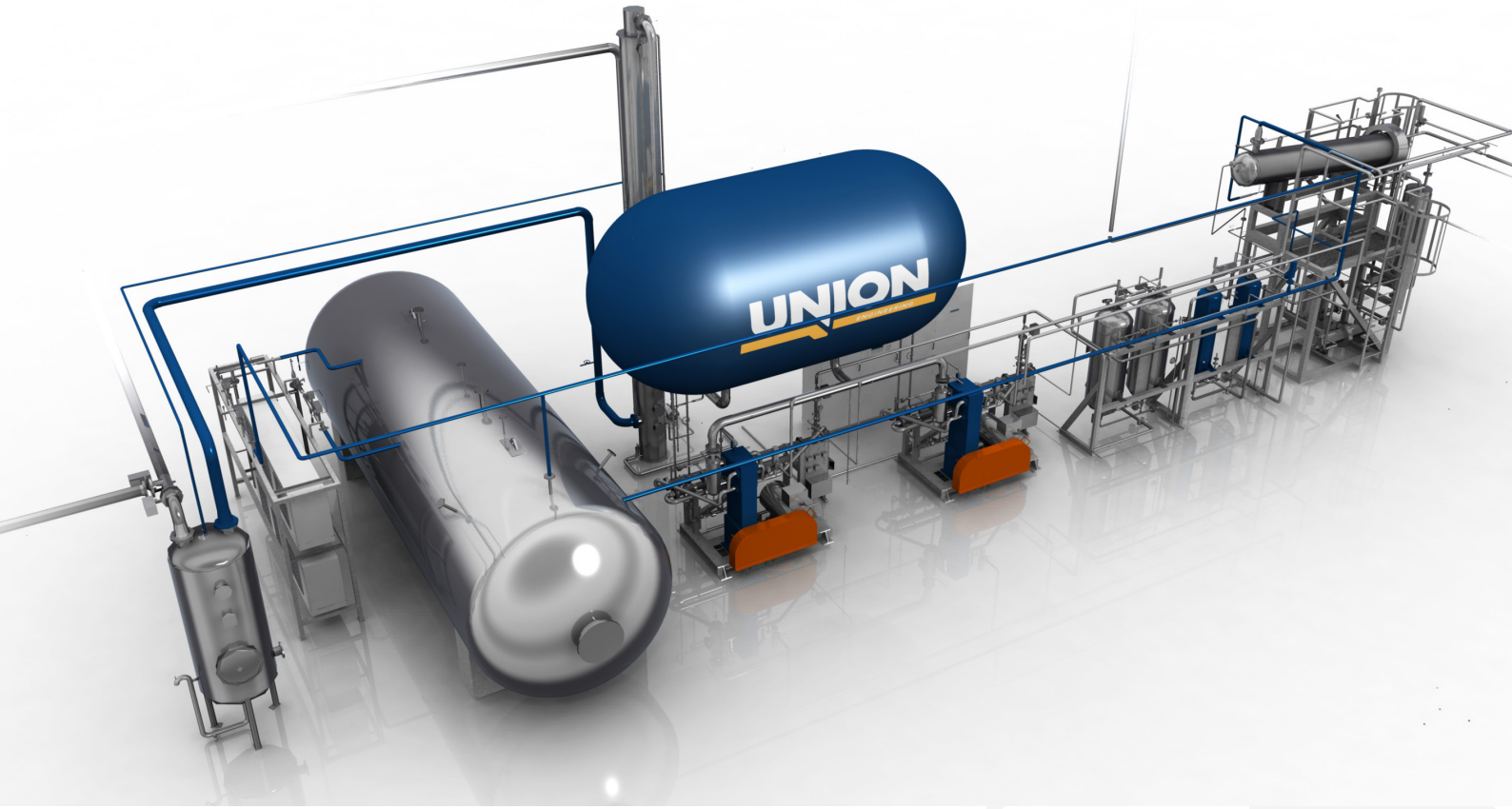
PENTAIR UNION ENGINEERING

# $CO_2$ RECOVERY PLANTS FOR BREWERIES




## $CO_2$ RECOVERY PLANTS

Recovery Plants (RBU) are specially designed to recover $CO_2$ from the fermentation processes at breweries. Through appropriate scrubbing, filtration and separation technology the recovered $CO_2$ is purified to comply with the highest quality requirements in the market.

