

INDUSTRIAL PRODUCTS AND SERVICES



Valve Packing Testing in Boric Acid

***USA/STARS AOV Group Meeting
2008 AUG Conference***



Industry challenges for valve leakage

- ◆ ***Stem Friction***

- Create the lowest coefficient of friction from packing set with the largest operability window for the actuator

- ◆ ***Long Term Sealing***

- Have a packing set that will perform leak free for many nuclear plant fuel cycles without maintenance issues

- ◆ ***Consistent gland load***

- Packing gland load calculations that can be easily applied without complication and chance for error

Boric Acid valve leakage

- ◆ High visibility
- ◆ Unique sealing challenges
 - Crystallizing fluid
- ◆ Need for investigation
 - Why leaks
 - What valve type / size
 - Concentration

Early Work / Discussions

- ◆ EPRI Meeting in February (Charlotte)
 - Discussions from many plants on the issue of what is a leak, frequency of leaks, etc.
- ◆ USA/STARS Summer meeting, Boston
 - Had similar discussions about Boric acid valve packing testing

Seabrook FP&L

- ◆ Paul Brown from Seabrook helped to work on a standard testing protocol



Standard Testing Protocol (Open)

- ◆ It is important to have an open standard that is respected in the industry
 - Duplicates as best as possible to real life
 - Has agreed upon metrics (cycles, concentration, temperature, pressures etc)
 - Could be repeated by anyone (no proprietary testing equipment)

Survey

- ◆ The best way to get a consensus on a testing protocol
- ◆ Chesterton sent an “electronic” survey to many utility engineers who deal with boric acid valves on a regular basis
- ◆ Topics included:
 - Type of valves seen with valve leakage
 - Concentration
 - Frequency
 - Stem materials

Boric Acid Valve Leakage Analysis

Prepared By A.W. Chesterton Engineering with assistance from Seabrook Nuclear Facility.

Part 1 - Boric Acid Leakage in General

The following questions pertain to general Boric Acid leakage, definitions, and identification.

Q0: Is Boric Acid leakage a concern at your Nuclear power Plant?

Please choose **all** that apply

- Yes
- No
- Specify plant name in "other"

Other:

Q1: Do you think Boric Acid leakage is a concern to the operation of all Nuclear Power Plants?

Please choose **only one** of the following:

