



MIID: Preventing Contaminating Cross Connections in Semiconductor Process Tools

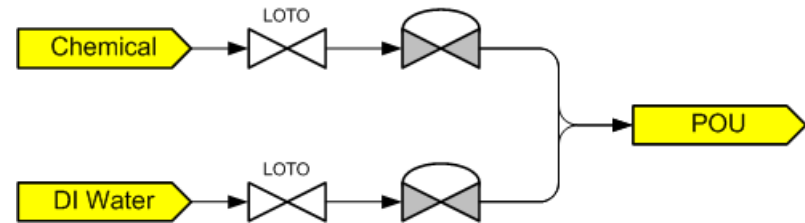
A presentation to the CMP Users Group

Peter M. Pozniak, *Malema Sensors*

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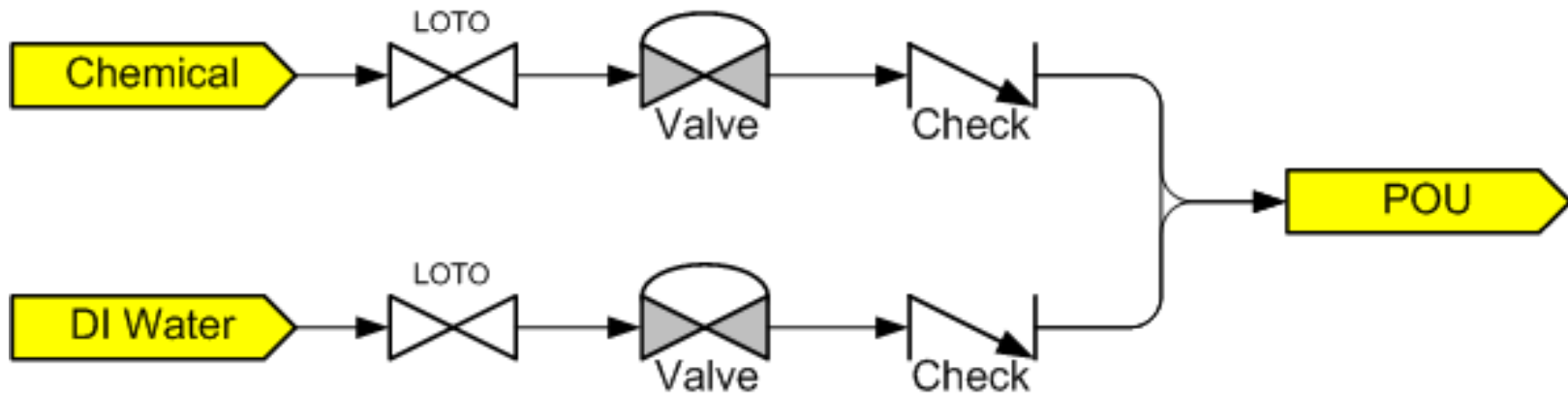
Chemical Cross Connections

- Bulk pressurized delivery systems create a need to cross connect the DI Water system with various chemical delivery systems.
- Typical arrangements provide only single containment
- Resulting in the potential cross contamination of these interconnected systems.



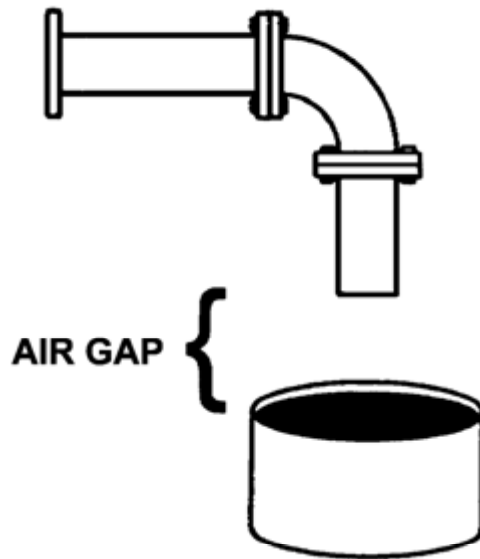
Typical Cross Connection arrangement

A better solution



- Sometimes we'll add check valves to mitigate the potential – *This solution isn't allowed in potable water systems because of its unreliability.*

Simplest form of Backflow Prevention



- Simple, reliable & inexpensive
- It's how your sink & dishwasher avoid cross connection
- Approved for use in Potable water systems.

