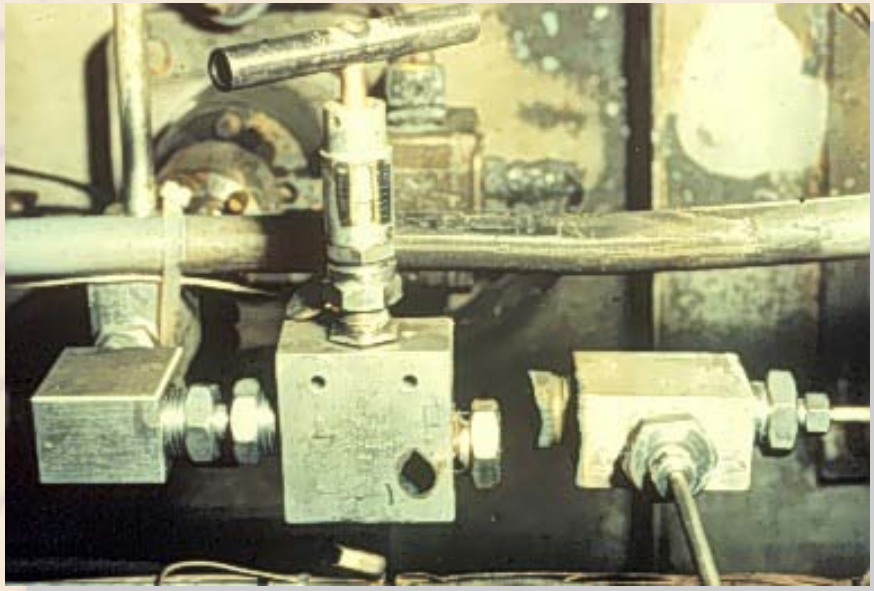
Particle Impact Ignition Test Data on a Stainless Steel Hand Valve

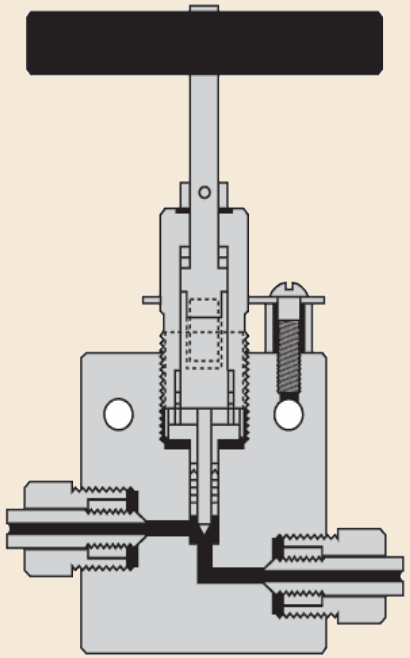
Particle Impact Ignition Hazard

- Manual valve ignition by assembly-generated contaminant
- Space Shuttle Main Engine (SSME) flow control valve

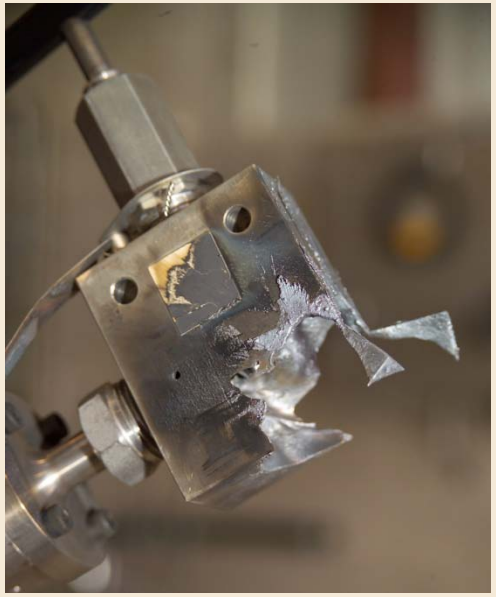


Stainless Steel Hand Valve Tests

- Valve used in White Sands Test Facility (WSTF) oxygen systems
- 6000 psi maximum use pressure



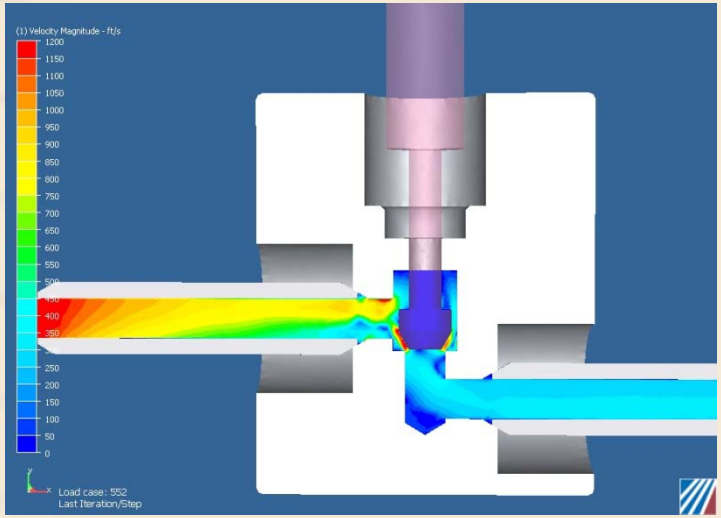
Test Results

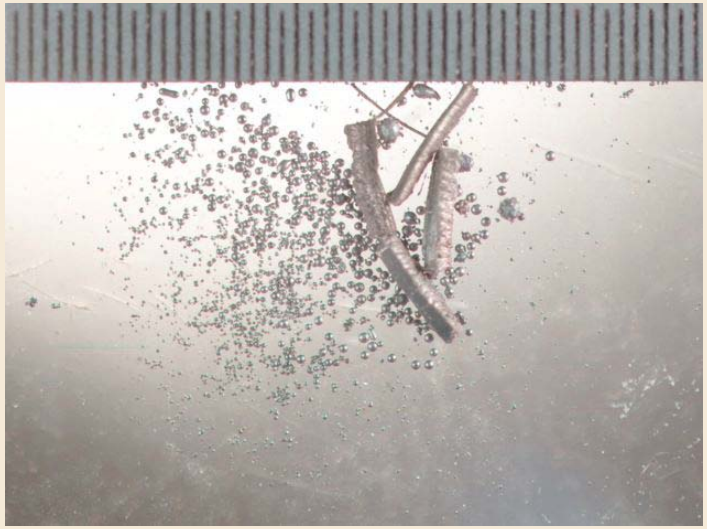


- Ignition at 1000 mg
- Ignition at 500 mg
- No ignition with 100 mg
  - 60 impacts in each direction
  - This yields a 93% likelihood at a 95% confidence level that a fire will **not** occur in the real population

Test Plan

- Determine most severe valve configuration
- Determine quantity of stainless steel particles that can be ingested in a valve without ignition in a worst-case scenario





Conclusion

- WSTF concludes that it is safe to use this hand valve configuration in our own oxygen systems
  - WSTF cleans systems and operates to reduce contamination
  - It is unlikely that 100 mg of stainless steel contaminant particles can be simultaneously released into this type of valve in the WSTF configuration
  - Statistical confidence (testing)

Summary

- Particle impact is a real fire hazard with stainless steel hand valves
- For a HIP valve in WSTF applications, 100 mg of particulate can be tolerated
- It is safe to use stainless steel hand valves of this configuration in WSTF's clean systems