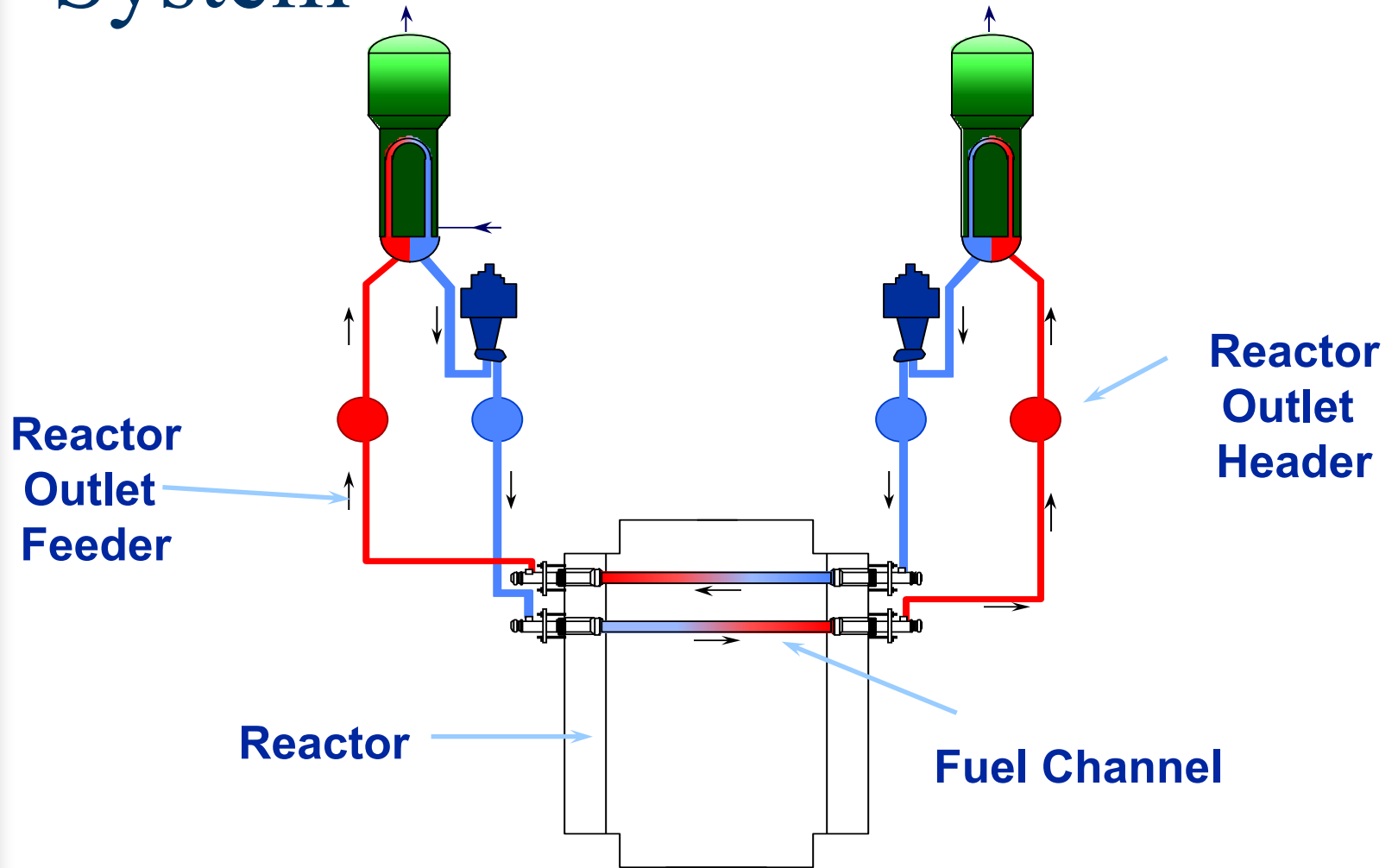


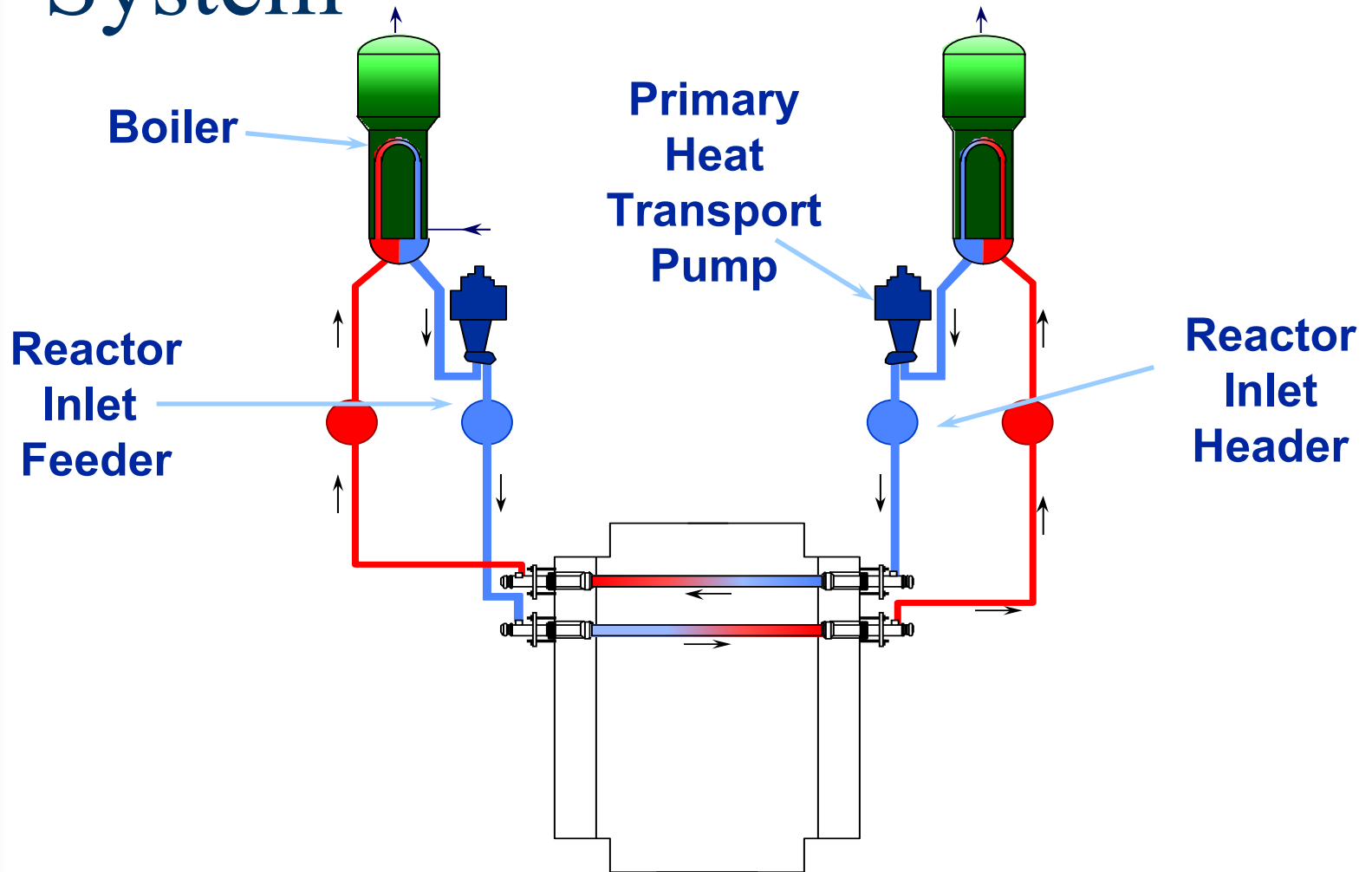
Heat Transport System



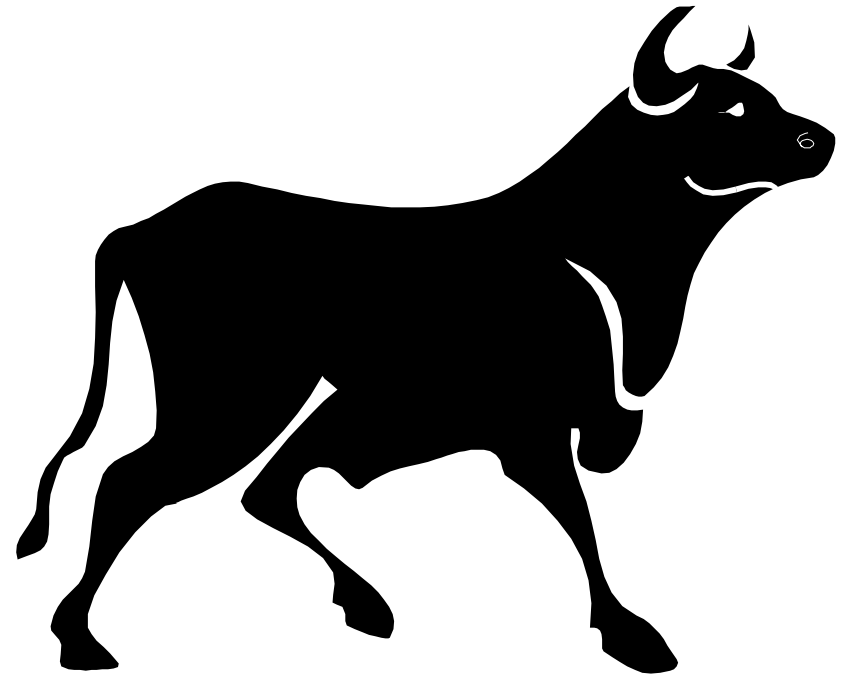
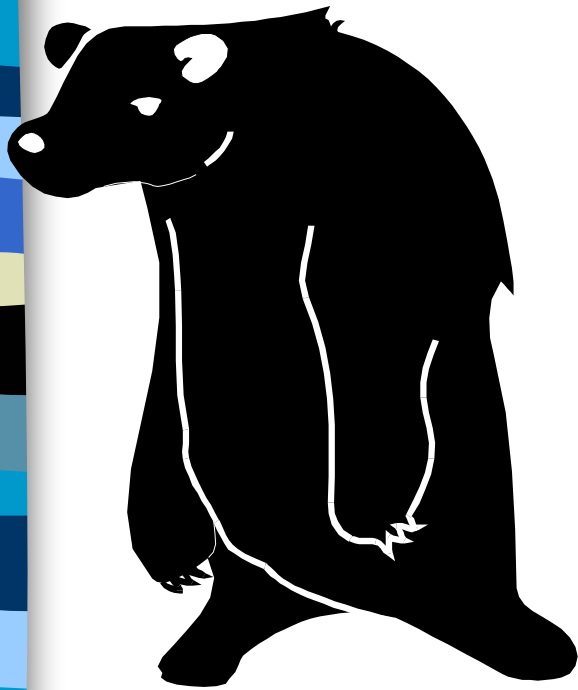
Simplified Heat Transport System