Common Products for Potable Water Systems

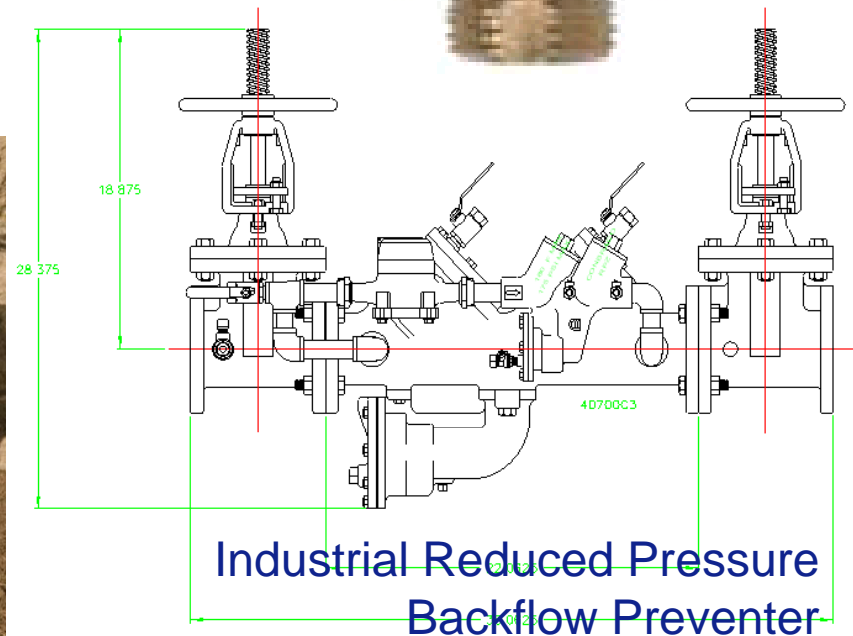


Pressure
Backflow
Preventer

Hose Bib
Backflow
Preventer



Irrigation
Backflow
Preventers





malema sensors

MIID IP

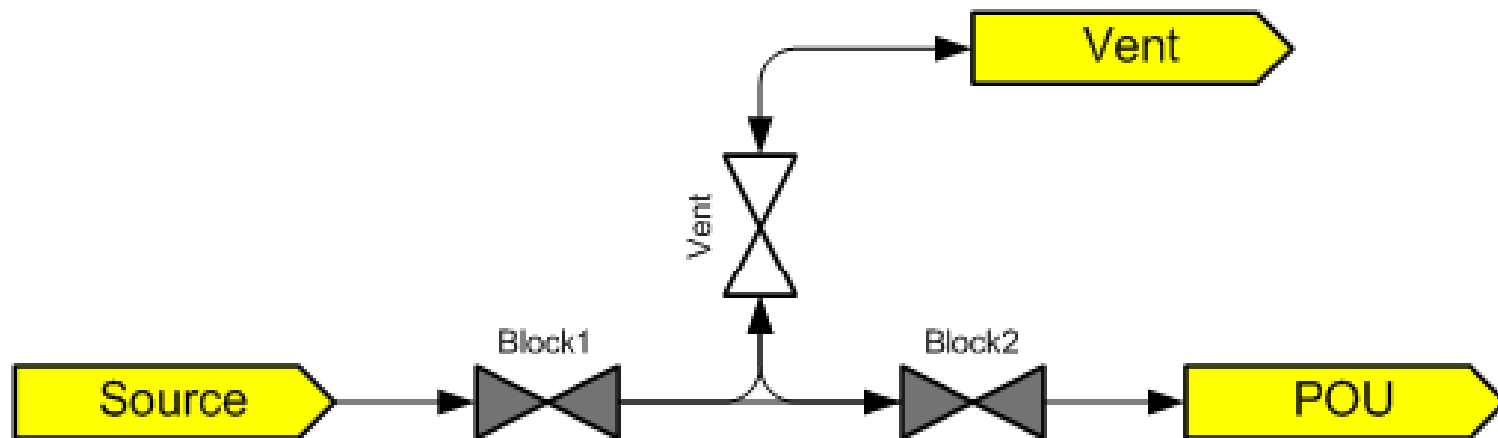
- The MIID product functions as a backflow preventer in cross connected high purity, critical liquids applications
- Markets serviced include:
 - Semiconductor manufacturing
 - Biotech
 - Pharmaceutical
 - Nanotech

Features

- Backflow prevention utilizing the “Double Block & Bleed” method
- Malema proprietary, ultra low level, by-pass leak detection