Using state of the art structured packing material in the water scrubber reduces the water consumption to 0.25 kg water/ kg $CO_2$ which equals up to 75% reduction compared with traditional plants.

The PUR-D technology is the final purification step, consisting of a distillation column which enables separation/blow-off of noncondensable gasses, thereby reducing $O_2$ content in the final product < 5 ppm (v/v) and obtaining corresponding $CO_2$ purity of min. 99.998% (v/v).

The electrical system for the $CO_2$ recovery plant consists of a local control panel and a LV (low voltage) MCC panel.
From the control panel, which comprises the latest PLC technology, the plant is operated and monitored on a touch colour TFT display, ensuring easy and continuous trouble-free operation.

The plant is started by an automatic start sequence and the operation is fully automatic.

The entire process is easily surveyed on the operator panel, showing the status of all drives, readings of all transmitters and alarm warnings, which will also be indicated by audible alarm.

All instruments installed on the skids are wired to junction or remote I/O boxes prior to shipment, thus reducing installation and commissioning time on site.

The plants are designed for high efficiency, availability and reliability through components selected for long life and 24/7 operation.

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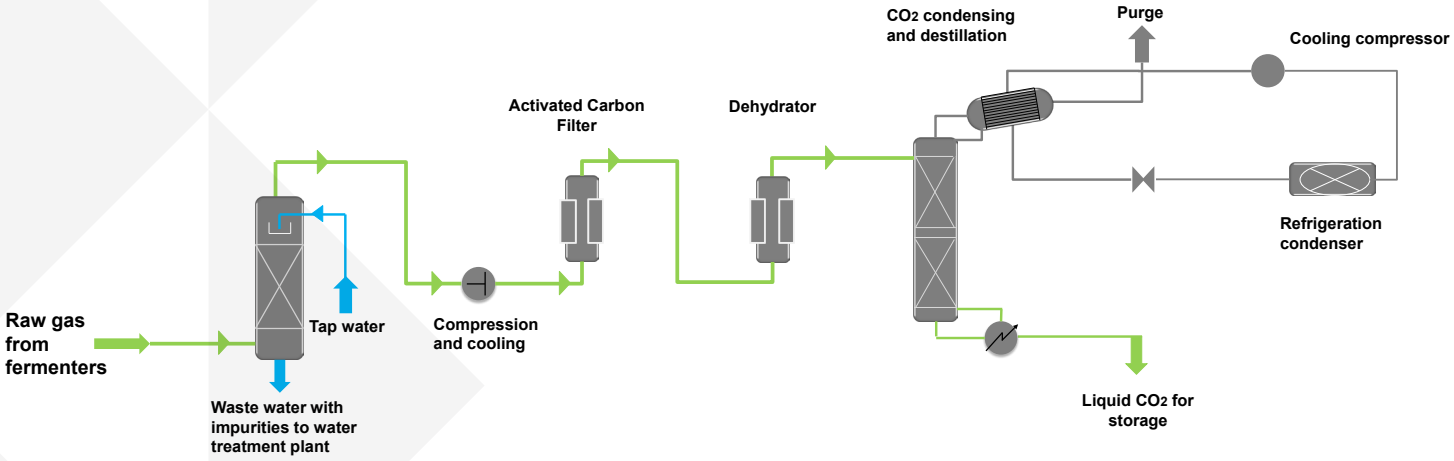
## RECOVERY PLANT PROCESS FLOW DIAGRAM




## GENERAL DESCRIPTION OF $CO_2$ RECOVERY PLANTS

After passing the foam trap the raw gas is washed in a water scrubber in order to remove any alcohols and sugar aerosols.

The gas is then compressed in two stages to approx. 15-18 bar(g) by the $CO_2$ compressor.