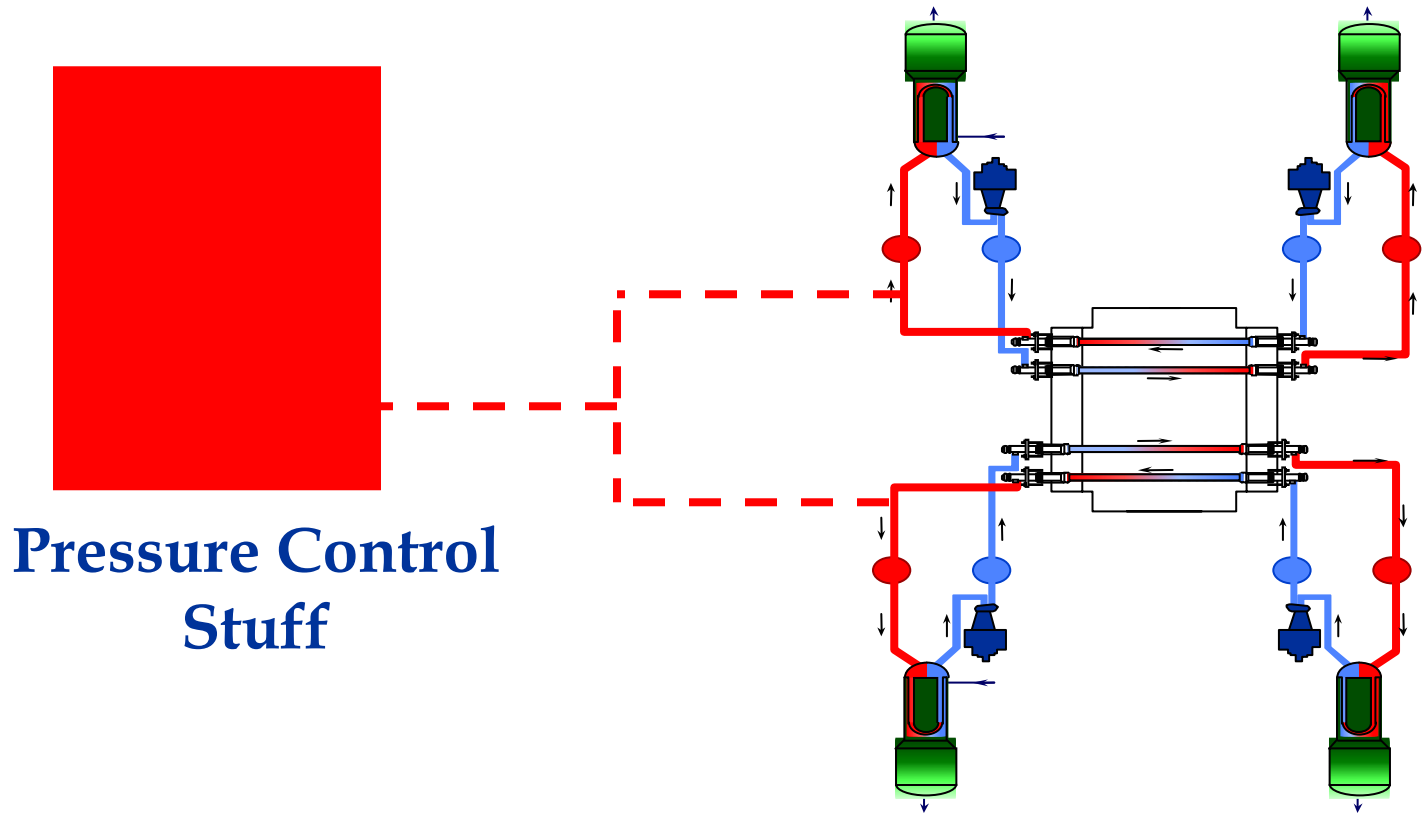
Simplified Heat Transport System



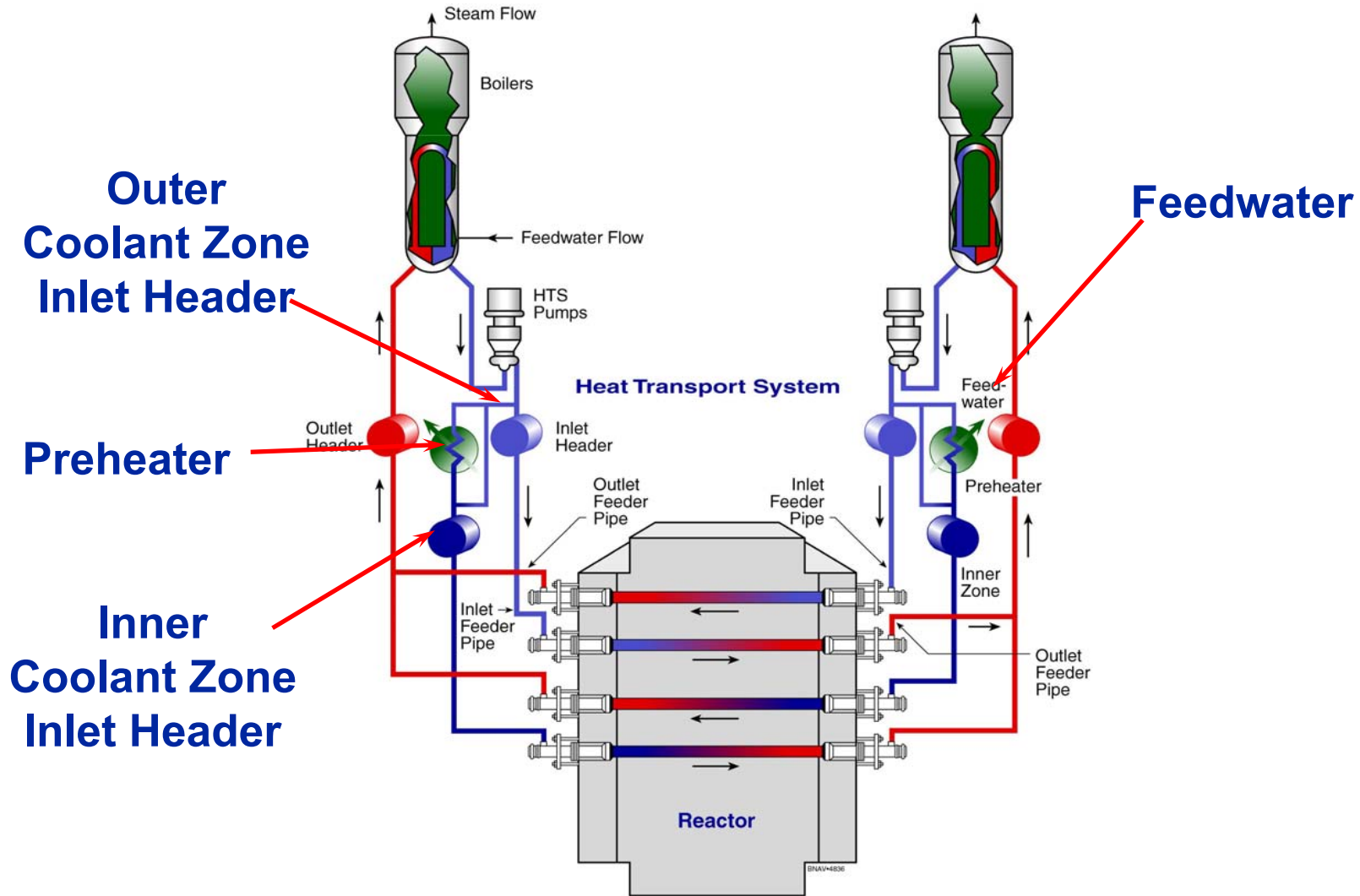
Two variations on a theme



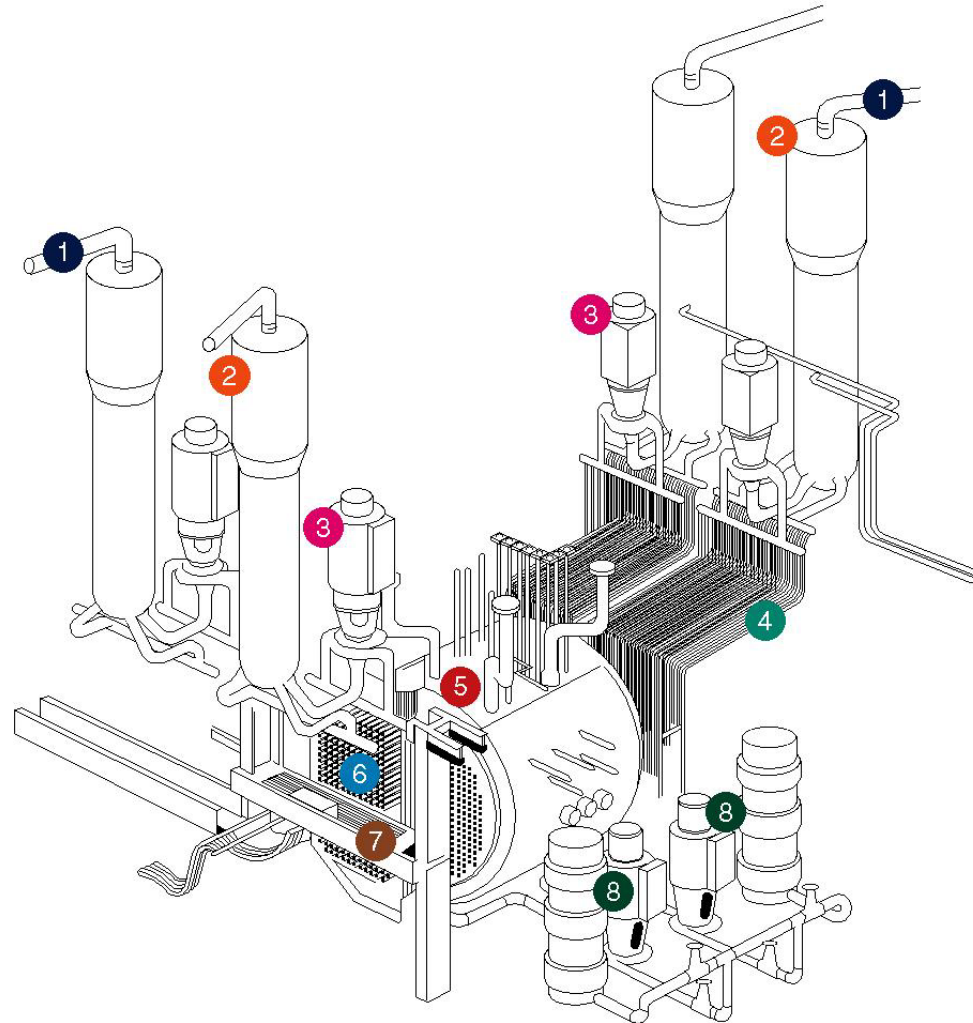
Double Loop Design



Two Cooling Zone Design

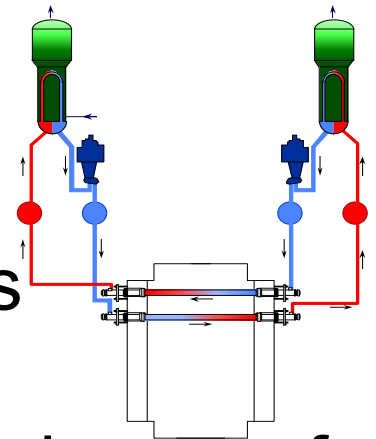


CANDU 6 Reactor



Notes on Heat Transport Systems

- No valves in the main circuit
 - in newer designs
- Ice plugs are used for a lot of isolations
- Variations on the simplified design shown here
 - double loop design
 - inner and outer cooling zones
- Arrangement of components allows thermosyphoning
- Pumps after boiler to minimize the chance of cavitation