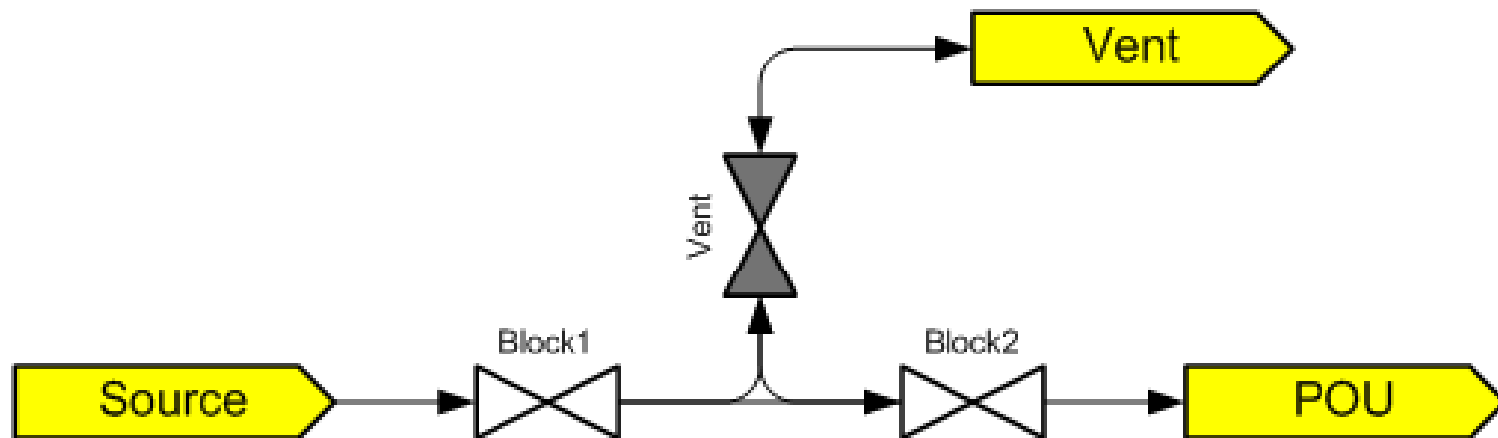
Classic Double Block & Bleed

Vent Active (Open) or protective mode



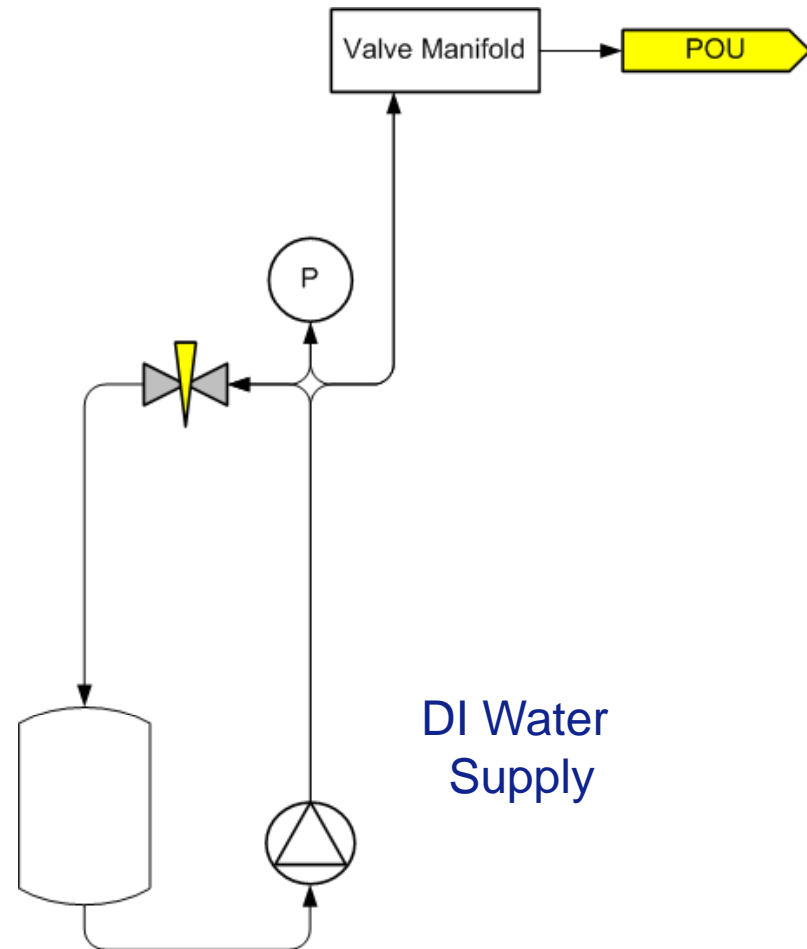
Classic Double Block & Bleed

