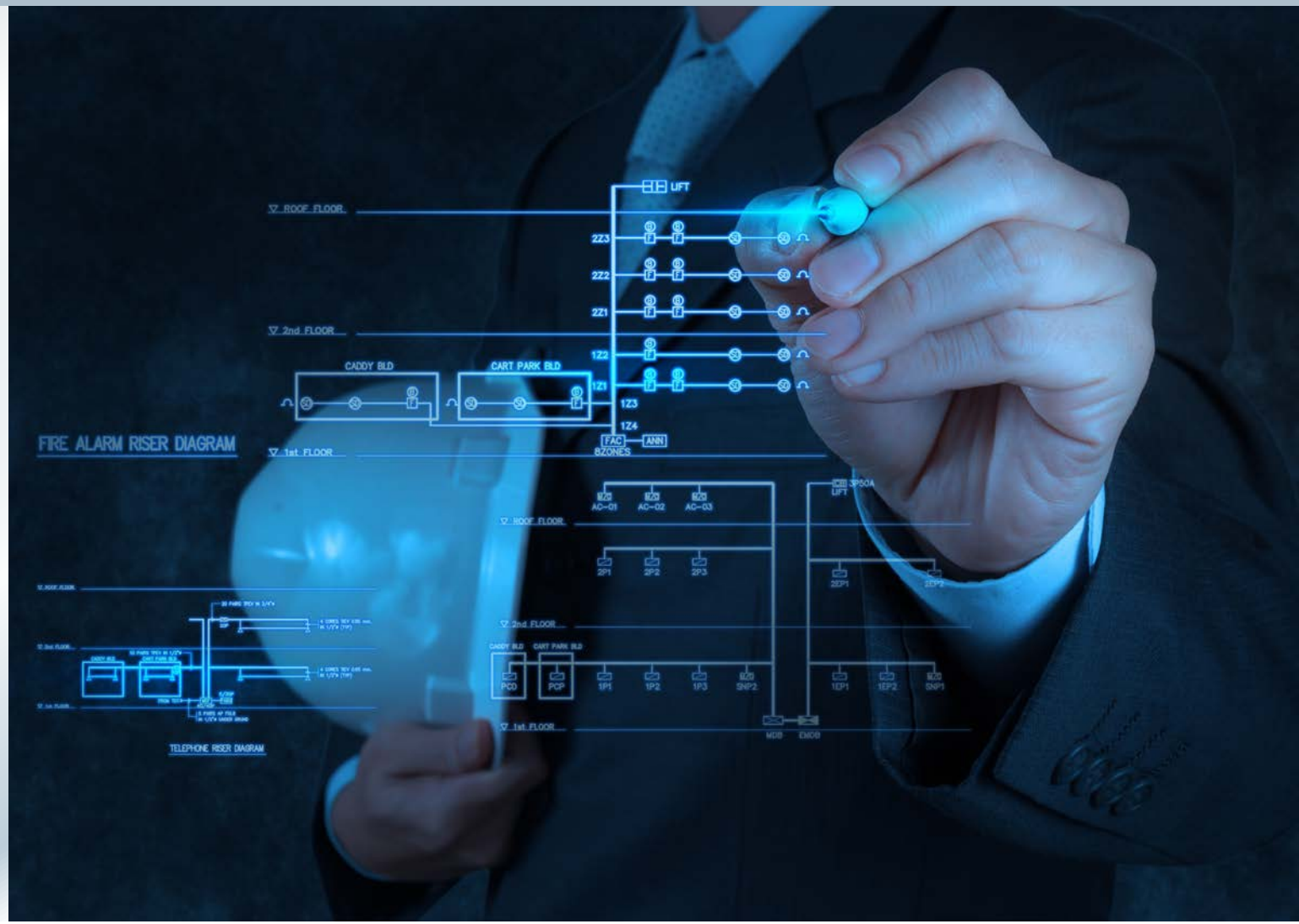
braeden engineering

- 21 employees
- Lafayette LA; Broussard, LA; Houston, TX
- Industrial, Oil and Gas Offshore / Onshore / Subsea
- Services include Engineering and Design, Consulting and Project Management,
- Portable testing and calibration systems, Subsea Drilling Riser Management Systems, Tidal Power systems, Control Systems and SCADA