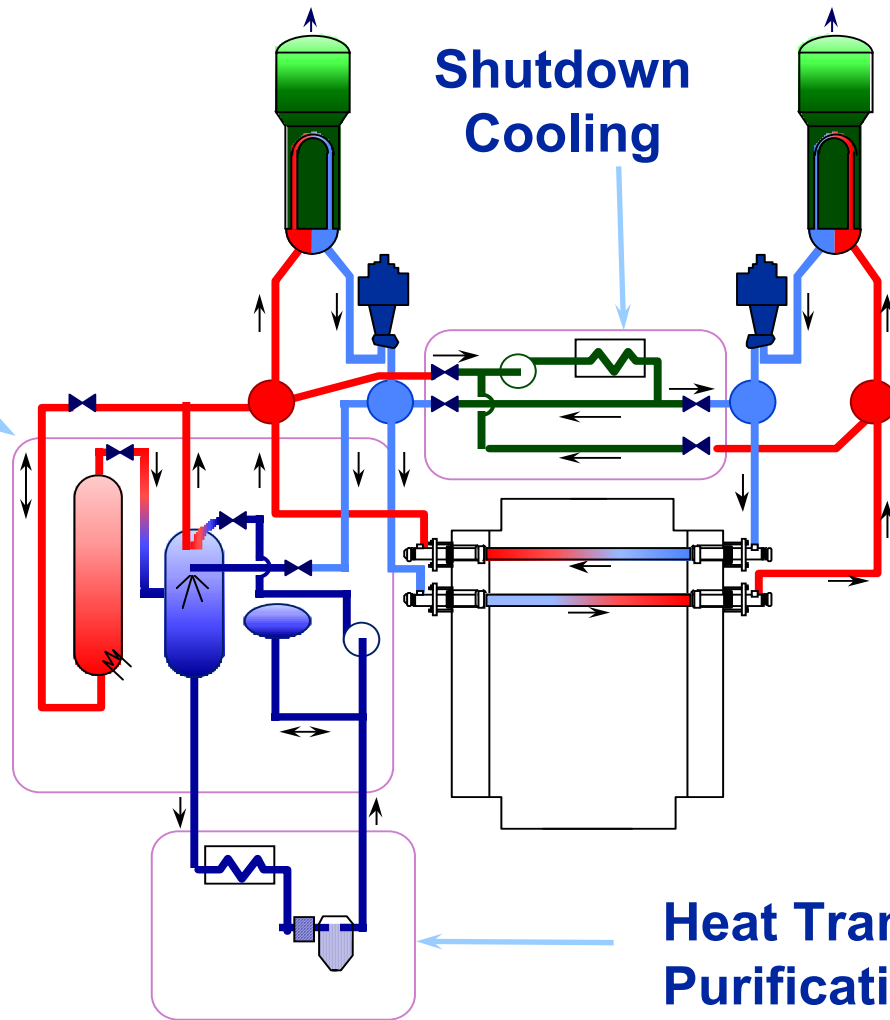
Hazards

- Tritium
- N-16 & O-19
- Potential for fission products
- High temperature
 - 250°C to 310°C range
- High pressure
 - 10 MPa



