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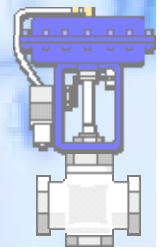
AOV Valve Packing

Gary McCoy &
Ron Frisard
AW Chesterton Company



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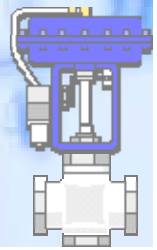
Also Presenting:

- **Curtis L Wood**
  - –Callaway NPP (Amergen)

    Main Feedwater Reg Valve Solutions

- **Bill Marriott**
  - – Marriott Valve Services

    Live Loaded Packing - Lessons Learned



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How Far Have We Come ?

Performance Assessment & Analysis

Operating Experience
Weekly Summary 96-27

Operating Experience Weekly Summary 96-27

June 28 through July 4, 1996

Table of Contents

EVENTS

1. BUILDINGS IN EVACUATION ZONES FOUND WITHOUT CRITICALITY ACCIDENT ALARMS
2. CRITICALITY ALARM SYSTEM VIOLATION DURING PREVENTIVE MAINTENANCE
3. INADEQUATE LOCKOUT/TAGOUTS
4. PRESSURE OSCILLATIONS CAUSE REACTOR TRIP

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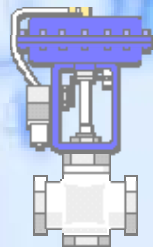
During a June 1996 outage, mechanics tightened the packing on the pressure control valve to preclude leakage in accordance with vendor instructions.

During troubleshooting, engineers determined that the packing requires some leakage or it dries out and prevents smooth operation of the valve. Mechanics loosened the packing to allow for minor leakage and installed a leakage collection system. Reactor personnel have contacted the vendor to determine why the technical manual instructions preclude leakage and whether some is appropriate.



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Communication

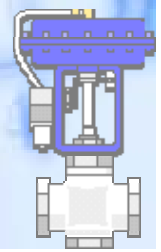
Packing Vendor

Engineering

Total Valve Ownership

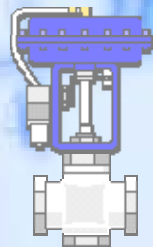
I / C

Maintenance



Communication Example

- **Nuclear Power Plant Valve procedure**
  - **Maintenance**
    - **Packing Installed & Consolidated by accordance with Packing Vendor / Engineering Specification (Torque / Stroked)**
  - **I & C**
    - **Completely unloaded packing**
    - **I&C re-loading packing based on instrumentation**
    - **Consolidate Packing Set for the 2nd time**



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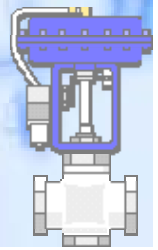
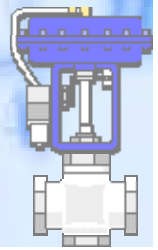
Packing Unloading

- Graphite Packing resiliency is diminished by unloading / reloading effecting overall packing life.
- Recommended Procedure would have only 1 group (either Maintenance or I&C) do the packing loading and Consolidation - Clean Handoff



Comunication 2nd Example

- Maintenance issues with Carbon Bushings
  - Training issue on Cutting / Maintenance Time
  - Utilized Copper /Graphite “Spacer” ring to replace Carbon Spacer
- Engineering issues with Change
  - Un-aware of Change
  - Major increase in Valve Friction
  - Increased Chemistry issues



Packing Software Programs

- **Chesterton packing materials are constructed differently then others**
  - **Chesterton Software Package “Valve Wizard” calculates for Chesterton Packing materials only**
  - **Gland Loads, installation procedures, Graphite ring Densities, & Carbon Spacer Materials are all different and need different calculations**

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Example

- Would you use an Owners Manual for a Ford Explorer on a Nissan Pathfinder
- Both have engines, Brakes, Doors, Etc.
- Car Market has not been ”Commoditized ” for one Generic Car User Manual.

