
A.W. Chesterton Mechanical Packing Testing
Air Operated Valve Users Group Conference
Summer Meeting
June 5 - 9th, 2000
Cleveland, Ohio

History

- Nuclear Stations implementing AOV Valve Sealing Programs
- Need for low friction materials to:
  - improve operability
  - reduce ALARA due to faster valve setup time in-line
  - provide longer MTBF
- Minimal information currently available on sealability and frictional properties of various packings under simulated operating conditions
- Graphite packing friction is higher than PTFE
- PTFE historically not allowed in primary circuit

History Continued

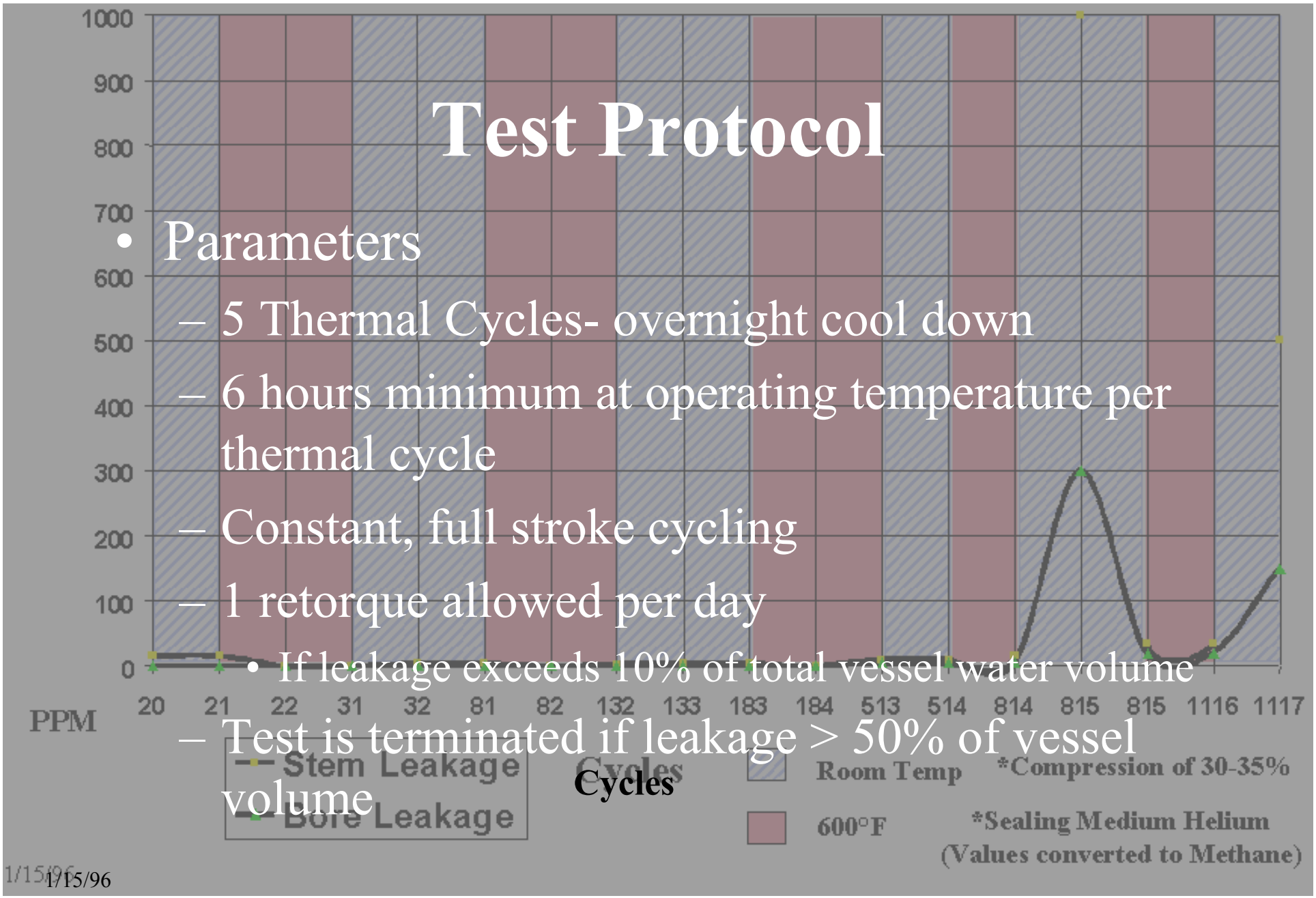
- Delays in testing due to:
  - Other tests scheduled in lab
  - Discussions with industry experts
  - Equipment problems
  - Obtaining new equipment