HTS Auxiliaries

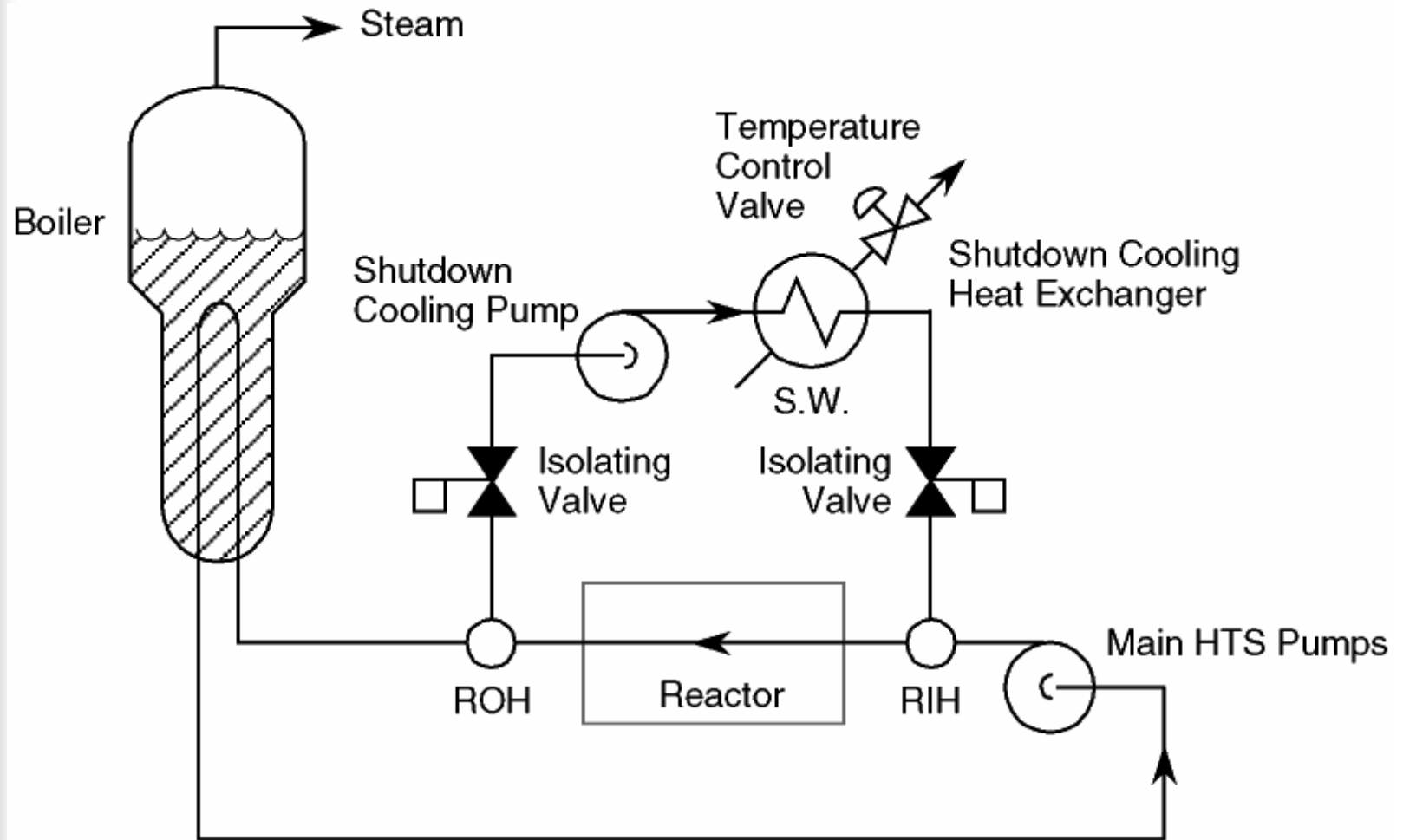
Pressure
&
Inventory
Control



Shutdown
Cooling

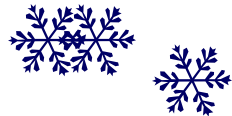
Heat Transport
Purification

Single Stage Shutdown Cooling



Shutdown Cooling

- Used when main circuit is not available
- Used when main circuit is not required
- Sized for decay heat removal
- Situated below the reactor headers so boilers can be drained