Vent Inactive (Closed) or dispense mode



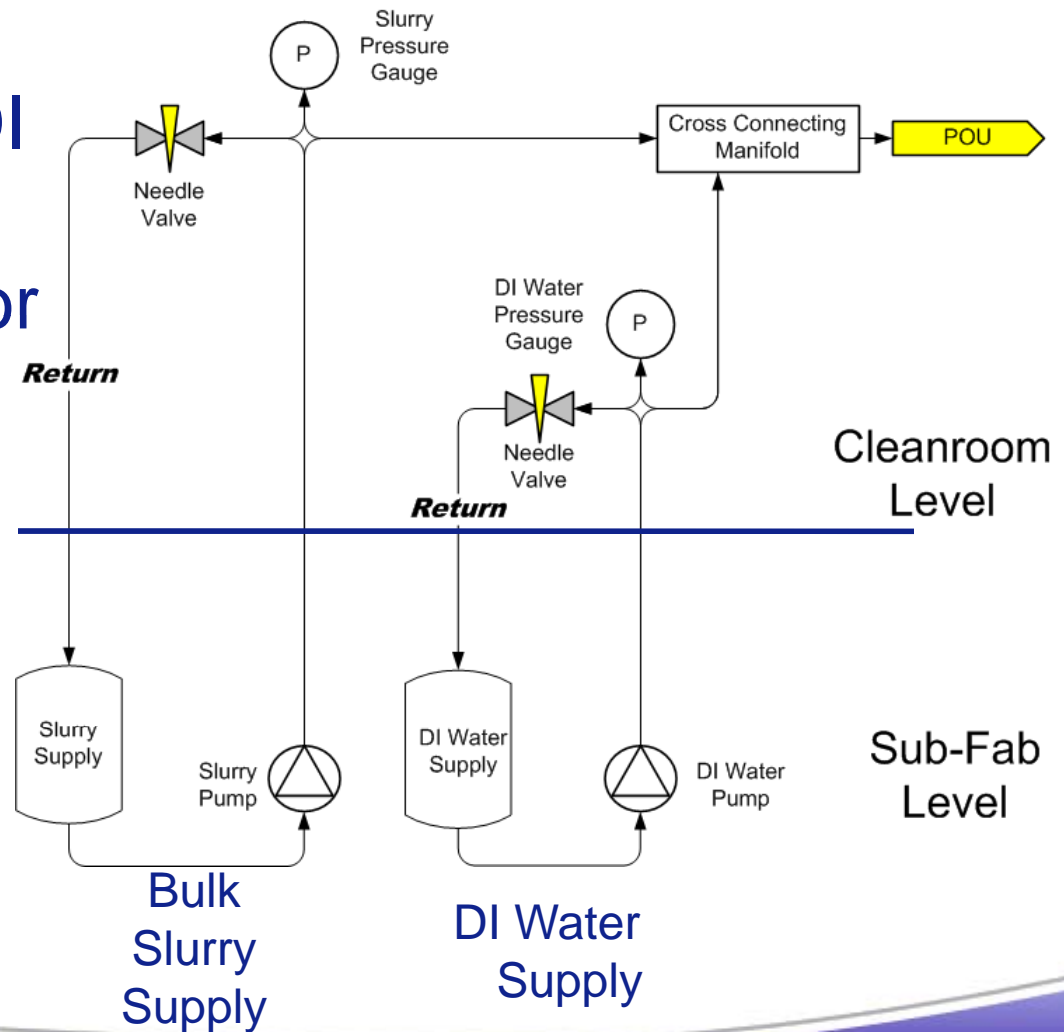
Typical DI Water Loop

- DI Water Loops like this exist in most every wafer fab
- Under “normal” circumstances they work dependably