Chesterton Product Update

- **Chesterton released Style 5800T**
  - **Combination set with I.D. Sealing rings braided from graphite tape overspun with pure PTFE mesh filament creating a homogenous mix**
  - **Passes API 589 Fire Test**
    - **evaluation of valve stem packing when exposed to fire**

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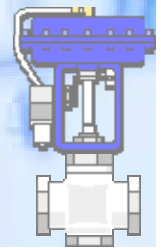
Chesterton Packing Friction

- **5300 (GTP) w/Style one End rings**
  - 5 Cross Sections in Height
  - Static Coef. Of Friction .15
  - Dynamic Coef. Of Friction .10
  - Minimum Gland Load 1400 PSI
- **5800 Wedge Packing (Graphite)**
  - 4 Cross Sections in Height
  - Static Coef. Of Friction .085
  - Dynamic Coef. Of Friction .085
  - Minimum Gland Load 1400 PSI
- **5800T Wedge Packing (Graphite with Small traces of PTFE)**
  - 4 Cross Sections in Height
  - Static Coef. Of Friction .065
  - Dynamic Coef. Of Friction .065
  - Minimum Gland Load 1400 PSI



Other New Technologies

- **Outer Guide Technology**
  - **Allows for simplified Installation**
  - **Creates a "Visual" indication of correct Valve loading or valve gland loss**

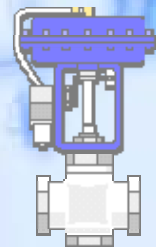
Squirter Load Washers

- In Development of applying Technology for Valve Squirter Load Indicator Washers
- Launched Technology for Valve Flanges to guarantee Correct Bolting load

Stem Lubrication

"Does Chesterton have any lubricant that we can use to reduce stem friction / sticking during packing consolidation in dry condition (no process fluid in the line) ?"

- Chesterton Does not recommend any type of added Lubrication for our Valve Packing System
- If a valve Fails a "Timing" test either lower the packing load or change to a lower friction packing material.



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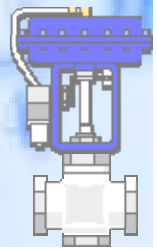
Packing Lube Example

From NRC Inspection Report

On July 9, 2002, as part of the Selected Issue Follow-up Inspection of Inspection Procedure 71152, the inspectors selected CAP003614 (dated March 15, 2002) for review. Corrective Action Process 003614 documented a licensee-identified concern where N-5000, an anti-seize lubricant used in valve maintenance, had been inappropriately applied to the stem of air-operated valve AFW-2A. Used in this application, the N-5000 lubricant had become degraded such that it was causing Valve AFW-2A to stick during its operation.



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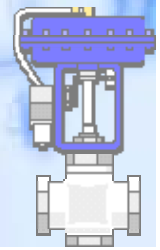
Main Feedwater Reg Valve Operating Resolution

Curtis L Wood

Amergen Callaway NPP



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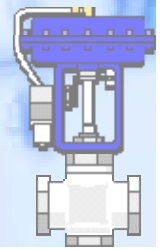
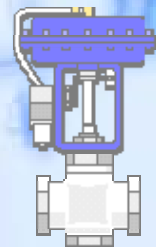
Main Feedwater Reg Valve Operating Resolution

- **Problem: Reg valve does not operate smoothly and packing will not last for an entire operating cycle.**



Valve and Control Design

- Valve: 16” Copes Vulcan model D-176720
- Actuator: Double acting piston, fail in place, Automation Technology model L1412DA
- Postitioner: Sensycon model TZID-C
- Regulator: Norgen, 5-150 psi
- Volume Boosters: Moore model 61-H
- Packing: Chesterton 5800 wedge type, 5 rings, carbon spacer top and bottom, live loaded
- Pneumatic configuration: One regulator providing air to both the volume boosters and the positioner.
- Reg set point: 90 psi.
- Stroke: 11”



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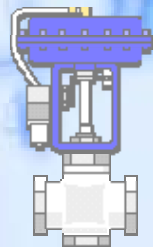
Testing and Resolution

- Testing Equip: Crane Nuclear Viper 20 system
- Base line test three different pneumatic configurations (current, separate regulators to positioner and VBs, regulated air to positioner and line to VBs.
- HDRL, Step Response, and Step Sensitivity of each pneumatic configuration
- Baseline, HDRL, Step Response and Step sensitivity two different packing types. 5800T, and 5800T with 1600 end rings
- Perform testing as directed by I&C engineer to evaluate positioner program.