- Normally put into service after HTS is cooled somewhat
- Provision to put in at HTS operating temperature in the event of boiler tube leaks
- Sometimes referred to as maintenance cooling
- May be an intermediate cooling method



HTS Auxiliaries

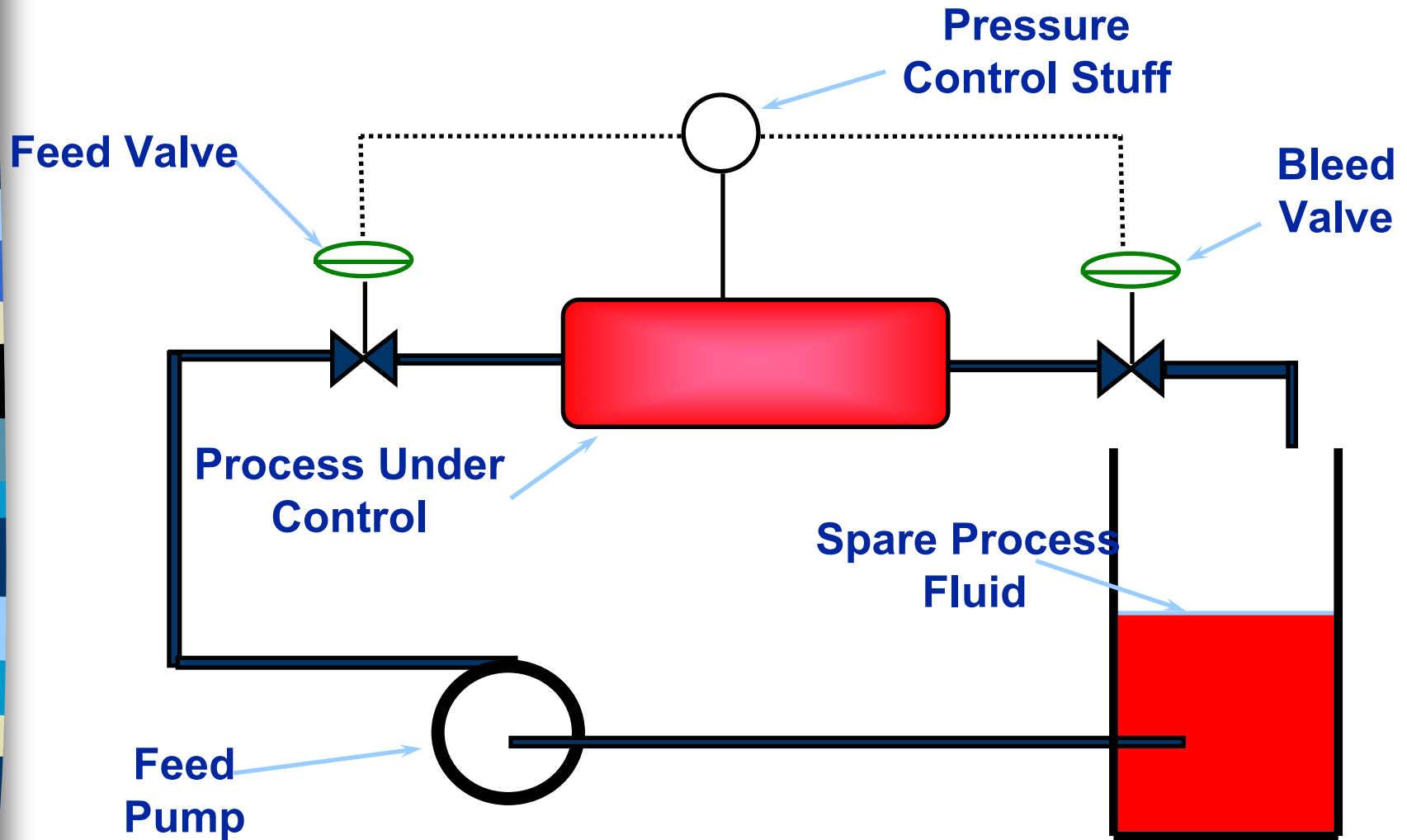


Auxiliary Systems

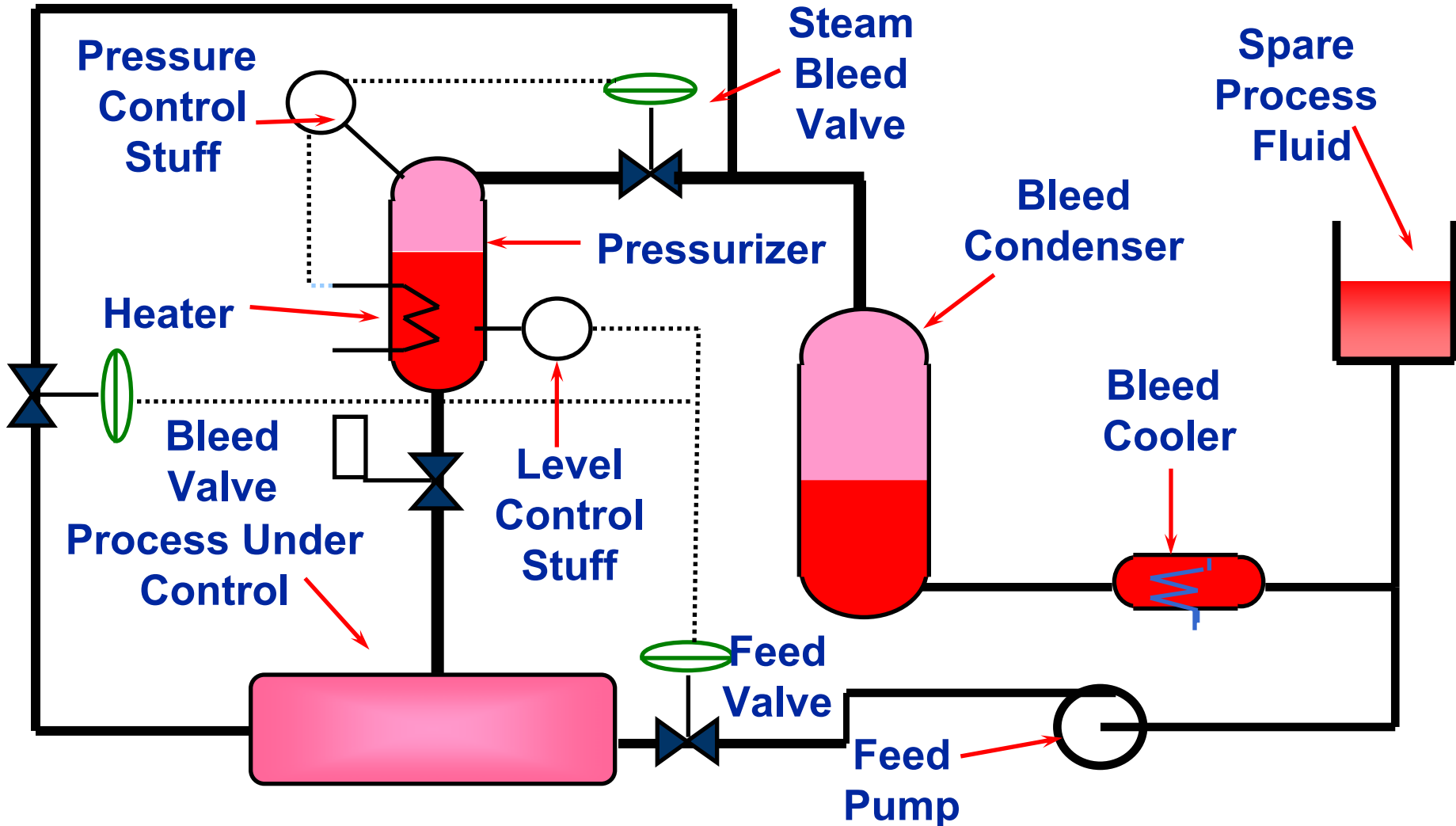
- Pressure and inventory control
- Relief
- Purification
- Gland Seal
- Collection and recovery