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Bio Slide – Robert “Bobby” Brignac, PE

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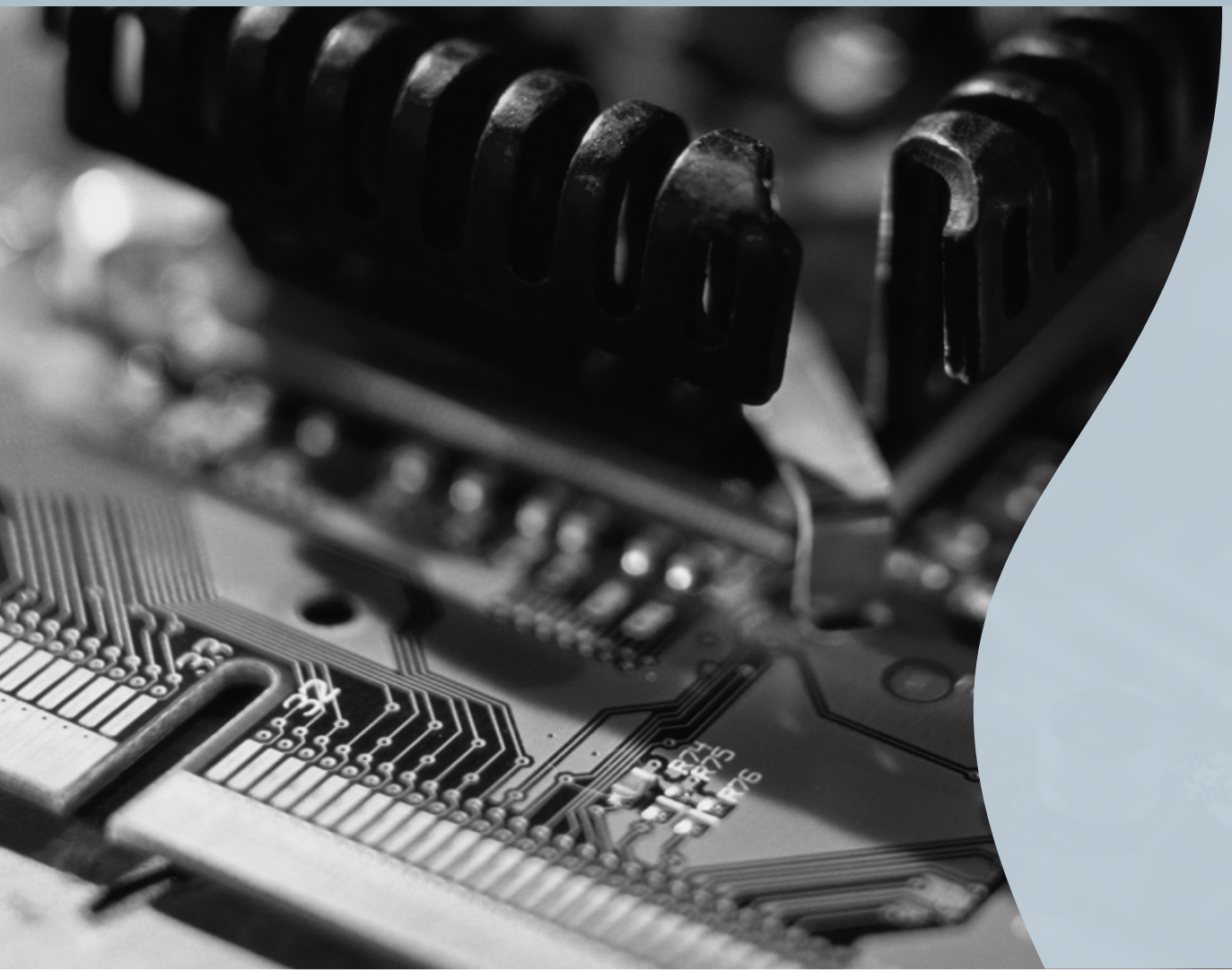