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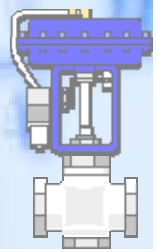
Testing Results

- **Pneumatic configuration of choice is regulated air to the positioner and line to volume boosters.**



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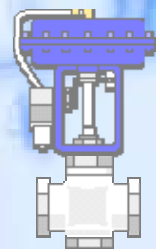
Testing Results

- 5800 Packing
- Friction Ave. 1035.8 lbs
- Travel. Average step change of .030”
- HD error: 3.72% fs
- Linearity error: 1.52% fs

- 5800T
- Friction Ave. 651.81
- Travel : Average step change of .0035”
- HD error 3.61% fs
- Linearity error 1.44% fs

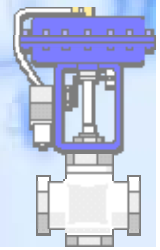


CHESTERTON

Testing Results

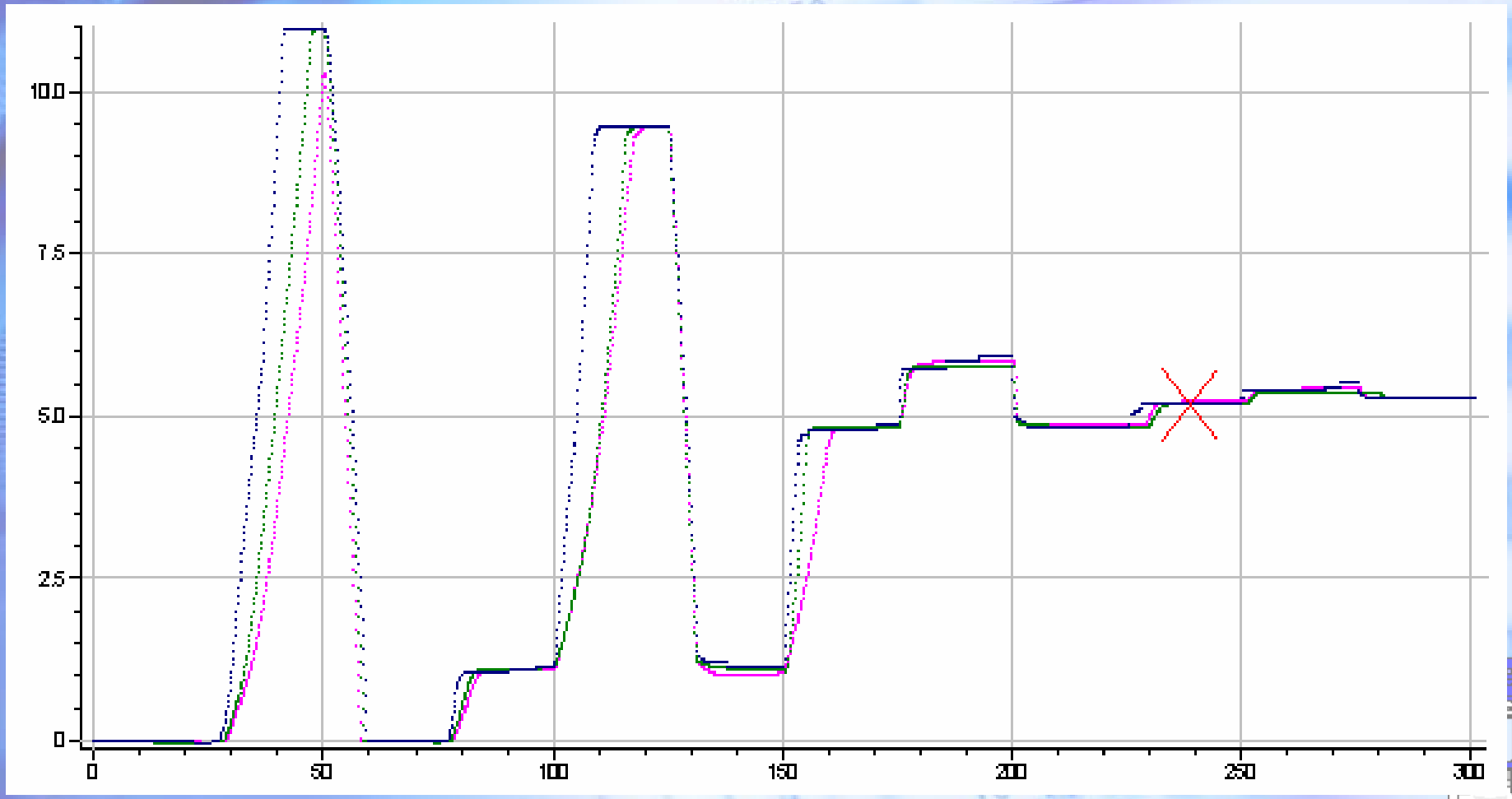
- 5800 Packing
- Friction Ave. 1035.8 lbs
- Travel. Average step change of .030”
- HD error: 3.72% fs
- Linearity error: 1.52% fs