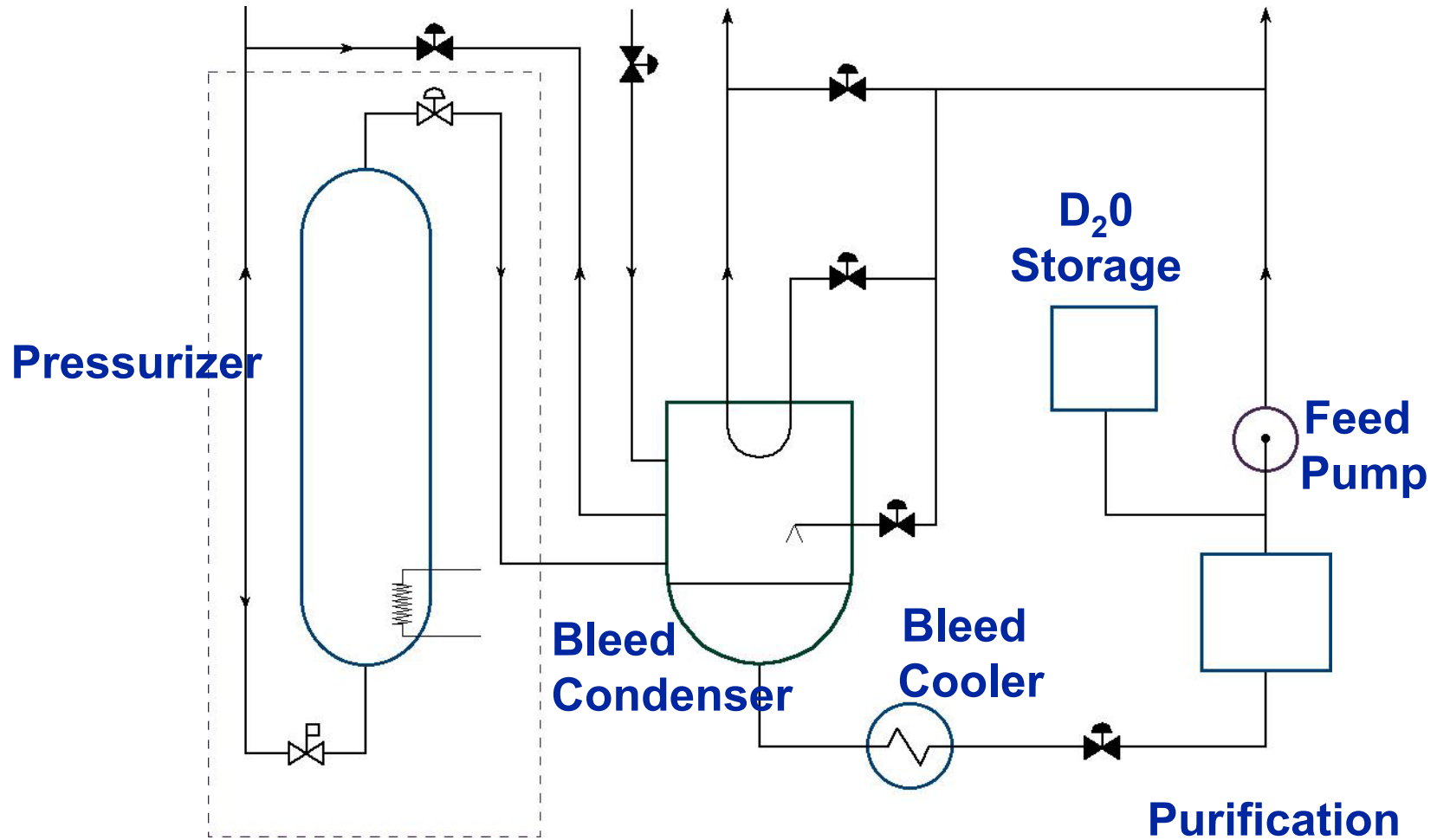
Pressure Control -- Feed & Bleed



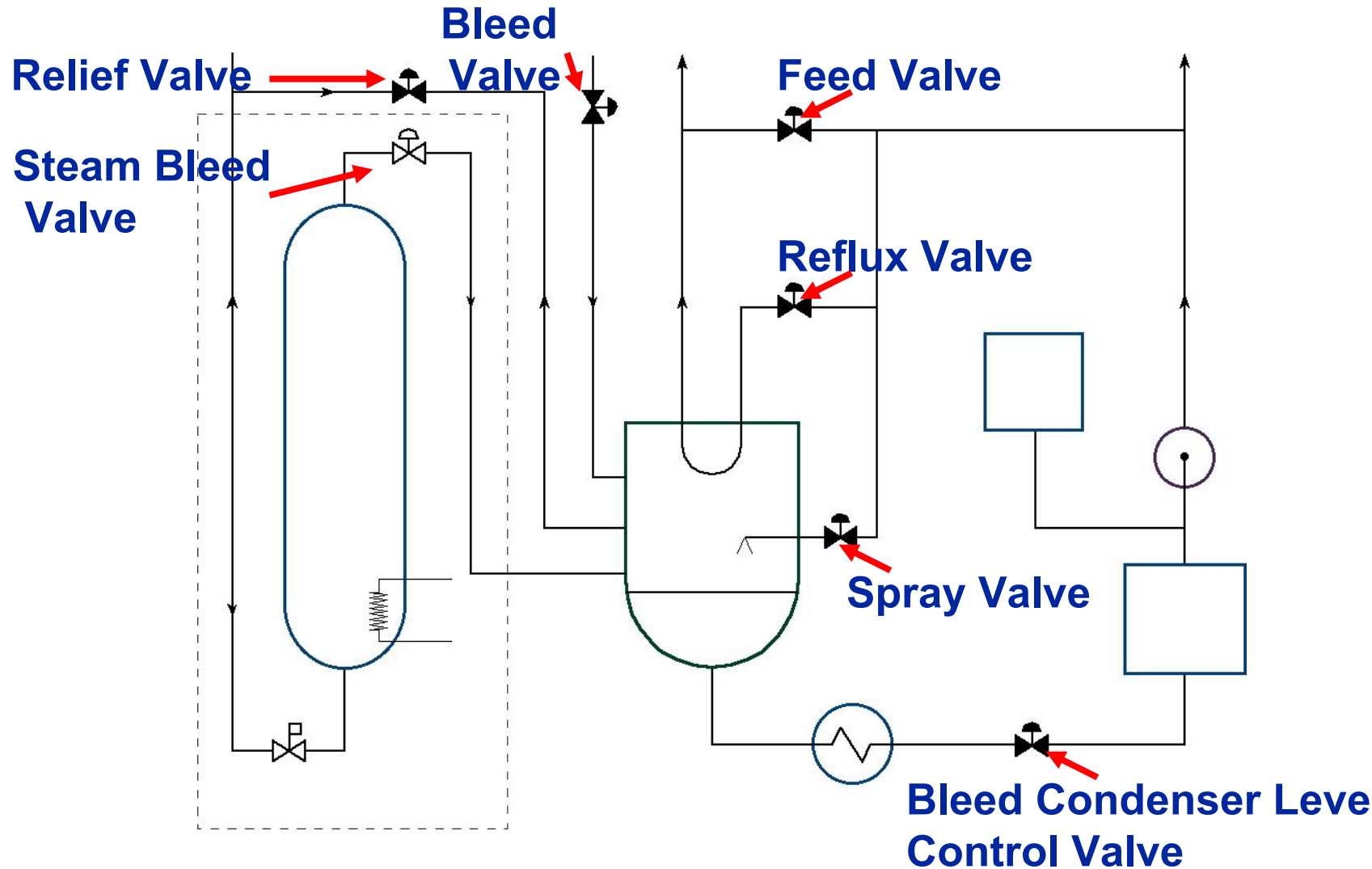
Pressure Control -- Pressurizer



Pressure and Inventory Control



Pressure and Inventory Control

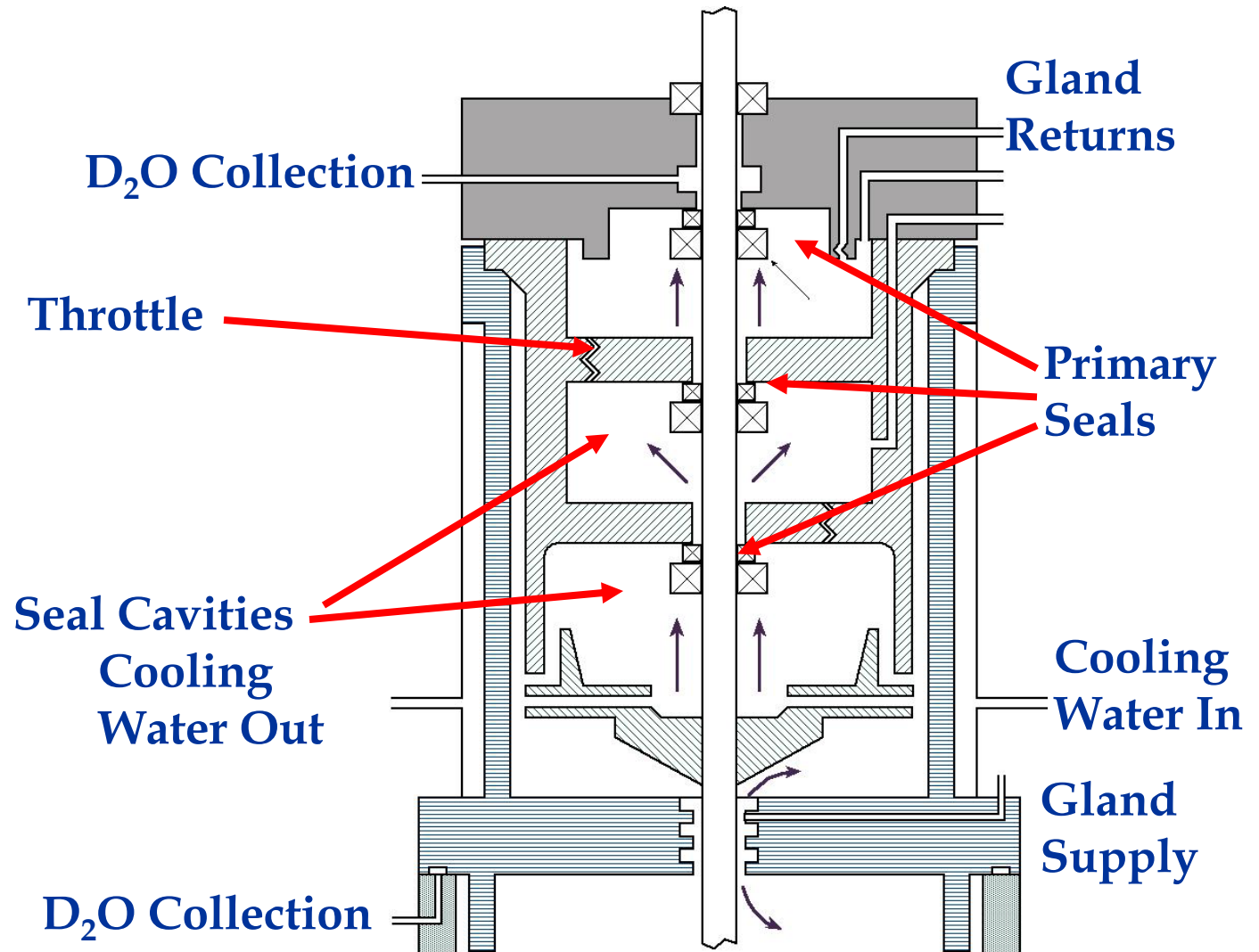


Purification

- Protection from corrosion
 - minimized with a high pH
- Protection from particulate damage
 - erosion
 - deposits
 - clogging instrument lines
 - activated deposits
- Removal of radioactive material
 - minimize fission products from failed fuel