- **Senior Controls / Electrical Engineer**
- Professional Engineer with a Bachelor’s Degree in Electrical Engineering from the University of Louisiana at Lafayette (ULL)
- Research and Development for Energy Sector
- Offshore/Onshore/Subsea Oil and Gas
- Hazardous Area Design and Compliance, COMPEx
- Drilling Instrumentation and Controls Product Design/R&D
- Blowout Preventer (BOP) and Diverter Controls, Subsea and Surface

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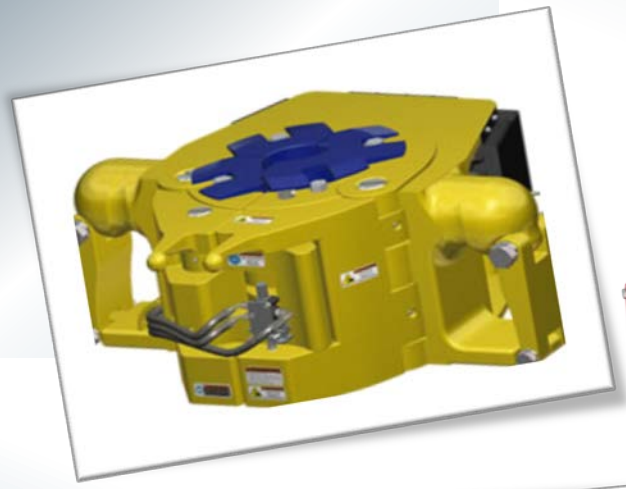
Overview of the Existing System



- OEM Manufacturer of tubular handling equipment for drilling applications
- American Petroleum Institute (API) requires testing of equipment to specific guidelines and standards
- Prove load rating of parts with test charts
- Existing system utilizes three separate testing systems for various parts

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Drilling Tong Testing System

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Torque tests drilling pipe tongs

PC Station

Excel based charting and reports

TONG TEST SYSTEM

No live trending

Serial communication to Omega panel meter

Cylinder/arm for applying torque

No automatic control of force

Mid-sized HPU (hydraulic pressure unit)

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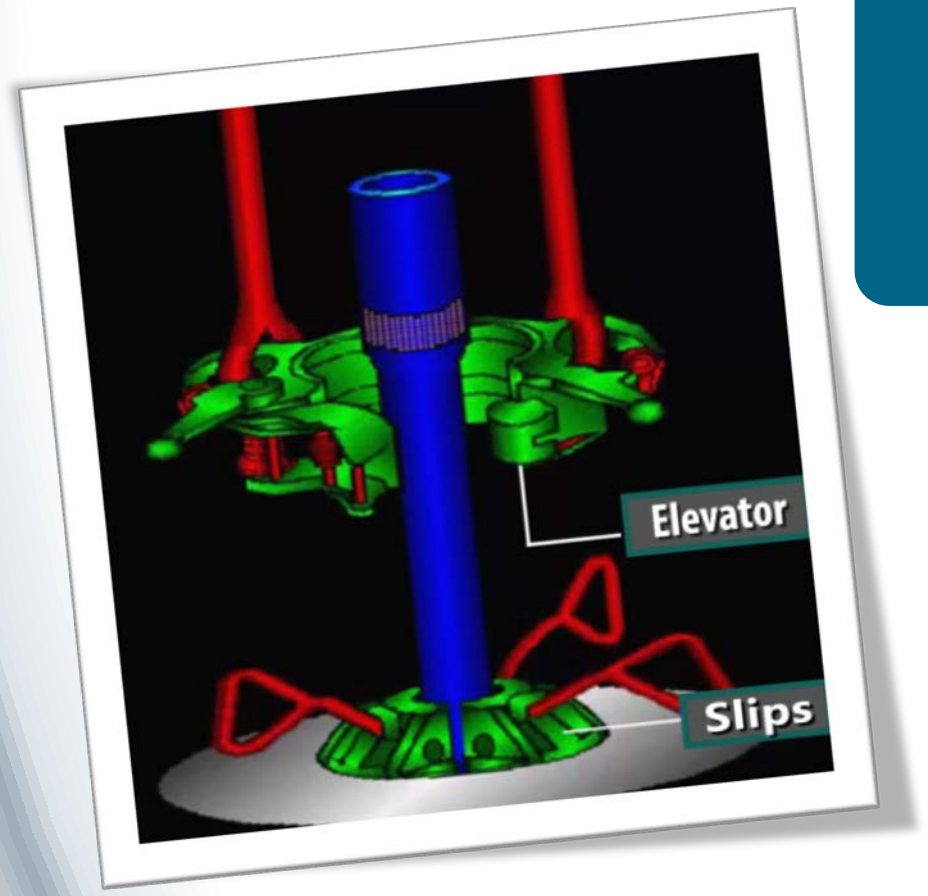
150 Ton Drilling Elevator Press