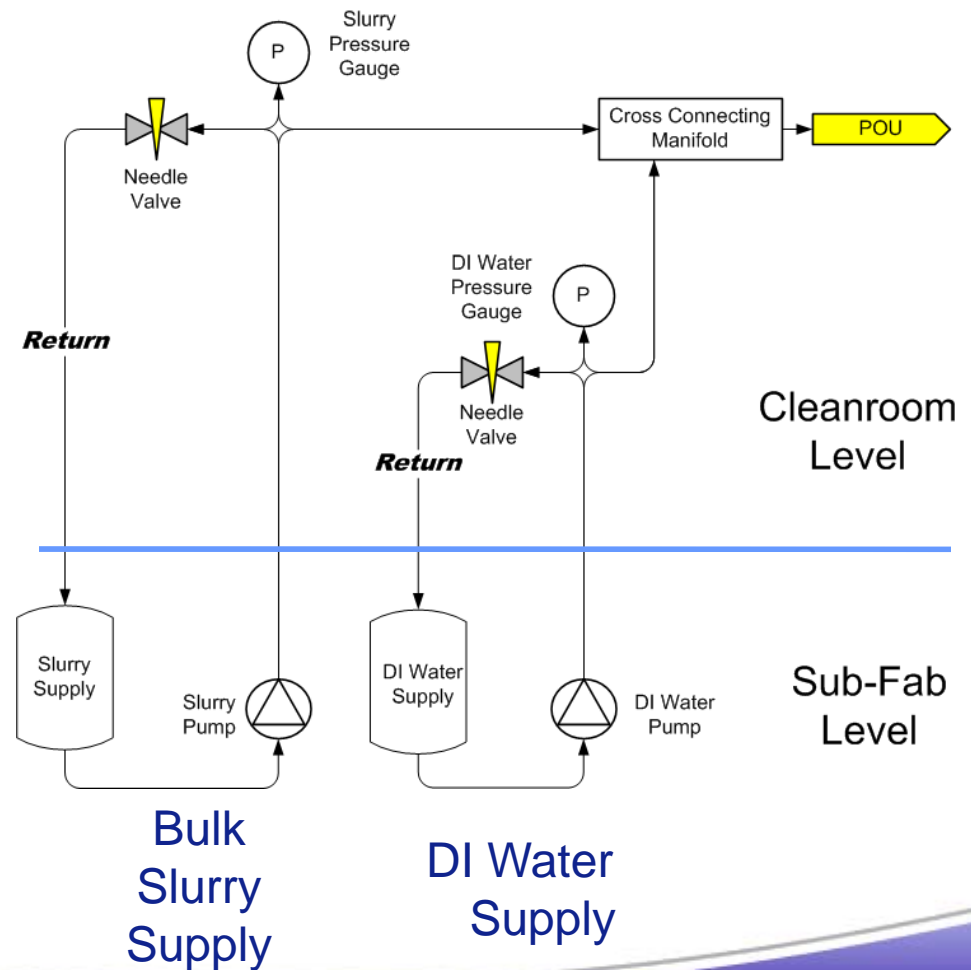
Typical Tool Connections

- A major use of DI Water in any process tool is for the safe flushing and dilution of chemical piping systems during maintenance operations.



DI Water & Slurry Loops

- If either pump shuts down
- The fab level pressure drops
- Gravity continues working on the contained liquid and the pressure not only drops but can generate significant vacuum at the POU valve manifold.