Test Protocol

- Air Operated Valve
  - Fisher Controls: 2”, 1500#, EHS
  - Actuator Type: 657, Size 50,
  - 1” Travel,
    - 105 sq.in. Diaphragm area
  - Packing Size: .750” x 1.375”
- Parameters
  - 1543 psi., 600°F saturated steam
    - Based On published PTFE maximum parameters
    - Will also test PTFE at 450°F (423 PSI)

Test Protocol

- Parameters
  - 5 Thermal Cycles- overnight cool down
  - 6 hours minimum at operating temperature per thermal cycle
  - Constant, full stroke cycling
  - 1 retorque allowed per day
    - If leakage exceeds 10% of total vessel water volume
  - Test is terminated if leakage > 50% of vessel volume



Products To Be Tested

- Graphite, Square cross section- 4 ring sets
  - die-formed sealer, braided end ring (various types)
- Graphite Wedge Sets
- Pure Braided PTFE- 4 ring sets
- OEM PTFE V-ring sets
- OEM PTFE/ Graphite V-ring sets
- Experimental Products

Proposed Test Stand

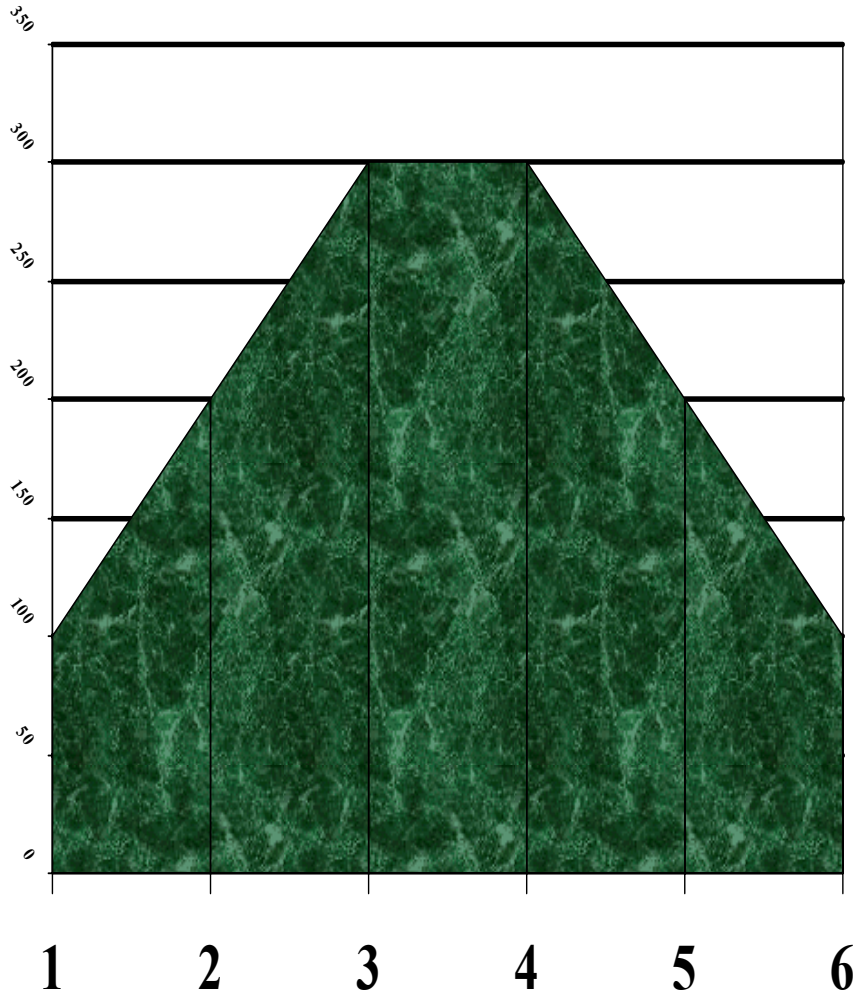
- Data Acquisition System
  - **Temperature Control**
  - **Temperature Cycling**
  - **Stem Cycling**
    - **Baffled air supply**
  - **Friction Measurement**
    - **Taken at room <u>and</u> operating temperature**

Friction Measurement

- Celesco
  - Linear Displacement Measurement Device
  - Mechanical design
  - Chose for simplicity and repeatability
- Keyence
  - Laser Displacement Sensor
  - Many Data Points