150 TON ELEVATOR PRESS

- Load tests pipe elevators, bails, spiders and slips to 150 tons
- PC Station
- Serial communication to Omega panel meter
- No live trending
- Excel based charting and reports
- No automatic control of force
- Smaller sized HPU
- Two small cylinders to apply force

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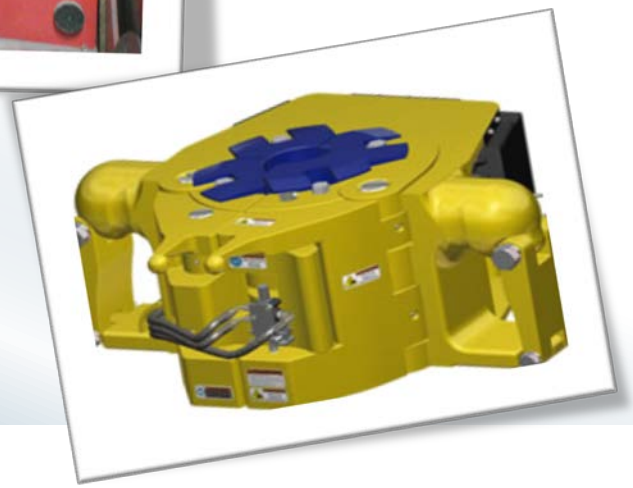
1000 Ton Drilling Elevator Press



1000 TON ELEVATOR PRESS

- Load tests and pipe elevators, bails, spiders and slips to 1000 tons
- PC Station with excel based charting and reports
- Automatic control of force via IDEC PLC
- Serial communications to IDEC PLC
- No live trending
- Large HPU
- Axial piston pump with electronic control
- 30HP motor; Oil cooler / radiator

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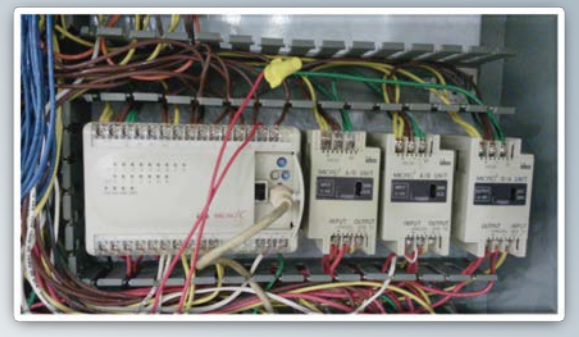
Reasons for the Upgrade

- Testing system designed about 20 years ago
- Antiquated and obsolete technology
- Customer experiencing constant equipment failure issues when testing.