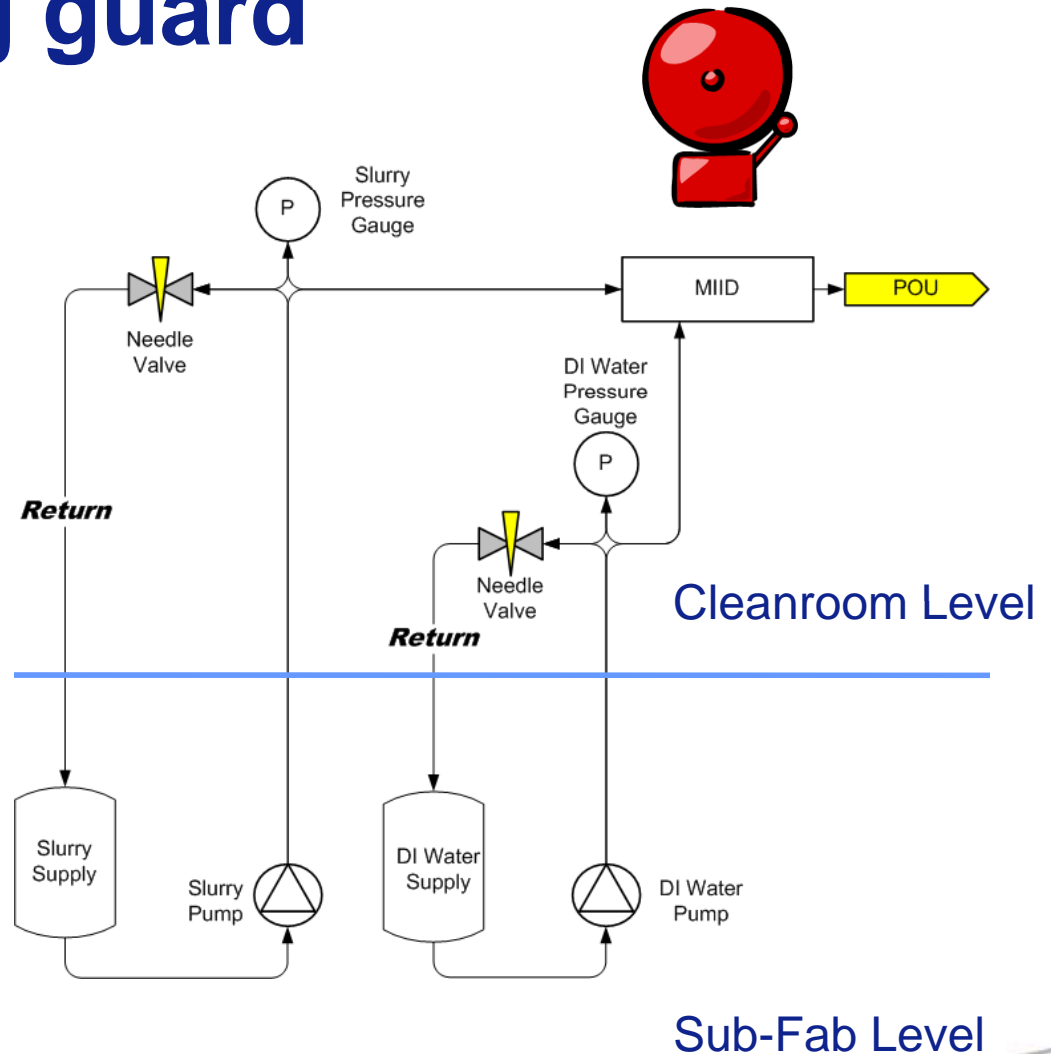


How does the MIID address this problem?

- The (MIID) eliminates these problems.
- The design of the MIID prevents back siphonage even if a valve or valves in the Cross Connect manifold leak(s).
- The MIID incorporates a Malema leak sensor that warns of leaking valves before a back siphonage event occurs and before cross contamination results.

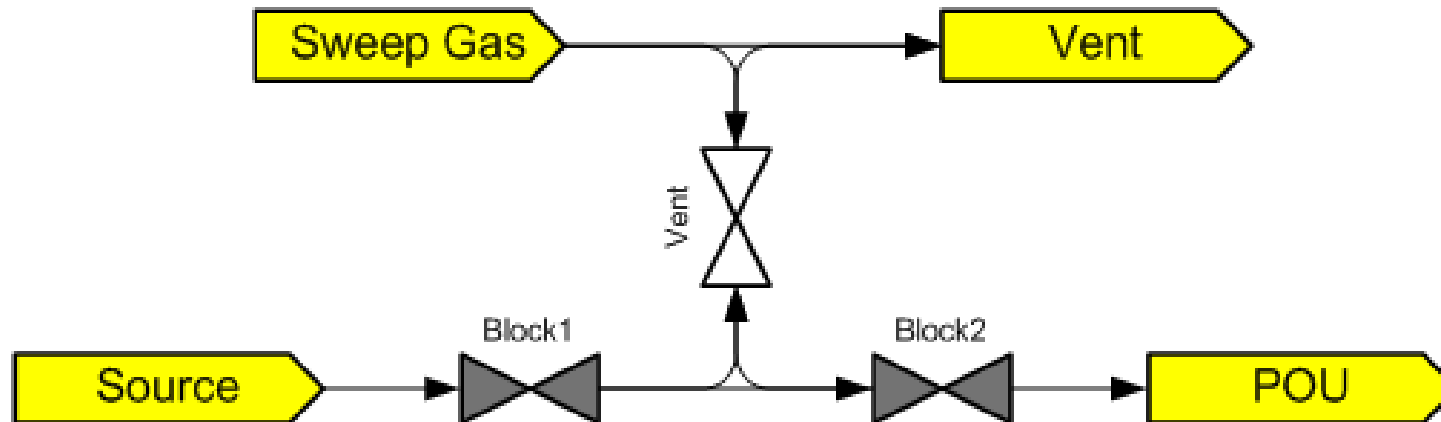
MIID standing guard

- MIID acts to prevent cross contamination from occurring
- A Malema leak sensor provides a warning prior to a backflow event