- 5800T/1600 end rings
- Friction Ave. 901.8 lbs
- Travel: Average step change of .003”
- HD error: 3.61% fs
- Linearity error 1.44% fs



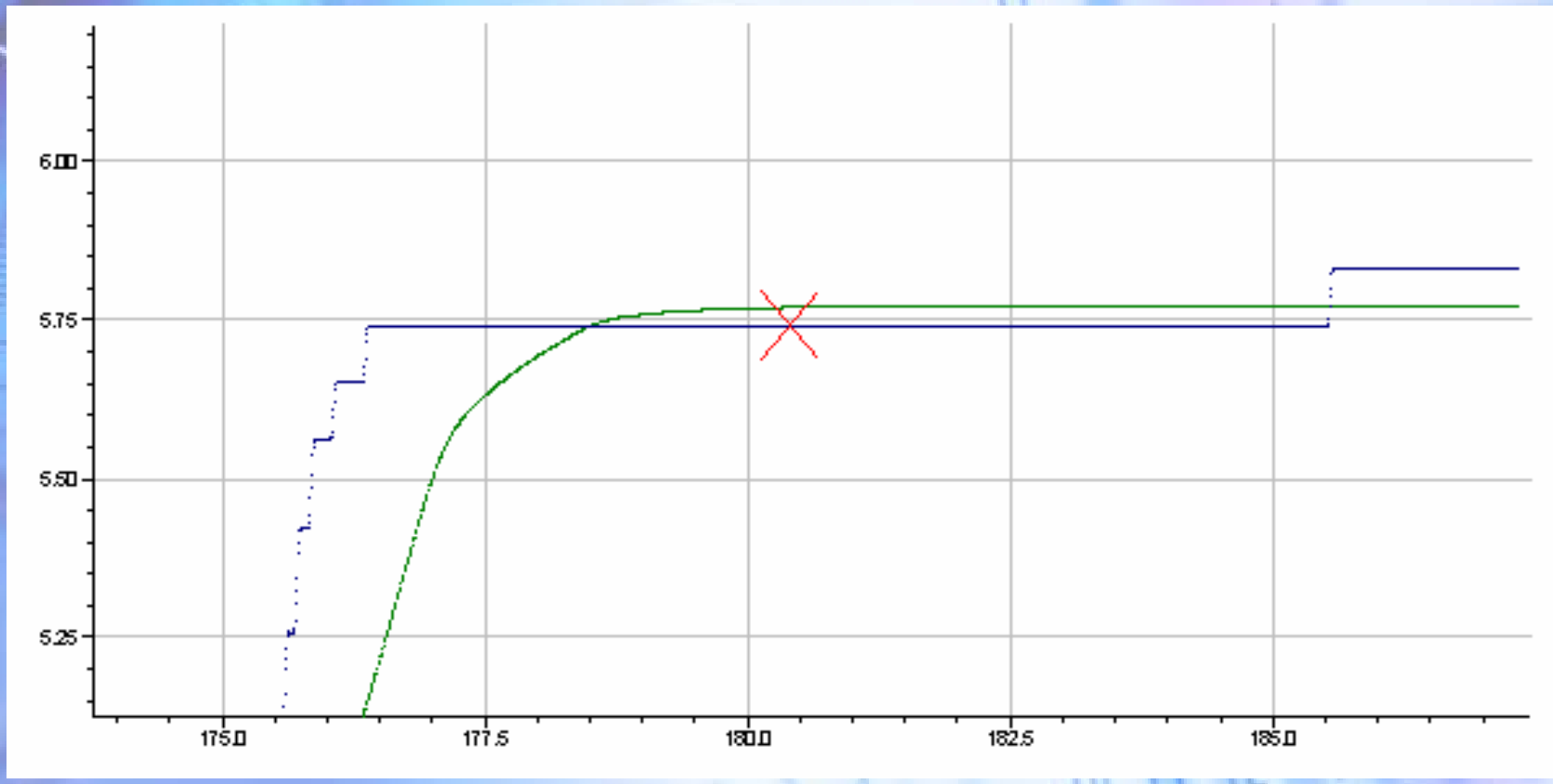
Test Results

- Step response over lay (5800, 5800T, 5800T/1600ER)



Test Results

- **Step response over lay (5800, 5800T)**



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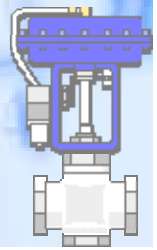
Conclusion

- During the next refueling outage Callaway will be repacking the Main Feed Reg Valves with a combination of 5800T, C1 end ring, and carbon spacers.
- During the next refueling outage Callaway will be changing the pneumatic tubing configuration to separate regulators providing supply instrument air to the positioner and volume boosters.



