Process Technology
Breweries

KRONES CO_2 Plants

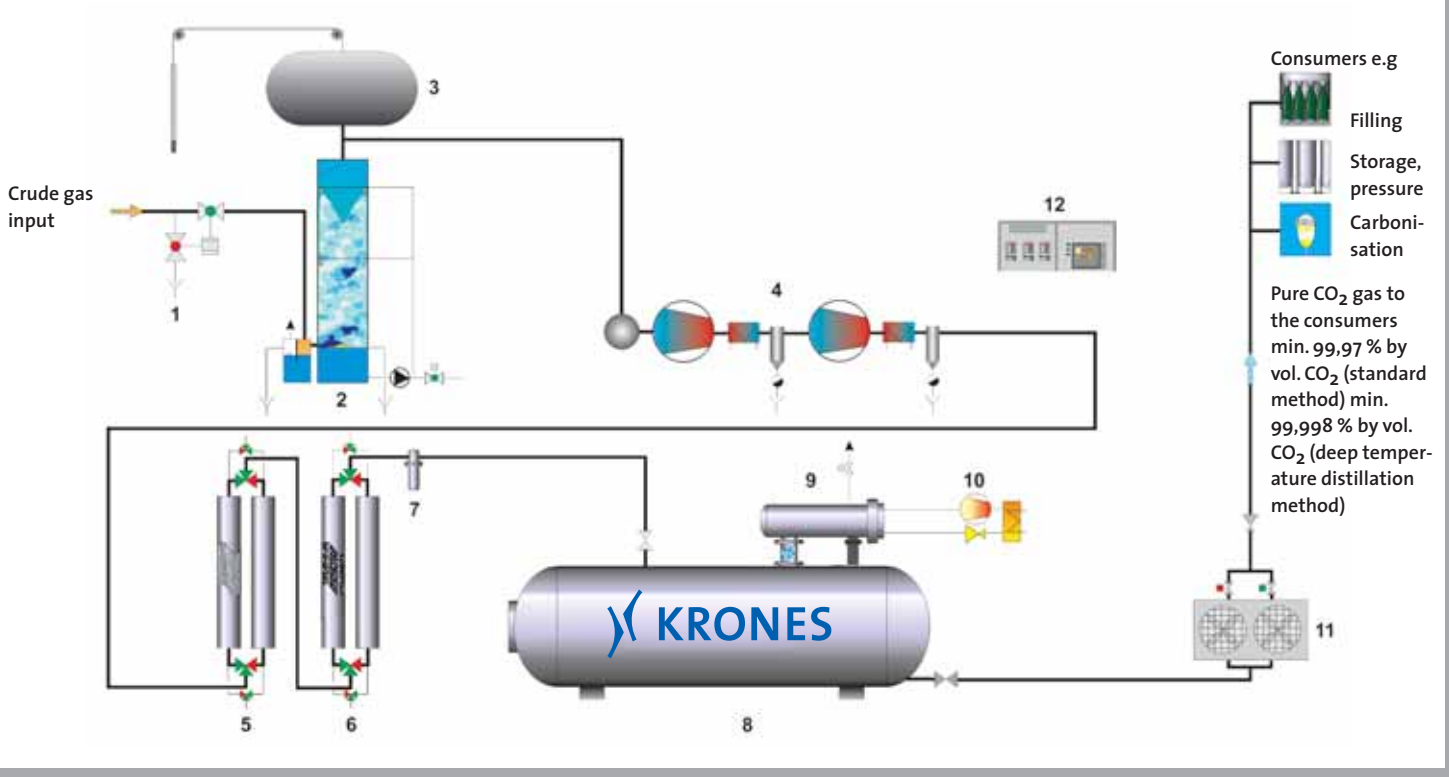
KRONES

Purely of Own Production

The CO_2 technology is used in many lines of industry: high demands are made on the quality and the purity of CO_2 when producing CO_2 from flue gas or combustion processes, when recovering CO_2 from fermentation processes and in CO_2 tank and utility plants.

In terms of optimal utilisation of the resource CO_2, e.g. in a brewery, it stands to reason to purify the CO_2 formed during fermentation in a recovery plant and use it as inert gas in the following process steps. Besides being efficient, this concept also enables you to control the quality of the CO_2 you use at all times.

KRONES' comprehensive process know-how in beverage production secures minimized operational costs and the fully automatic operation of the plant for you. The result is that there is absolutely no need to purchase any CO_2. Moreover, you also contribute to environmental protection.



1 Foam monitoring
2 Gas scrubbing with circulation pump and low contamination spray nozzle system
3 CO_2 balloon
4 Two-stage CO_2 piston compressor – oil-free
5 Activated carbon double tower purifier
6 SilicaGel double tower dryer
7 Dust filter
8 CO_2 liquid gas storage tank
9 CO_2 liquefier
10 Refrigeration plant for CO2 liquefaction
11 CO_2 evaporator
12 Fully automated PLC plant control

The KRONES Solution for CO_2 Systems Engineering:

- The plants are dimensioned in compliance with individual customer requirements such as crude gas quality, fermentation method and consumption specifications.
- The energy coupling with existing cooling and heating media provides a continuous concept for the utilities in the production plant.
- The PLC enables fully automated operation and also the production-related CO_2 processing.
- Standard modules are used for every process step. They are compiled to customised overall plants – also in preassembled execution.
- Additional efficiency in CO_2 production may be achieved by integrating dry ice plants in processing.