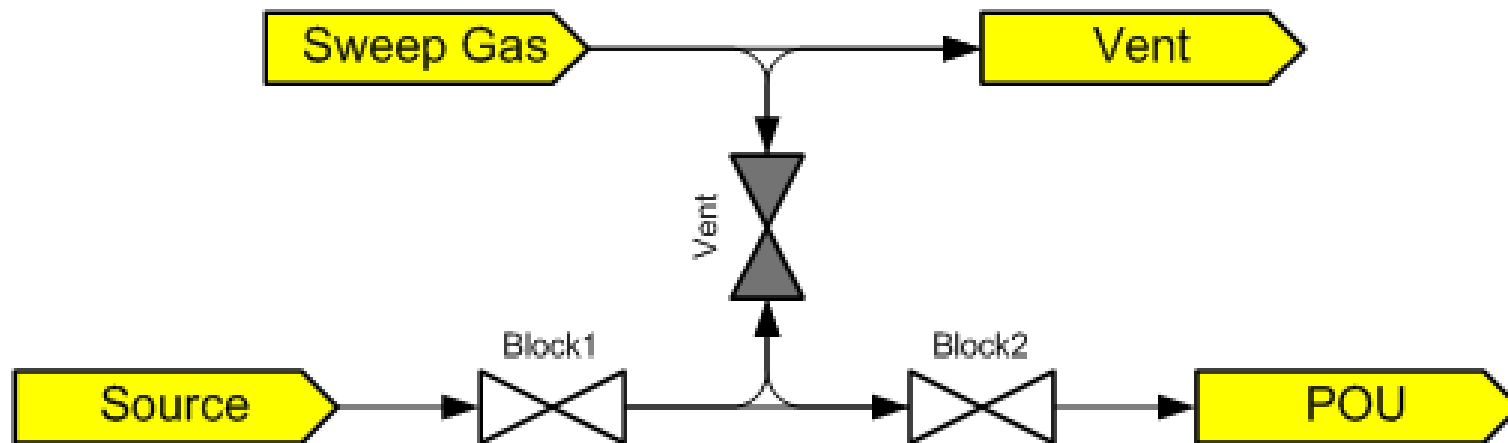
Malema Double Block & Bleed

Vent Active (Open) or protective mode



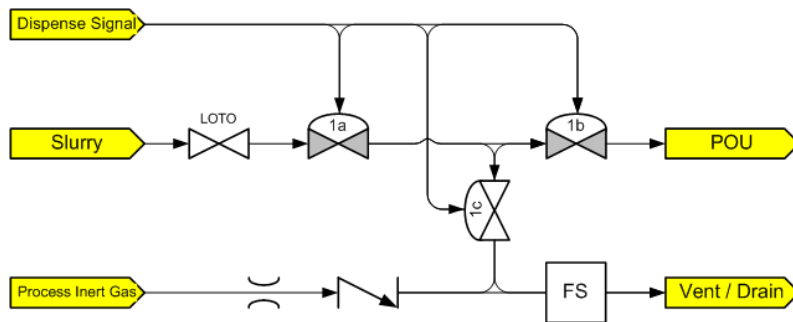
Malema Double Block & Bleed

Vent Inactive (Closed) or dispense mode

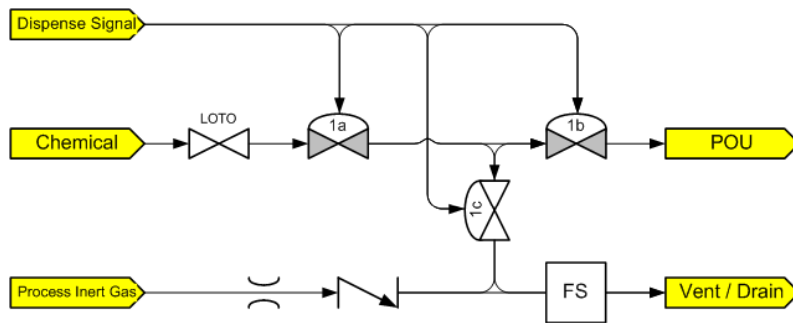


Monitoring?

- The MIID incorporates a Malema leak sensor warning of leaking valves before a back siphonage event occurs and before cross contamination results.



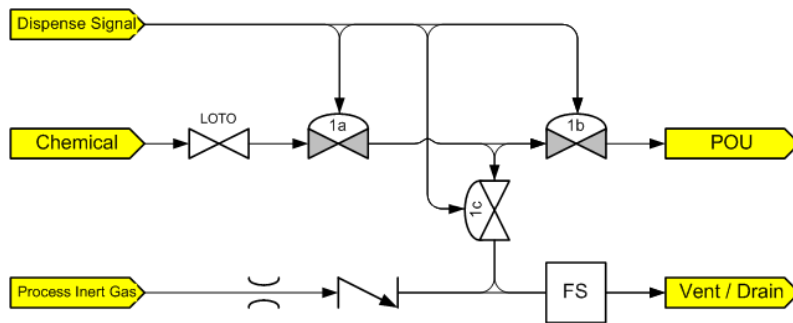
MIID Operation



One channel of a typical MIID module

- Three(3) pneumatic operated valves comprise one channel of a MIID module.
- In the normal, inactive or protective position the connection between the bulk supply and the cross connect point is broken by connection to the drain.