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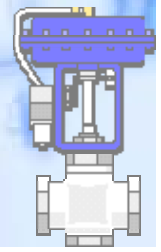
Live Loaded Packing
Lessons Learned

Bill Marriott

Marriott Valve Services



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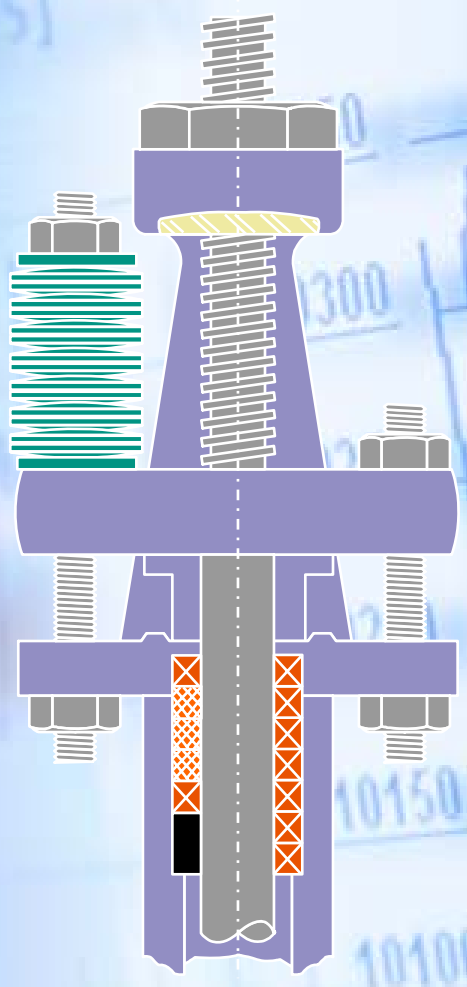
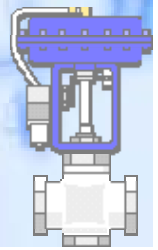
Example of Live Loaded Stem Packing



Packing Live Loaded Case History

- 10” Fisher Double Ported Main Feedwater Control Valve, with a Double Acting Piston Actuator with an area of 55.5 square inches.
- Chesterton Wedge Set consisting of 5 wedges and Live Loaded designed for 1800 psi psig, Torqued to 19 ft-lbf. Nominal 1” stem.