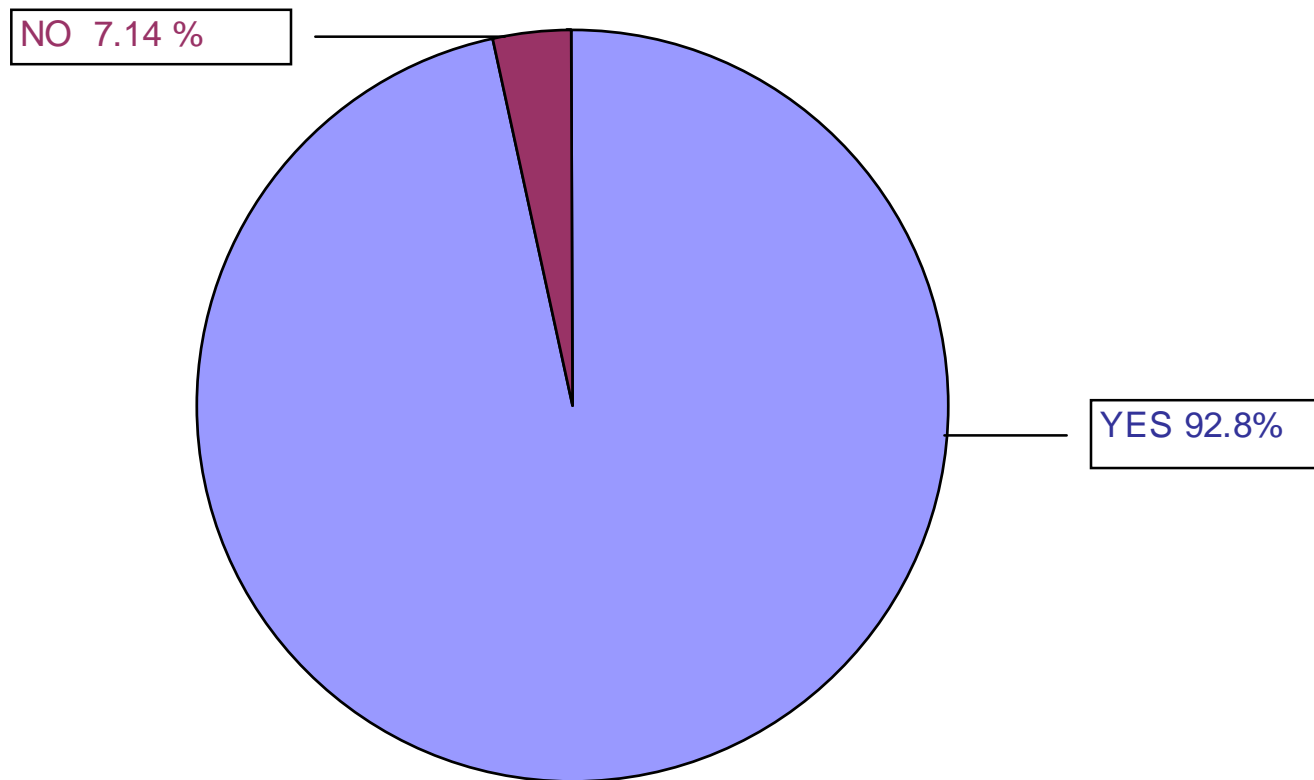
- Yes

Survey

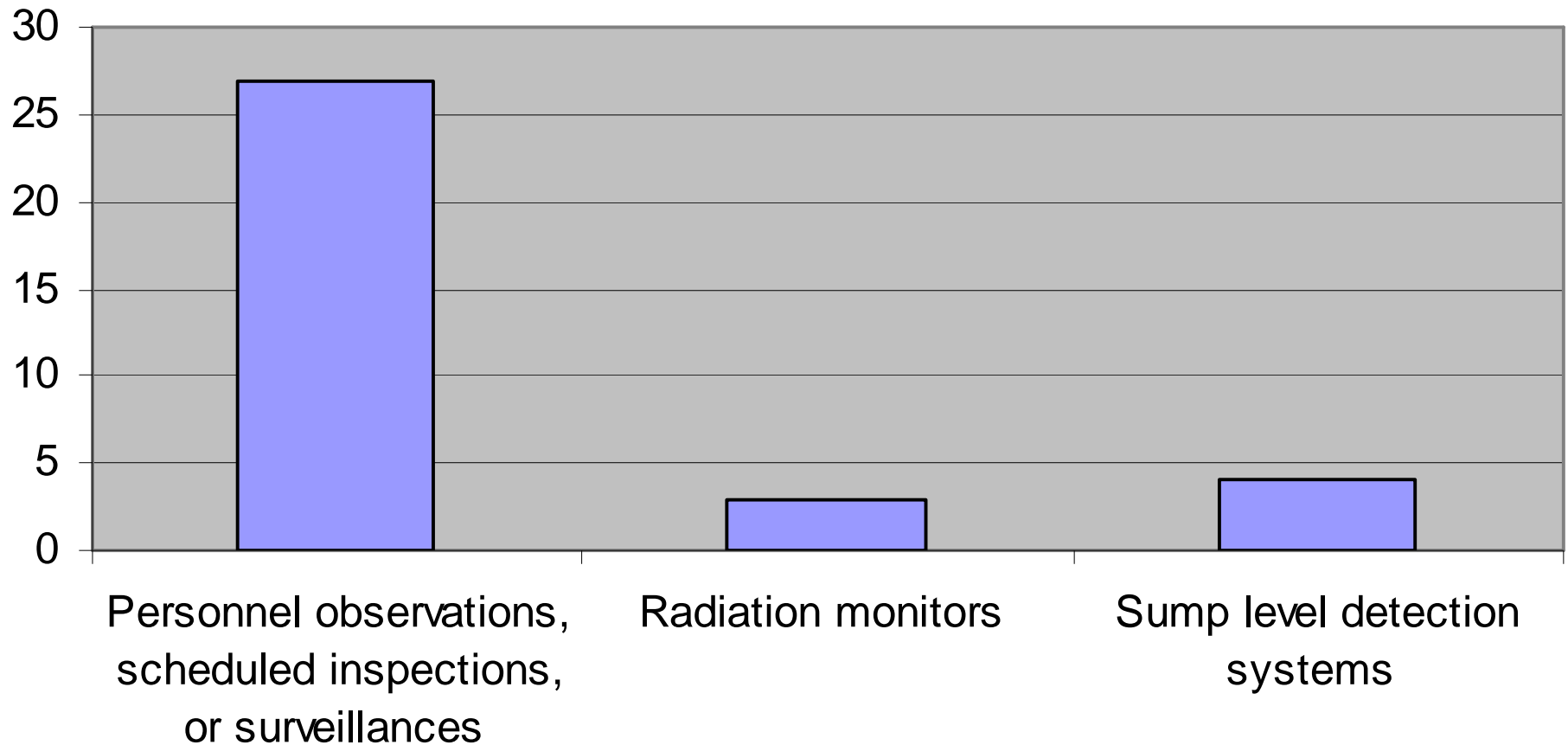
- ◆ Thanks for everyone who participated
- ◆ If you did not,
 - See us at our booth to give us your email
 - Take a printed version from the back of room
- ◆ Our final results will be given to the FLMUG group as reference data and put on the website