Hereafter the $CO_2$ gas passes through an activated carbon filter which absorbs any remaining alcohols, odors and aromatic hydro carbons from the $CO_2$ gas. Regeneration is done automatically by either steam or electrically heated air, subsequent venting and pressurization is done with dry purge gas from the $CO_2$ condenser.

Prior to liquefaction, the gas is dried to a dew point of approx. -60°C (10 ppm v/v $H_2O$) in the dehydrator. Regeneration is done automatically by electrical heating and use of dry purge gas from the $CO_2$ condenser.

Traces of acetaldehyde are also removed in the dehydrator.

To remove the last non-condensable gases, the $CO_2$ gas first passes a distillation process in the purification column (type PUR-D). It is then condensed at a temperature of approx. -27°/-23°C in a $CO_2$ condenser, where the non-condensed gases are purged off. Finally, the liquefied $CO_2$ is led to an insulated storage tank.

A refrigeration unit, controlled by the $CO_2$ pressure in the $CO_2$ condenser, supplies the required refrigeration capacity. The liquid $CO_2$ is stored under a pressure of approx. 15-18 bar(g) and a corresponding temperature of approx. -27°/-23°C.

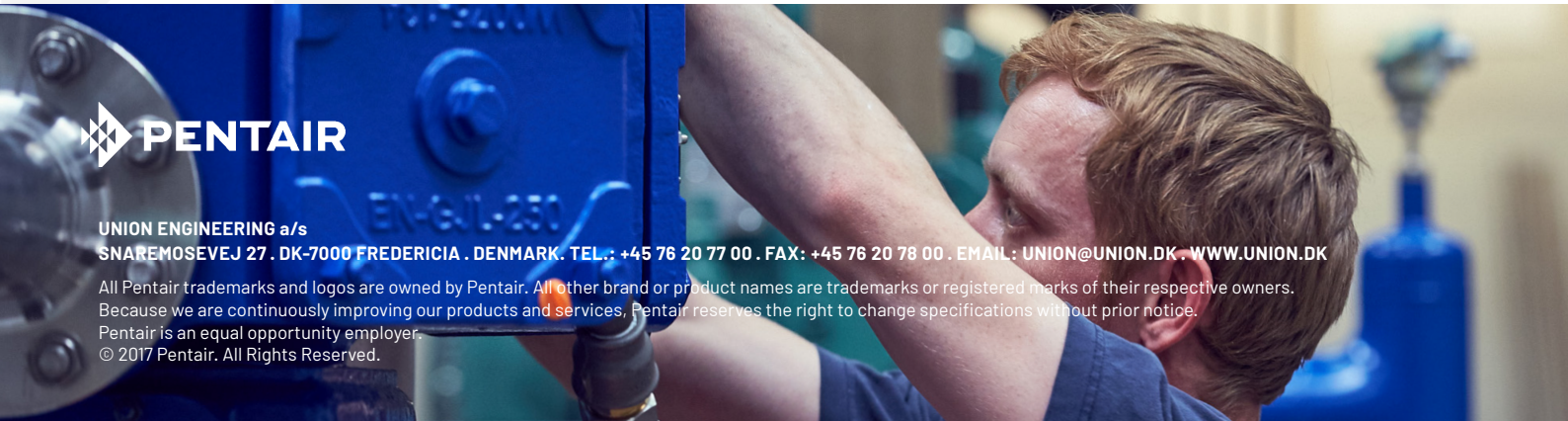
During a non $CO_2$ production period, the refrigeration unit is able to operate independently of the rest of the $CO_2$ plant in order to maintain the correct $CO_2$ storage tank temperature/pressure.

The $CO_2$ produced has a minimum purity of 99.998% (v/v) and an oxygen content < 5 ppm (v/v) which fulfills the quality standards for breweries worldwide.

**$CO_2$ Recovery Plant standard sizes (measured as liquid food-grade $CO_2$ produced):**

| |
|---|
| 145 kg/hr |
| 285 kg/hr |
| 500 kg/hr |
| 1000 kg/hr |
| 1500 kg/hr |
| 2000 kg/hr |

- other sizes available on request.



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