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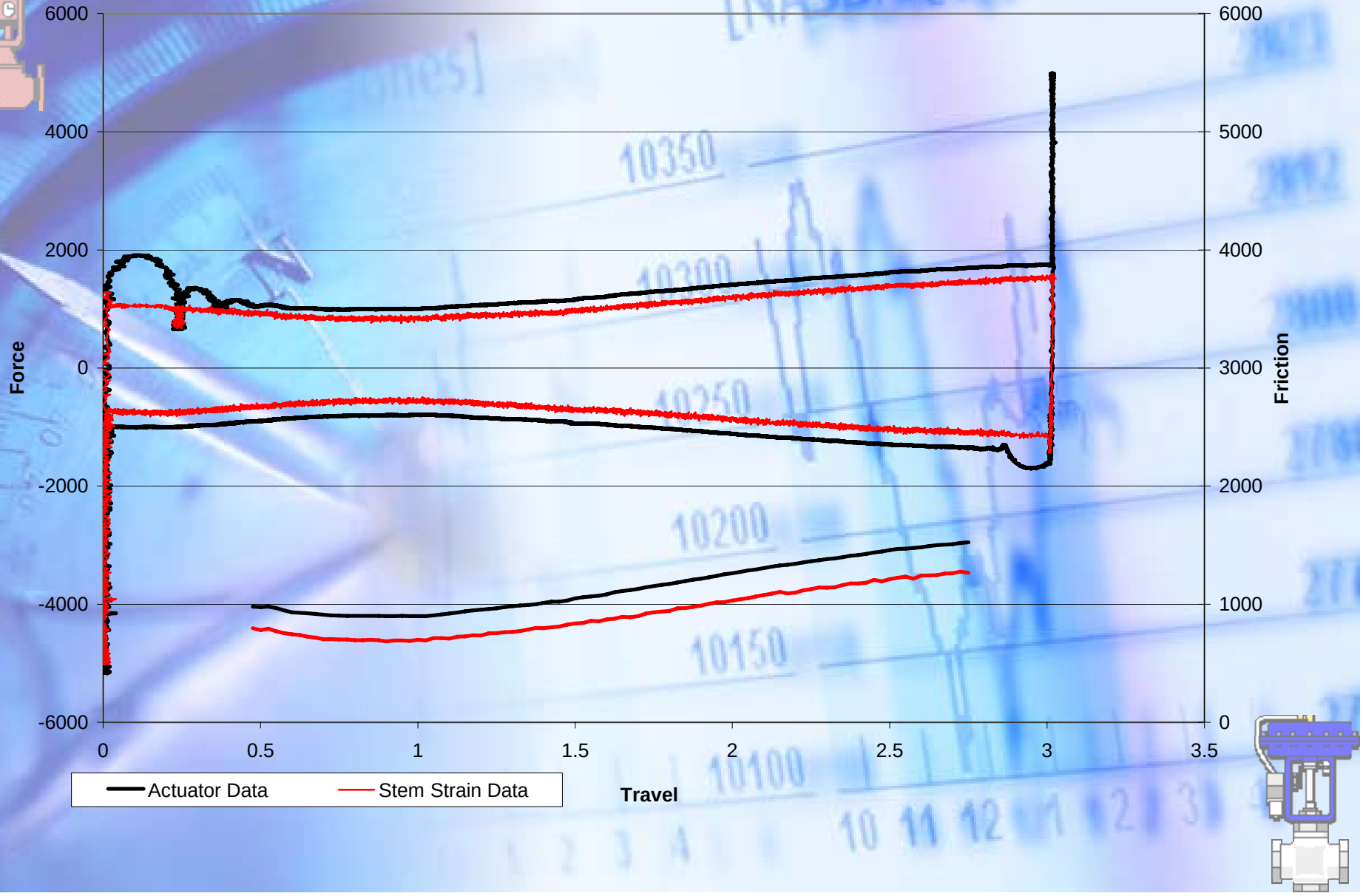
FCV-6-12B
RFO22 - After Repack