- Random load loss on chart
- Downtime affecting production
- No wiring diagrams
- No PLC program

- Safety and Efficiency improvements
- Upgrades, troubleshooting was not possible or difficult



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Upgrade - PLC Hardware

Key Features

- S71200 PLC and I/O modules provided more I/O density and variation in a reduced footprint.
- The I/O density allows flexibility for future upgrades or modification needs.
- Ease of install and integration allowed for maximum use of existing components to reduce costs.
- TIA Portal was extremely user friendly
- PID blocks were easy to use
- WinCC communication

Limitations

- Auto-tune of PID
- Desire to maximize use of antiquated, legacy equipment

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Upgrade – WinCC Software

Key Features

- WinCC was extremely user friendly
- Very powerful software package
- Update to WinCC 7.2 made a more stable runtime
- C and VBScript compiler/editor
  - Organization of all functions for multiple developers
  - Auto print PDFs using PDF creator
  - Multiple chart creation
  - File operations
  - Database operations
  - Fast processing of load values

Limitations

- WinCC V7.0 did not work with S71200 PLC
- Auto generation of PDF reports

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Issues Encountered

- Conflicting Information from customer
- Lack of knowledge on the system from the customer

- Proportional controller obsolete and faulty
- Faulty communications from panel meters

- Pressure transmitter mounted directly on output of the pump
- Hydraulic lines to the cylinders were hosed inefficiently
- Inadequate hardware support of hydraulics
- Fluid temperature of pump, unstable control at low temps
- Fluid type

- Unrepairable failure of existing Tong Test Machine PC fast-tracked initial deployment
- Facility move just before the project
- Little Upgrade Time

