Extract from Equinor’s best practice WR2672 for filling of nitrogen with or without use of gas booster pump

Purpose

The purpose of this document is to provide guidelines for filling nitrogen using a transportable gas booster pump or directly from the distribution grid/other cylinders, to avoid pressure build-up during for example N2 filling of accumulators, gas cylinders, pulse suppressors, sampling cylinders etc.

The target group is operation and maintenance personnel and other relevant discipline personnel.

User manuals for the equipment shall be complied to in addition to this document.

Requirements to N2 filling with or without gas booster pump

Plan work operation

When executing N2 filling the following shall be handled before the operation starts:

- Check the potential maximum pressure of the source relative to the pressure class of the object to be filled
- Executor of the work operations shall have the following competency:
    - 3653 - Instrument tubing and fittings
    - 3595 - High-pressure fittings
    - 4355 - Hoses assemblies
    - 5251 - Filling of nitrogen with or without the use of booster pump
- During connection and setting, the need for buddy check shall be evaluated
- Evaluate suffocation danger during nitrogen bleed off
- Work permit

Execute N2 filling

Prepare work operation

- Check that the N2 filling equipment is certified and fit for the purpose
- Perform a visual inspection of all equipment, pre-use check
- Perform a pre-use check of hoses and couplings
- Ensure that clean/ dry hoses are used by the inlet and outlet of the filling unit

Perform N2 filling

N2 filling equipment shall, as a minimum, have the following safety features:

- Adjustable supply pressure regulator
- Double supply pressure indicators
- Pressure relief valve (PRV/PSV) for supply pressure (to protect the receiving system)
- Bleed-off valve

In addition, when using a gas booster pump, the following safety features shall be in place:

- PRV/ PSV with a fixed setting to protect the pump
- PRV/ PSV to protect the N2 supply from overpressure by any backflow

Filling without use of gas booster pump

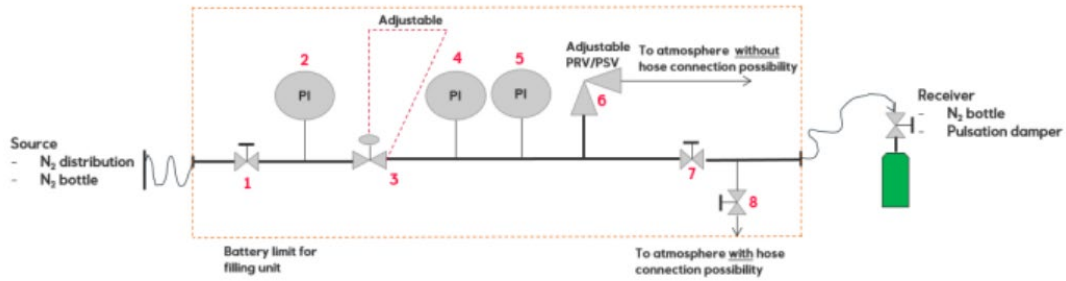

Figure 1 - Pressure reduction skid

Description of components included in the skid:

1. Closing valve inlet
2. Pressure indicator inlet pump
3. Pressure regulator (PCV) for adjusting of supply pressure
4. Pressure indicator for supply pressure
5. Pressure indicator for supply pressure (for redundant reading)
6. Safety valve (PRV/PSV) for protection of equipment to be pressurized
7. Closing valve outlet
8. Valve for pressure release of skid

During filling of N2, comply with the following points:

1. The operation shall be done according to the user manual/ SO documentation
2. Secure any loose pressure containers
3. Cordon off the area
4. Assess a safe position for personnel in connection with the work operation
5. Adjust the set point for PRV/ PSV (6) to approximately 10% over desired end pressure, but not above the design pressure of the equipment that shall be filled
6. Verify that pressure indicators are working

Perform N2 filling using a gas booster pump

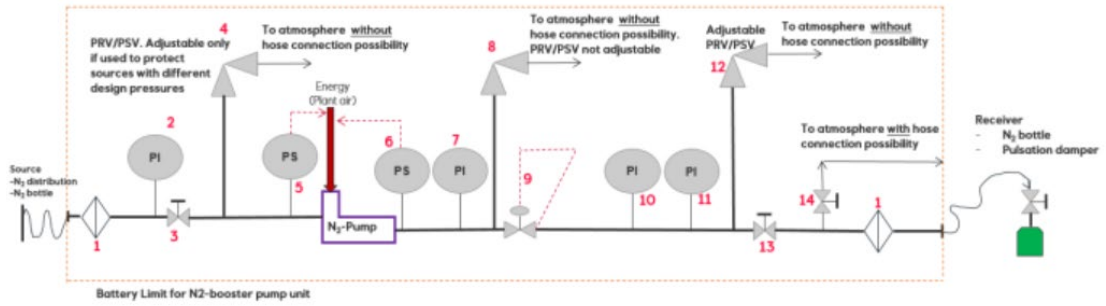

Figure 2 - Gass booster pump skid

Description of components included on the skid:

1. Gas filters
2. Pressure indicator inlet pump
3. Closing valve inlet
4. Safety valve (PRV/PSV) to protect the upstream equipment to overpressure from backflow
5. Pneumatic pressure switch for minimum inlet pressure. Stops the pump by shutting down air supply if pressure falls below minimum
6. Pneumatic pressure switch for maximum outlet pressure from pump. Stops the pump by shutting down air supply if supply pressure exceeds maximum pressure
7. Pressure indicator outlet pump
8. Safety valve (PRV/PSV) for protection of pump ski
9. Pressure regulator (PCV) for adjusting of supply pressure
10. Pressure indicator for supply pressure
11. Pressure indicator for supply pressure (for redundant reading)
12. Safety valve (PRV/PSV) for protection of equipment to be pressurized
13. Closing valve outlet
14. Valve for pressure release of skid

During filling of N2 using a gas booster pump, comply with the following points:

- The operation shall be done according to the user manual/SO documentation
- In zone classified area, the gas booster pump shall be grounded
- Secure any loose pressure containers
- Cordon off the area
- Assess a safe position for personnel in connection with the work operation
- When using an adjustable PRV/PSV (4) on the pump inlet, this shall be adjusted according to the design pressure of the source
- Adjust the set point for PRV/PSV (12) to approximately 10% over desired end pressure, but not above the design pressure of the equipment that shall be filled
- Verify that pressure indicators are working

Additional information

Definitions and abbreviations:

PI – Pressure indicator
PS – Pressure switch
HP – High pressure
LP – Low pressure
PSV – Pressure safety valve
PRV – Pressure Relief Valve
PCV – Pressure control valve
SO – System and operation
N2 – Nitrogen gas
Supply pressure – N2 pressure on outlet of filling unit
End pressure – Supply pressure by finished N2 filling