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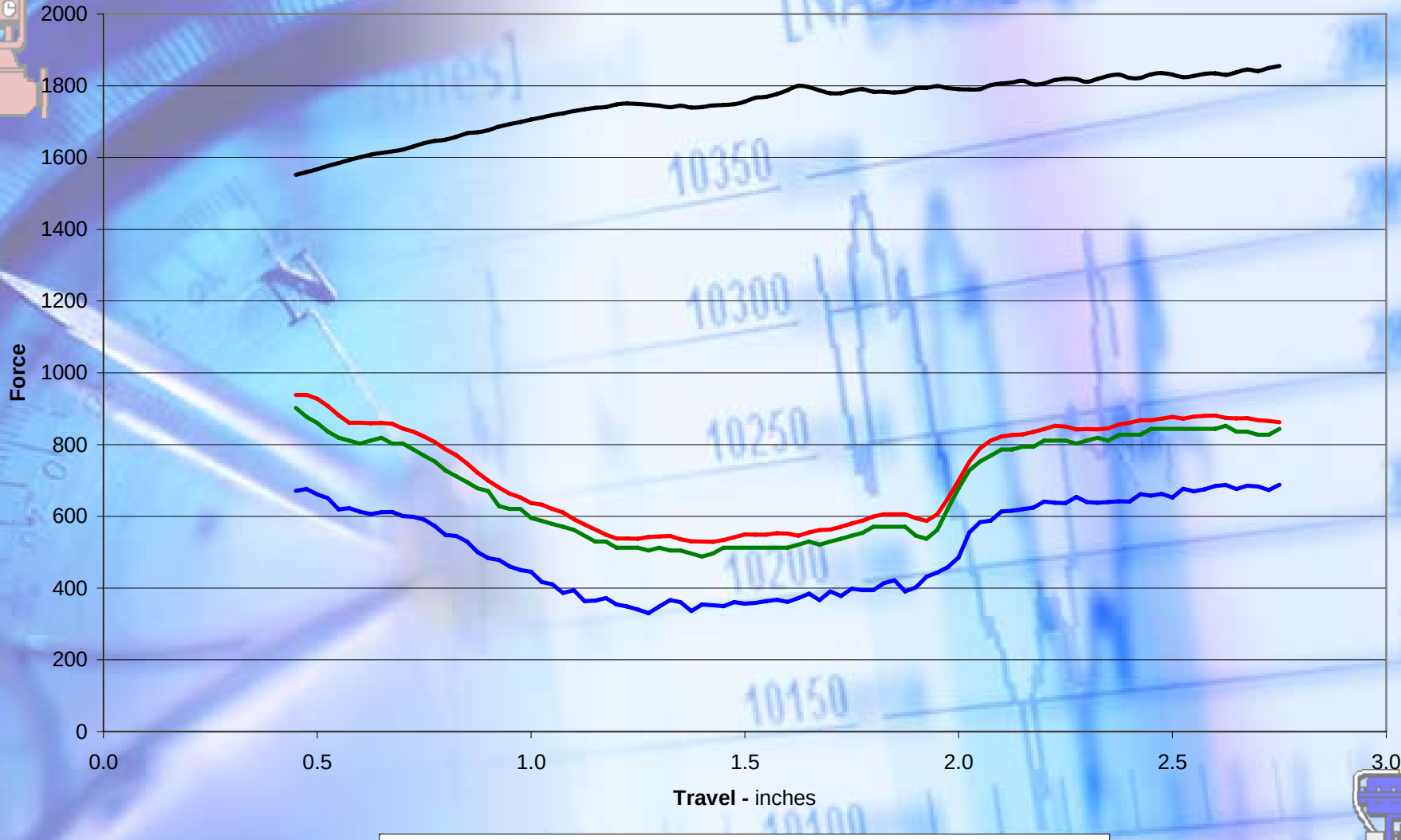
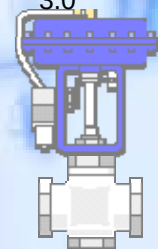
FCV-6-12A





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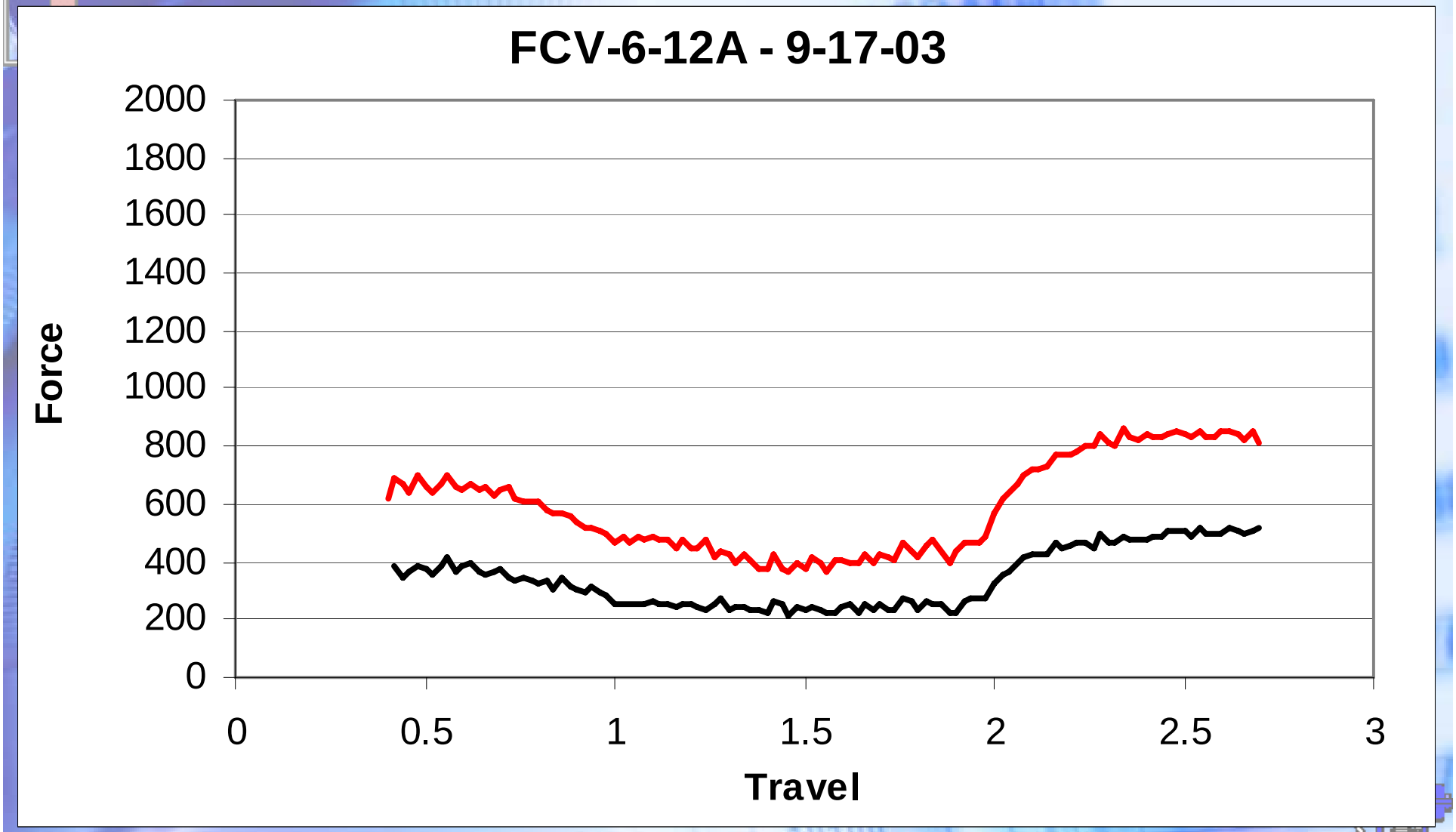
FCV-6-12A - 9-17-03
Force
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
0.5
1
1.5
2
2.5
3
Travel