Results so far

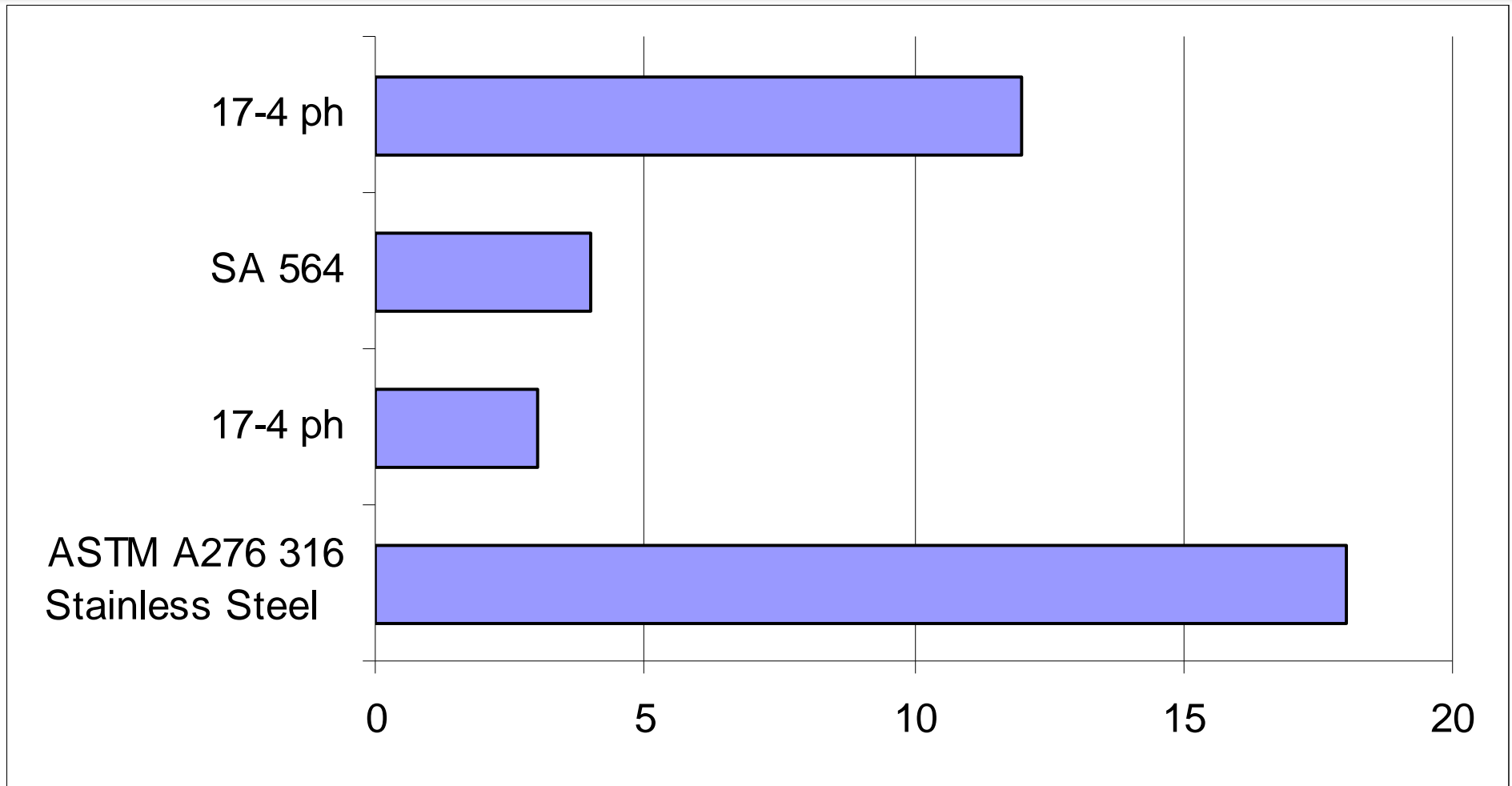
IS BORIC ACID A CONCERN AT YOUR POWER PLANT



During plant operations, what is the most common method used to identify a Borated Water leak?



Of the following materials, what are most valve stems in Borated Water Systems made of?



Proposed Testing Standard

- ◆ **Parameters**

- ◆ **Boric Acid Concentration: 2000 ppm**
- ◆ **Temperature and Pressure: (115)°F & 2250 psig**
- ◆ **Stem Material: ASTM A276 316 Stainless Steel**
- ◆ **Stem Finish: 8 – 15 rms**
- ◆ **Valve Actuations:**

- ◆ **Installation / Consolidation**

- ◆ **Install 5-Ring Packing Set**
- ◆ **Tighten Gland Studs to Specified Torque**
- ◆ **Packing Consolidation**
- ◆ **At 2250 psig 115 °F stroke full 3”**
- ◆ **Actuate valve (# OF CYCLES)**
- ◆ **Monitor gland load throughout test**
- ◆ **Visually monitor 3 times daily for leakage**
- ◆ **Collect 10 cycles**

Proposed testing equipment

- ◆ 3"-1500 lb ASME Class 2 Copes Vulcan Model D-100-160 AOV
- ◆ 1" DIA ASTM A276 316 Stainless Steel Stem
- ◆ "3/8" Packing cross section
- ◆ "Graphite" Packing Type
- ◆ **Data Acquisition**
 - Thermocouples
 - Process Temperature
 - Gland Temperature
 - Bonnet Temperature
 - Pressures Transducers
 - Process Pressure
 - AOV operation
 - Strain Studs
 - Strain gauged bolts



Proposed leakage collection and observation

Using digital photography of the stem and gland area multiple times daily to see “visual” leakage

Review of USA/STARS summer meeting at Chesterton

- ◆ Great feedback on industry challenges in fluid leak management
- ◆ Download Chesterton final Friction report: <http://tinyurl.com/2o9w86>