Focussing on Purity Step by Step

Purification and Compaction

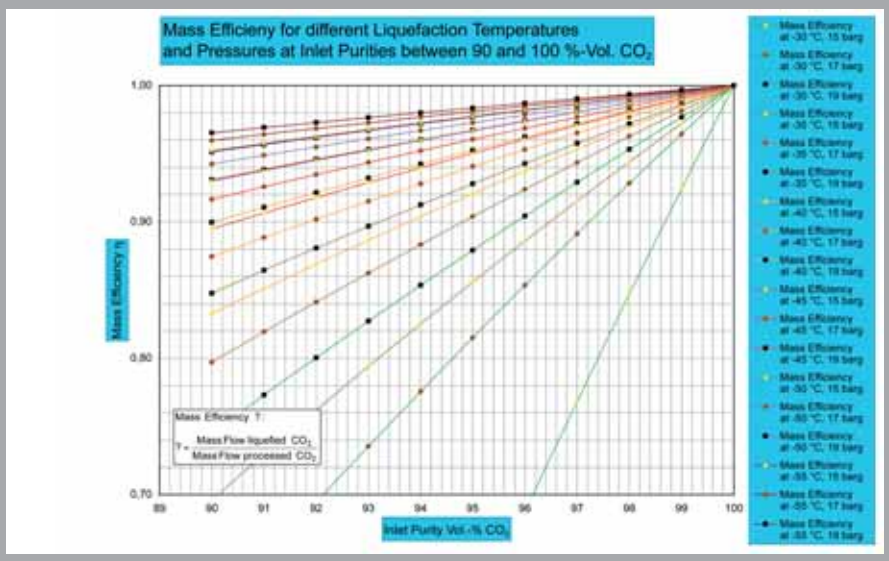
The CO_2 coming from the fermenting tanks is led over the gas scrubber. The highly efficient scrubber removes water-soluble matters such as ethyl alcohol by means of spray nozzles and a circulation system. If required, a tower packing increases the contact time and the contact surface of the gas with the scrubbing medium. The connected CO_2 balloon is a compensation tank for capacity differences between accruing gas and gas taken out by the CO_2 compressors.

Supported by continuous content measuring and a dynamically controlling software, the capacity of the balloon is optimally utilized and a reduced start/stop load of the CO_2 compressors is obtained. The gas is then compressed in the two-stage piston compressor, operated without oil, to a pressure of 16 to 19 bar. In particular cases, a cold medium as e.g. glycol is impinged on the gas cooling of the CO_2 compressor aggregate to remove most of the contaminating water from the CO_2.

Activated Carbon Purification and Drying

Subsequently, the remaining odour and flavour compounds such as hydrosulphides, higher alcohols and ester are removed from the gas flow in the activated carbon double tower purifier.

Then the CO_2 is fully dehumified by a SilicaGel double tower dryer so that the dew point of the gas leaving the dryer is clearly below the liquefaction temperature of the CO_2. Separating the two aggregates enables independent loading and regeneration.



CO_2 Liquefaction and Storage

CO_2 is stored in a deep cold liquid state of aggregation. The temperatures from –26°C to –35°C necessary for liquefaction are produced directly in the associated refrigeration plant. The optimal coordination between CO_2 plant and refrigeration plant – i.e. liquefaction pressure and liquefaction temperature – and the current crude gas purity effects a high mass efficiency ratio. That way, CO_2 with a low input purity can be processed, too.

Supplements to the CO_2 Plants:

- Depending on the kind of impurity in the CO_2, a chemisorptively acting carbon is used in activated carbon scrubbing.
- Substance combinations which cannot be removed by activated carbon can be removed by chemical scrubbing or special non-regenerative activated carbons.
- Supplementary, the deep temperature distillation system may be integrated in the process for the removal of oxygen and nitrogen portions in the CO_2 up to a residual oxygen rate of 5 ppm/vol.
- If the gas is strongly contaminated by aerosol, a special aerosol trap is provided as additional purification stage behind the gas scrubber. It protects the following plant components from the negative effects of the aerosols such as deposits in the CO_2 compressors, corrosion at tanks, pipelines and so on.

Components for Success:

- Standard components of the KRONES CO_2 technology (also available as retrofit modules to supplement the process, suitable for every plant)
  - foam monitoring and removal
  - gas drying and scrubbing
  - gas pre-scrubbing and chemical scrubbing
  - refrigeration plant for CO_2 liquefaction
- Optional process supplements:
  - aerosol trap
  - deep temperature distillation systems

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