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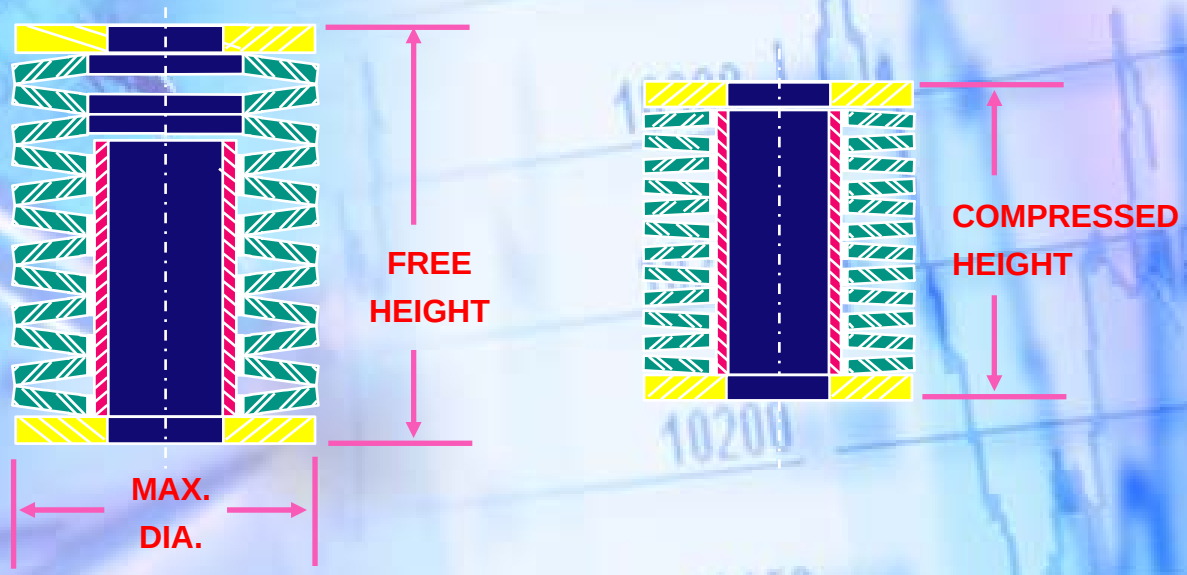
LIVE LOADING SPRING ASSEMBLY



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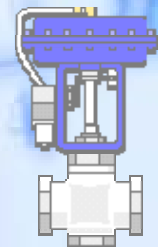
Lessons Learned

- Torque IS NOT the proper method to re-establish gland force.
- Alignment of Washers within Spring packs is very important.
- Spring pack height is the proper way to establish gland force and for re-establishing that force.



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Questions ?