CELEBRATING NBBI MILESTONES
PRD TEST LAB

30 YEARS OF EXCELLENCE

Joseph Ball
Director, Pressure Relief Department
A bit of history

- National Board Involvement in PRD testing
  - Ohio State lab
  - Original National Board lab
  - A new beginning (30 years ago)

Interface with ASME and National Board programs

- National Board Capacity Certification – assurance of device operation and capacity
  - Test Laboratory Certification
- National Board Valve Repair (VR) and Testing Certification – assurance of quality PRV testing and repair
- Investigation testing

Challenges for the Future
A BIT OF HISTORY

- Original involvement in PRV testing: National Board sponsored tests at OSU in 1935
- Design testing added to ASME Code for safety valves
- Test work done at OSU Robinson Mechanical Engineering Laboratory
- Steam tests done on the weekends
A BIT OF HISTORY

Robinson Laboratory in 1939, home to The Ohio State University's Mechanical Engineering Department and the National Board's first safety valve testing lab.
A BIT OF HISTORY

- National Board builds its own laboratory in 1974
- Lab included steam and air; liquid system added
A BIT OF HISTORY

- Code expansion, testing of production samples added (Winter, 1976)
- Assemblers added (Winter, 1976)
- Liquid valve certification (Summer, 1984)
STEAM TEST SYSTEM

Valves designed for steam service are demonstrated on this system which uses dry saturated steam as a test medium. Relieving capacities are determined using the weighed-water method by condensing the discharged steam from the valve being tested and collecting the condensate over an established period of time.

Steam generated at the Columbus and Southern Ohio Electric Company power plant enters the laboratory via a two inch insulated supply line at 1250 psig and 950°F. The pressure is reduced through one or more of three pressure reducing valves. An air-operated emergency shut-down valve is included for safety and can be activated from several locations in the laboratory.

The incoming superheated steam flows through an automatic, venturi type desuperheater to provide dry saturated steam for test purposes. The final desuperheating for this condition is carried out manually, using cooling jackets surrounding the steam supply piping.

Steam Test Vessel and Condensers

The steam enters a 42 inch diameter by nine foot, six inch long test accumulation vessel. This vessel is equipped with both three inch and four inch outlet connections to which either threaded or flanged pressure relief valves under test can be mounted. Adaptor fittings are available for smaller sizes. This vessel has a maximum allowable working pressure of 625 psig at 650°F. The three manually operated pressure control valves are used in parallel to provide for a more precise control of the test vessel pressure.

Pressure Relief Valve Under Steam Performance Test

Condensate Collection and Weighing Station

All steam discharged from the valve under test is captured, condensed in one of three water cooled condensers, collected in tanks for an established period of time and weighed on digital read-out scales. The system can measure flow rates up to approximately 15,000 pounds per hour, depending upon the test pressure used.
A BIT OF HISTORY

- Problems at Picway
- Planning starts for a new facility, closer to main office
- Feasibility study done
A BIT OF HISTORY

- A location is chosen ...
- Where the lab should have been …?
A BIT OF HISTORY

- A plan is drawn up
- What does this symbolize?
A NEW BEGINNING

- The project is approved, and new lab is built.
NOTHING STANDS STILL

- 1999: Rupture disk certification begins, RD test rigs built, and new air test vessel purchased
- 2011: 3,000-square-foot expansion with 2 new higher pressure gas test systems with permanent rupture disk testing equipment, gas testing changed from air to nitrogen
- 2015: Steam system revamped with new boilers
NOTHING STANDS STILL
A FEW NUMBERS: 30 YEARS OF TESTING

- Tests since opening: 53,804
A FEW NUMBERS: 30 YEARS OF TESTING

- New product certification: 36,493
- Repair Certification: 8,975
- Laboratory comparisons: 646
- Investigation: 197
- NB Tests: 2,015
INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NEW PRODUCT CERTIFICATION

- National Board Capacity Certification (Average 1,216 test per year)
- Code requirement to test pressure relief device designs at an accepted laboratory
- Initial design tests are done by original manufacturer
- Production tests of randomly selected samples for each manufacturing or Assembler location (repeated every six years)
- Assurance to Members and the public they represent that PRD’s will function properly and have an accurate capacity rating
INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NEW PRODUCT CERTIFICATION

