Valve Selection Criteria for CMP Slurry

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Factors in Selecting a Slurry Valve

Durability in Slurry

*How long of a cycle life is required?*

Effect on Slurry Chemistry

*How much particle generation can be tolerated?*

Valve Function

*What function will the valve serve?*

Cost vs Performance

*How Critical is the Valve?*
Pinch Valves

Durability in Slurry

*Highest Cycle Life and Durability*

Effect on Slurry Chemistry

*No Slurry Cohesion*

Valve Function

*On/Off, Flow Control*

Cost vs Performance

*Higher Cost, Optimum Performance*
Pinch Valves

- Straight Flow Path:
  - High Cv
  - No Dead Space
  - Ability to Fully Flush

- End Connector (PTFE)
- Compressor Shaft (PVDF)
- Tube (PTFE Blend)
Pinch Valves

What Type of Tube Material?

PTFE Blend vs PFA / PTFE

PTFE Blend:
✓ Higher Durability
✓ Full Seal
✓ Complete Restoration
✓ High Vacuum Resistance
✓ Low Particle Generation
Pinch Valves

Failure of Diaphragm Valves in Slurry

- Cohesion in Dead Space
- Stress on Diaphragm
- Slurry Cohesion Break off
Pinch Valves

**Pinch Valve Durability Test in Slurry**

- **Slurry Type**: Cabot SS-25
- **Test Cycles**: 2 Million
- **Cycle Time**: 4 sec
Pinch Valves

Pinch Valve Durability Test in Slurry

Diaphragm valves lose pressure rating or fail!

![Graph showing pressure rating for DV 1, DV 2, DV 3, and PV after initial rating and after cycle test.](image-url)
Pinch Valves

Pinch Valve Durability Test in Slurry

Pinch Valves show no signs of wear!

![Bar chart showing pressure ratings for DV 1, DV 2, DV 3, and PV. DV 1 and DV 3 have higher initial ratings compared to DV 2 and PV. After the cycle test, the ratings for all valves are significantly reduced, with DV 1 and DV 3 showing more wear.]
Pinch Valves

Pinch Valve Slurry Cohesion Test
Pinch Valve demonstrates same effect on cohesion generation as blank piece of tube.

![Graph showing particles vs day for different valves and a PFA tube.]

Slurry Type: Cabot SS-25
Pinch Valves

Pinch Valve HP Particle Generation Test
Pinch Valve demonstrates low particle generation

Pure Water → 0.1μm filter → Test sample → Particle Counter

- Test sample
- Particle Counter
- Pure Water
- 0.1μm filter

Graph:
- X-axis: Cycles [times]
- Y-axis: Particle Count [Pcs./10mL]
- 500, 450, 400, 350, 300, 250, 200, 150, 100, 50, 0

Legend:
- PV
- DV 1
- DV 2

Sample Data:
- 0 ~ 350: 50
- 700 ~ 1050: 350
- 1000000: 350
- 1050000: 350
- 2000000: 350

Asahi/America, Inc.
www.asahi-america.com
Pinch Valves

Electric Pinch Valve for Flow Control

- Ability to Fully Flush
- High Durability
- Flow Control tested to over 1 Million cycles
Pinch Valves

Electric Pinch Valve for Flow Control
Accurate Linear Performance
Pinch Valves

Electric Pinch Valve for Flow Control

Fast response time and high repeatability

![Flow Rate vs Time Graph](image-url)
Pinch Valves

**Pinch Valve for Back Pressure Control**
Controls back pressure from equipment loop with the ability to fully flush
Diaphragm Valves

Durability in Slurry

Low – Medium Lifespan
Varies Greatly by Manufacturer

Effect on Slurry Chemistry
Causes Cohesion

Valve Function
On/Off, Throttling

Cost vs Performance
Lower Cost, Performance Based on Cycle Life
**Multiport Valves**

**Durability in Slurry**

*Low – Medium Lifespan*

*Varies Greatly by Manufacturer*

**Effect on Slurry Chemistry**

*Small Effect on Cohesion*

**Valve Function**

*Combo Valves, Manifolds, Zero-Dead Leg Valves*

**Cost vs Performance**

*Good Cost and Performance*
Multiport Valves

- Ability to Fully Flush
- No Dead Leg

OPEN

CLOSE
Multiport Valves

Multiport Valve Application

- Slurry
- Close
- Open
- Close
- Polishing
- Flushing
- OFF
- Deadleg
- CMP
- DIW
Multiport Valves

**Multiport Combo Valves**

Incorporates shutoff valve for DI rinse
Multiport Valves

Multiport Combo Valves

✓ Ability to Fully Flush
✓ Eliminates Fittings and Dead Space
✓ Allows Media to Continually Recirculate
Multiport Valves

Multiport Combo Valves

- Compact Design
- Eliminates Fittings and Tubing
- Ability to Fully Flush
- Compact Design
Slurry Valves

Final Advice

✓ Ask the valve manufacturer for slurry test data
✓ Discuss your application with the manufacturer for optimum product selection
✓ Ask the manufacturer if they can provide a product customized to your application
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Thank you for your time!