

Protection and safety: Inerting in chemical processes

Inerting methods:

Inerting is used to reduce the risk of explosions and to prevent dust explosions as well as undesirable reactions. Mainly nitrogen, but also carbon dioxide or argon, are used as inert gases.

Three different methods can be used:

- **Displacement purging:** The inert gas displaces the gas in the chamber being purged. Ideally, only a volume of inert gas equivalent to the single volume of the chamber is required.
- **Dilution purging:** The inert gas mixes with the gas being displaced. The inert gas requirement can be several times the chamber volume, depending on the required final concentration.
- **Pressure swing purging:** The chamber is first pressurized with inert gas. Then the pressure is released again. This procedure is repeated several times.

Inert gas sluices:

Inert gas sluices prevent the entry of oxygen, particularly when vessels are opened and filled. For that the filling hole is purged with inert gas by means of nozzles specially developed by Linde for this purpose. The sluices can be permanently installed or can be fitted only as required. Inert gas sluices are mainly used in batch processes characterized by cyclic filling and emptying of reaction vessels.

Possible designs of inert gas sluices:

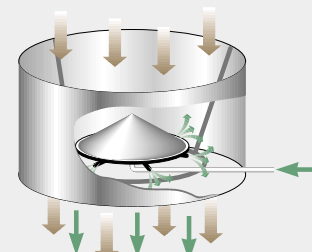
Sluice with concentric nozzle

- For smaller filling hole cross sections (up to 600 mm Ø)
- Filling from big-bags etc.
- Purging by means of a concentric ring in the sluice jacket
- Simple installation, e.g. in existing manholes



Sluice with conical nozzle

- For larger filling hole cross sections (600 mm Ø or larger)
- Filling from barrels etc.
- Inert gas feed through a double cone in the filling hole
- Fitted to the vessel cover



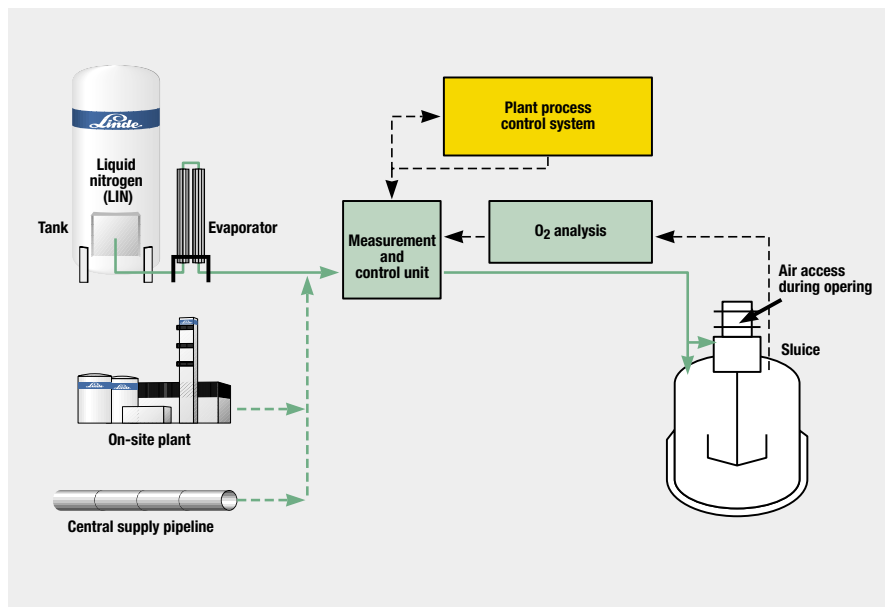
Effects / benefits:

- Solution specially tailored to the application
- Minimum entry of oxygen into the vessel during opening and filling
- Only a small amount of nitrogen is required
- Can be easily fitted on existing vessels
- Simple handling in everyday use

Inert gas supply:

If nitrogen is used as inert gas, it can be supplied by liquid tank, on-site plant or via pipeline. Liquid supply is advantageous if the nitrogen requirement fluctuates considerably and is not too high. In case of high continuous consumption an on-site system can be more favourable, with a membrane system being used for low purity requirements and a pressure swing adsorption system being used for more stringent requirements. Carbon dioxide or argon is normally provided by liquid supply.

Basic diagram for supplying a vessel with an inert gas sluice:



Process requirements:

- Incorporation of the specially designed sluice system
- Incorporation of the oxygen analysis and nitrogen supply control into the process control and safety system
- Inert gas supply

Range of services:

- Carrying out tests
- Carrying out safety and economy studies
- Working out a tailored problem solution and selection of the most economical nitrogen supply
- Supply of the inert gas sluice and the required measurement and control system
- Installation and commissioning
- Inert gas supply

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