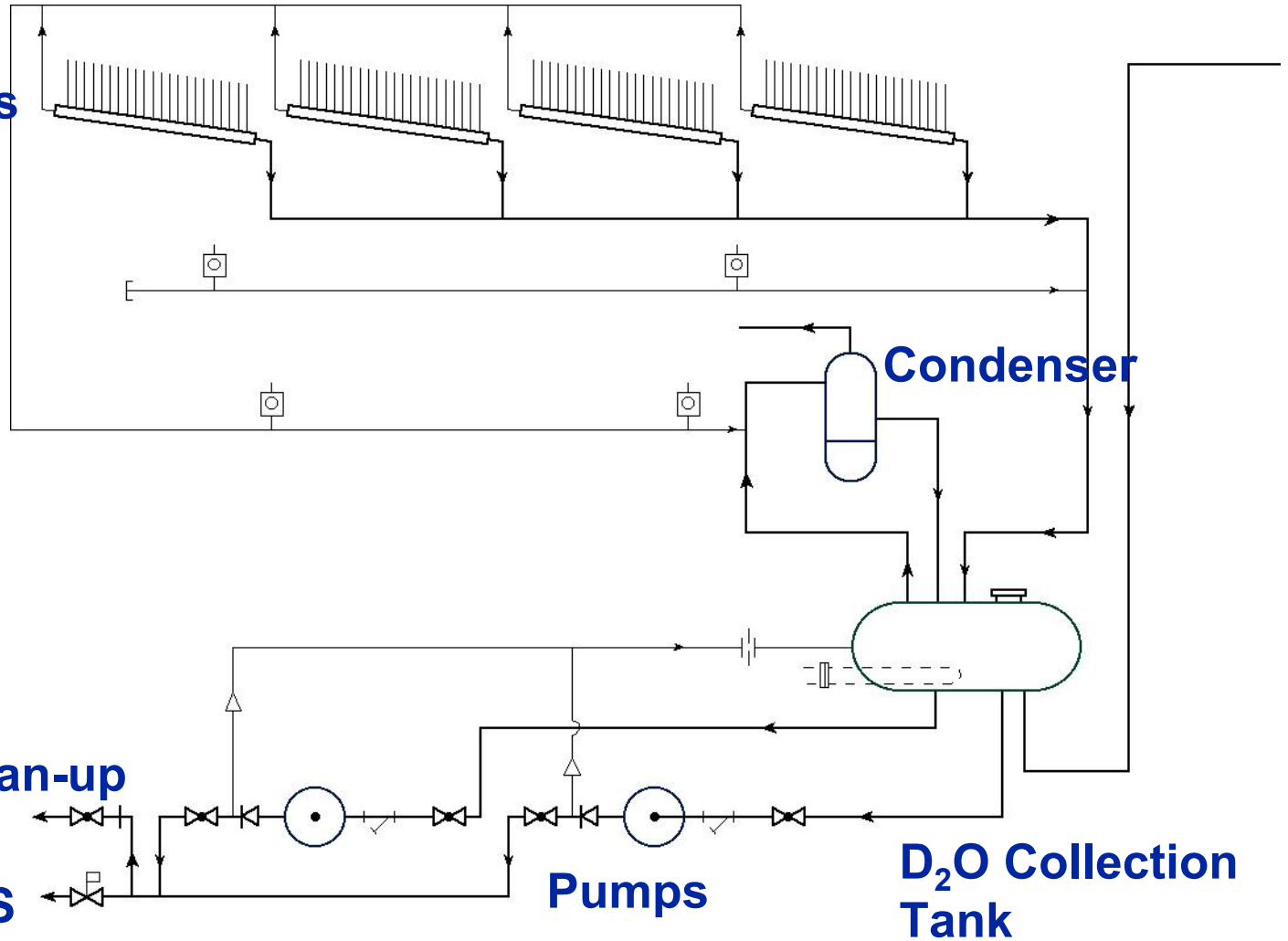


Gland Seals

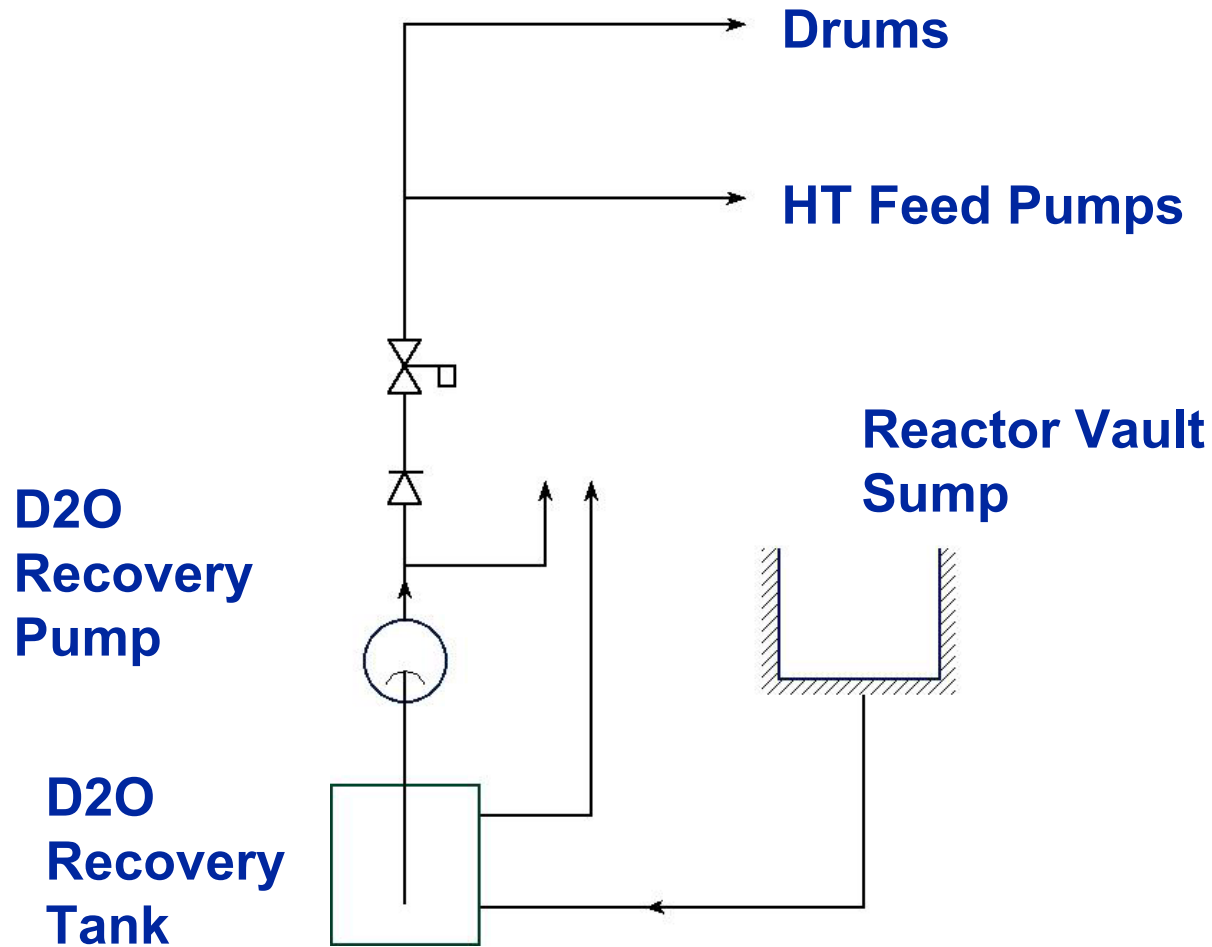


HTS Collection

Leakage
Indicators

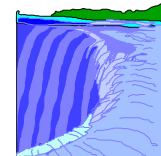


HTS Recovery



All heavy water ain't the same

	<u>Moderator</u>	<u>HTS</u>
Isotopic	99.8%	97.55% to 99.35%
pH	7	10
Other Impurities	May contain poison	May contain fission products
Tritium	Higher Concentration	
Leak Rate		Higher





Fuelling Machines

- Part of HTS pressure boundary when attached to a channel
- Some machines inject a little water into the channel to prevent flow of contaminants into machine