- 85% of tests done at NBTL (testing is also done at other labs)
- Qualified designs are listed in NB-18
# NB18 Report

**Allied Valve, Inc. - Riverdale, IA (VRS)**

Riverdale, IA 52722 United States

This Company Manufactures or Assembles:

<table>
<thead>
<tr>
<th>Design Name: 1811, 1511</th>
<th>NBCert # 18122</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Manufacturer/Assembler</th>
<th>Code Sections</th>
<th>Expiration Date</th>
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</thead>
<tbody>
<tr>
<td>Assembler</td>
<td>I, VIII Div. 1</td>
<td>06/23/2021</td>
</tr>
</tbody>
</table>

**Design Type**

- **Safety Valve** 1811, 1511
- Capacity Tests: Sec. I, VIII Div. 1 at Dresser, Inc. on March 11, 1975
- Method of Establishing Relieving Capacity: Flow Capacity, K
- Certified Value: 0.877 Units
- Media - Test: Air/Gas, Steam; Certified: Air, Gas, Steam
- Set Pressure Definition: Pop
- Blowdown Characteristics: Adjustable
- Designed by: Dresser, LLC (DR)

<table>
<thead>
<tr>
<th>Inlet Size</th>
<th>Outlet Size</th>
<th>Flow Area</th>
<th>Orifice [designator] dia.</th>
<th>Lift</th>
<th>Set Pressure Range</th>
<th>Media</th>
<th>Code Section</th>
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<tbody>
<tr>
<td>1.25-1.5 NPS</td>
<td>1.5 NPS</td>
<td>0.307 m²</td>
<td>[F] 0.25 in</td>
<td>0.156 in</td>
<td>15-1500 psi</td>
<td>Steam</td>
<td>I, VIII Div. 1</td>
</tr>
<tr>
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<td>1.5 NPS</td>
<td>0.307 m²</td>
<td>[F] 0.25 in</td>
<td>0.156 in</td>
<td>15-1500 psi</td>
<td>Air</td>
<td>VIII Div. 1</td>
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<tr>
<td>1.25-1.5 NPS</td>
<td>1.5 NPS</td>
<td>0.503 m²</td>
<td>[G] 0.8 in</td>
<td>0.2 in</td>
<td>15-1500 psi</td>
<td>Steam</td>
<td>I, VIII Div. 1</td>
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<tr>
<td>1.25-1.5 NPS</td>
<td>1.5 NPS</td>
<td>0.503 m²</td>
<td>[G] 0.8 in</td>
<td>0.2 in</td>
<td>15-1500 psi</td>
<td>Air</td>
<td>VIII Div. 1</td>
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<tr>
<td>1.5-2.5 NPS</td>
<td>2.5 NPS</td>
<td>0.785 m²</td>
<td>[H] 1 in</td>
<td>0.25 in</td>
<td>15-1500 psi</td>
<td>Steam</td>
<td>I, VIII Div. 1</td>
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<tr>
<td>1.5-2.5 NPS</td>
<td>2.5 NPS</td>
<td>0.785 m²</td>
<td>[H] 1 in</td>
<td>0.25 in</td>
<td>15-1500 psi</td>
<td>Air</td>
<td>VIII Div. 1</td>
</tr>
<tr>
<td>1.5-2.5 NPS</td>
<td>2.5 NPS</td>
<td>1.287 m²</td>
<td>[J] 1.281 in</td>
<td>0.321 in</td>
<td>15-1500 psi</td>
<td>Steam</td>
<td>I, VIII Div. 1</td>
</tr>
<tr>
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<td>2.5 NPS</td>
<td>1.287 m²</td>
<td>[J] 1.281 in</td>
<td>0.321 in</td>
<td>15-1500 psi</td>
<td>Air</td>
<td>VIII Div. 1</td>
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<tr>
<td>2-3 NPS</td>
<td>3.4 NPS</td>
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<tr>
<td>2-3 NPS</td>
<td>3.4 NPS</td>
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<td>[K] 1.531 in</td>
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<td>VIII Div. 1</td>
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<td>2.5-4 NPS</td>
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INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: LABORATORY COMPARISON

• NBBI is the ASME Designated Organization (ADO) for PRD Laboratory certification
• ASME PRD Certificate of Authorization for capacity testing
• NB lab is comparison standard between all labs (21 tests per year)
Please contact the applicable facility for confirmation of their ability to test a particular valve. Also, please note that valves usually cannot be tested at both the maximum pressure and maximum capacity limits simultaneously.