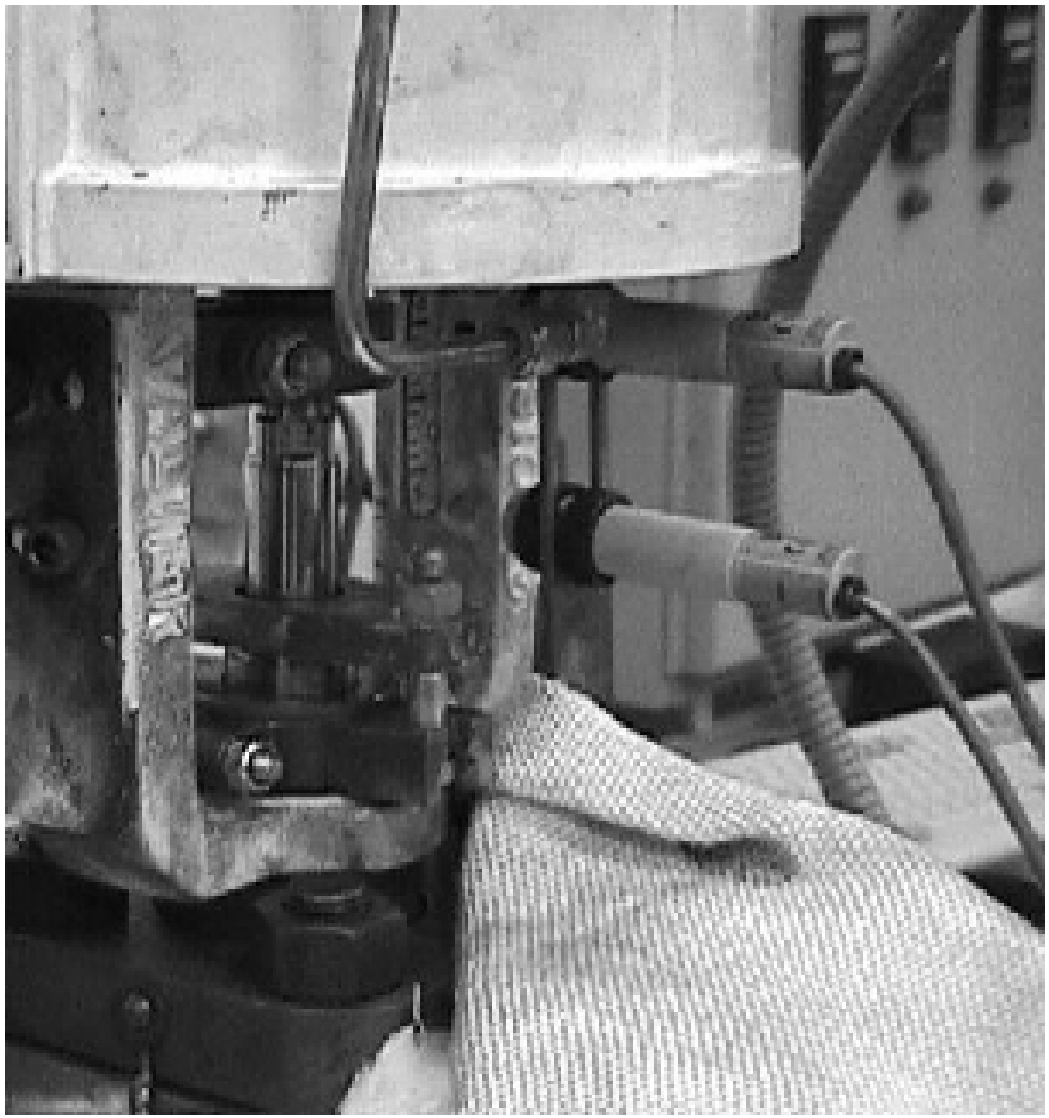
Typical Friction Data Points

- 6 basic points
  - 1) Pressure as stem starts to move Close
  - 2) Pressure @ midpoint of stroke
  - 3) Pressure as Stem hits the seat
  - 4) Pressure as Stem start to move open
  - 5) Pressure @ midpoint of stroke
  - 6) Pressure as stem hits top position



Other Packing Friction Testing

- **Piston Type Actuator**
  - **VOC Environment**
  - **Helium & Methane @ 450 PSIG.**
  - **Temperature 600°F**



Other Packing Friction Testing Continued

- **Friction testing based on force to move stem**
- **DA Controlled Thermal Cycles & Valve Actuation**