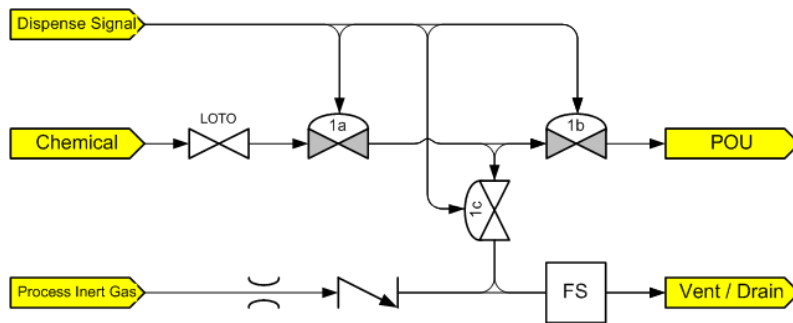
MIID Operation



One channel of a typical MIID module

- When chemical is required by the process:
- Valves 1a & 1b OPEN while Valve 1c CLOSES
- At the end of a dispense cycle the valves return to their normal positions breaking any potential back siphon path by connecting the outlet of the supply valve to the drain line.

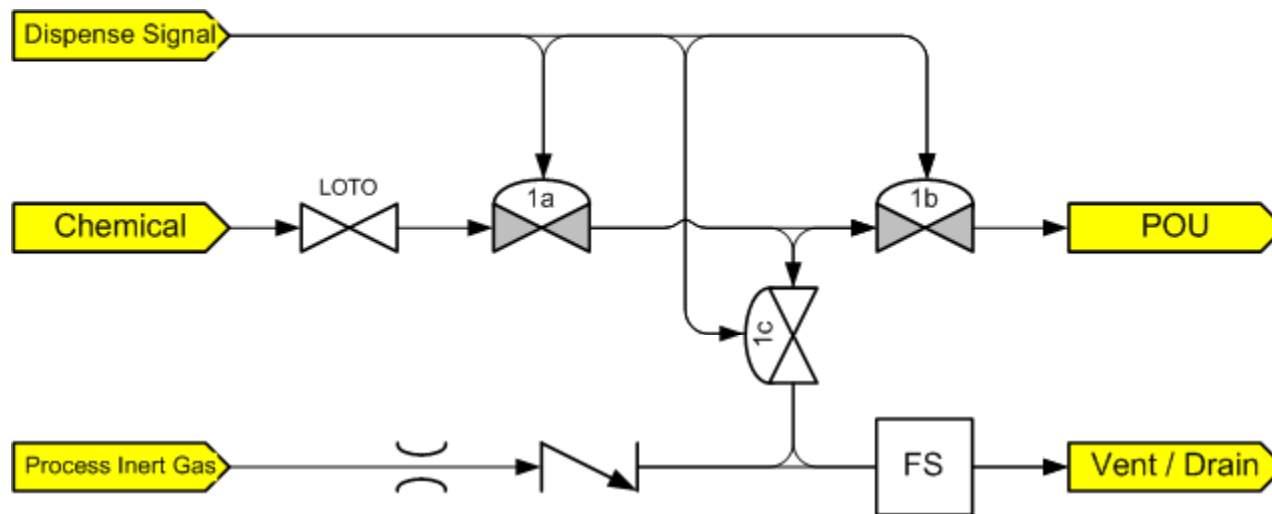
MIID Operation



One channel of a typical MIID module

- Any developing back siphon is broken by connection to the vent / drain line
- Preventing a cross contamination event.
- The vent / drain line is monitored by a leak sensor providing an early warning of leaking valves.

Malema Interconnect Interlock Device Simplified Description



Test & Validation

- During simulations in Malema's Lab each valve in the MIID module was equipped with a known leaking valve poppet.
- Several combinations of leaking and non-leaking valves were tested
- No cross contaminations occurred
- All valves were replaced (simultaneously) with known leaking poppets
- No cross contaminations occurred

Modular MIID Backflow Preventer