For a list of Authorized Observers at a specific facility, please contact the facility directly.

<table>
<thead>
<tr>
<th>Name/Address</th>
<th>Fluids</th>
<th>Pressure</th>
<th>Size</th>
<th>Capacity</th>
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<tbody>
<tr>
<td>Anderson Greenwood Crosby</td>
<td>Nitrogen</td>
<td>1000 psi</td>
<td>8”</td>
<td>10-70000 scfm</td>
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<tr>
<td></td>
<td>Water</td>
<td>1000 psi</td>
<td>4”</td>
<td>5-2000 gpm</td>
</tr>
<tr>
<td>BS&amp;B Safety Systems, LLC</td>
<td>Air</td>
<td>275 psi</td>
<td>4”</td>
<td>2000 scfm</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continental Disc Corp.</td>
<td>Air</td>
<td>200 psi</td>
<td>4”</td>
<td>7200 scfm</td>
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<tr>
<td></td>
<td>Air</td>
<td>650 psi</td>
<td>4”</td>
<td>6600 scfm</td>
</tr>
<tr>
<td></td>
<td>Water</td>
<td>650 psi</td>
<td>4”</td>
<td>960 gpm</td>
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<td>Dresser, LLC</td>
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<td>4”</td>
<td>4700 scfm</td>
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<td>3”</td>
<td>500 gpm</td>
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<tr>
<td>Elfab Limited</td>
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<tr>
<td>Alder Road, West Chirton Industrial</td>
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</tbody>
</table>
INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NBBI VALVE REPAIR (VR) PROGRAM

- National Board Valve Repair Certification (VR program), Technical Requirements in NBIC Part 4, Administrative requirements in NB-514
- Scope: ASME Stamped NB Capacity Certified Pressure Relief Valves (PRV’s)
- Verification valve tests required based on repair scope of work
  - Minimum of two valves repaired and tested
  - One valve for each test fluid/Code Section to be repaired
    - Typical repair test program is a Section I steam valve, a Section VIII air/gas valve and a Section VIII liquid service valve
    - Section IV valve
    - Section VIII steam valve set on air
INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NBBI VALVE REPAIR (VR) PROGRAM

- **VR** valves tested to the same standards as new valves

8,975 tests of valves for **VR** Certification (300 per year)
INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NBBI VALVE TESTING (T/O) PROGRAM

• National Board Testing Organization (T/O program), Technical Requirements in NBIC Part 4, Administrative requirements in NB-528
• Scope: Testing and recalibration of ASME Stamped NB Capacity Certified Pressure Relief Valves
• Verification valve tests required, depends on testing scope of work
  • At least two valves tested
  • One valve for each test fluid/Code Section to be tested
    • Typical repair test program is a Section I steam valve, a Section VIII air/gas valve and a Section VIII liquid service valve
    • Section IV valve
    • Section VIII steam valve set on air
    • Note: VR Organizations qualified for T/O based on VR scope of work
For VR and T/O, capabilities of the organization are demonstrated (valve designs were already certified)

Capabilities of test equipment and knowledge of personnel are industry issues

Demonstrations on typical work samples “encourage” repair organizations to improve their capabilities

Assurance to Jurisdictions and Users that repairs are reliable
INTERFACE WITH JURISDICTIONS - INVESTIGATION TESTING

• Available as a service to Membership

197 tests done for investigation (6.6 per year)
GOALS FOR THE FUTURE

• Continue to provide accurate informative tests to test lab customers
• Be prepared to respond to novel designs:
  • Spring and buckling pin non-reclosing pressure relief valves
  • Larger PRDs beyond capacity limits
• Respond to changing business environment
• Continue providing service to the Membership, and users of pressure equipment
• Keep the safety in pressure relief devices!
THANK YOU!