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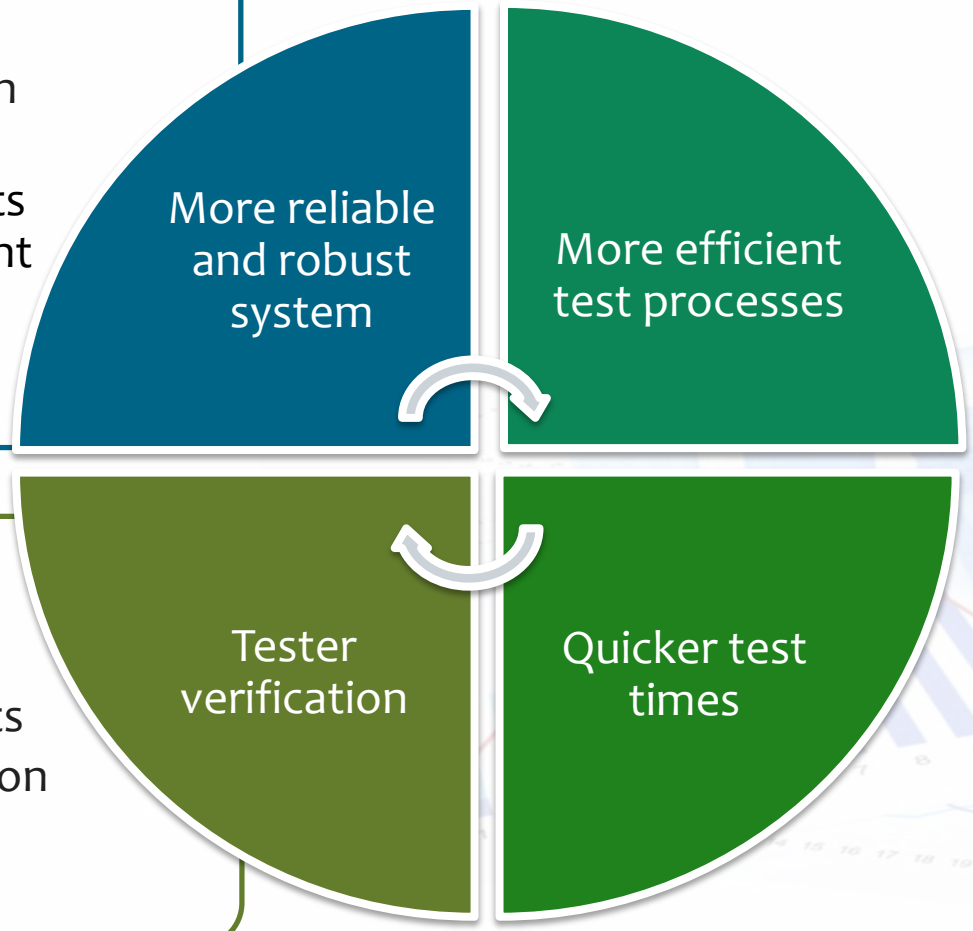
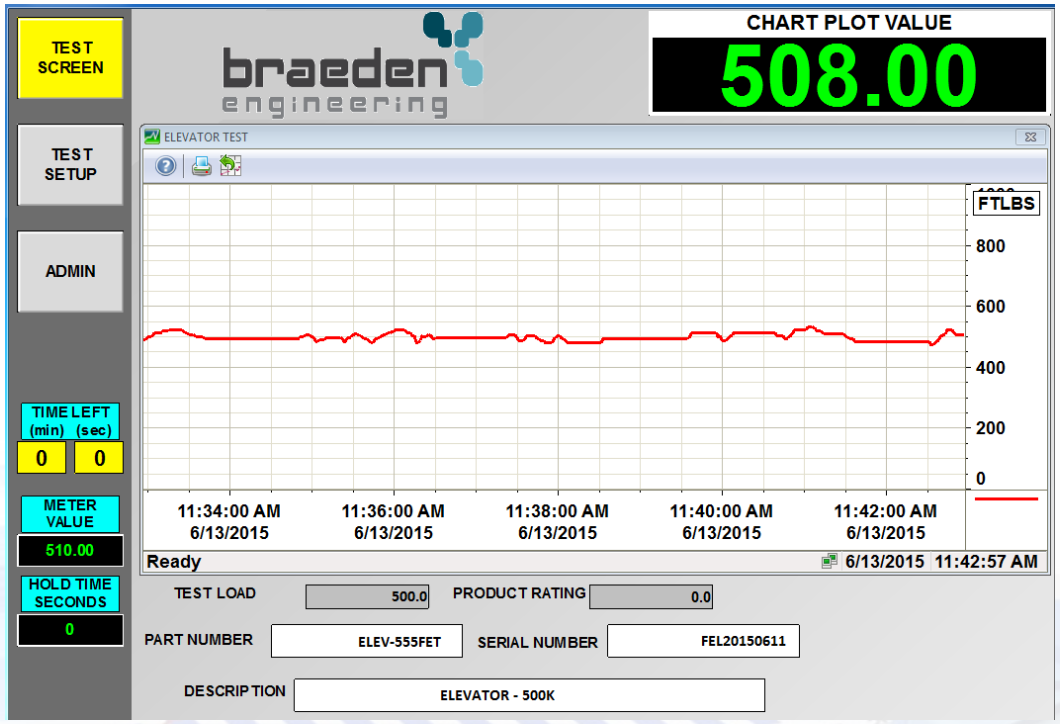
Results of Project

- Far less downtime
- Single version of software for all tests
- Non-linear calibration for 1000 ton press
- No errors during tests due to PLC equipment or software
- Better reporting to the end user



- Auto-shutdown on overload and under-load conditions
- Archival of failed tests
- User friendly operation
- Error correction and prevention



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If I could do it all over again…

Investigate connecting the new system at the same time as the old system

Reference Siemens white paper on migrating legacy equipment (LINK)

Look into using TIA Portal for WinCC Advanced in lieu of WinCC 7.2

Investigate the hydraulics issues further and pressure client into fixing them

Additional testing of legacy system

Additional documentation

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- Add automatic control to the Tong and 150 ton press
- Non-linear calibration for all machines
- Remove panel meters and replace with S71200
- New control panel for 1000 ton press
- Design a 2000 ton press machine

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Before we wrap up…

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