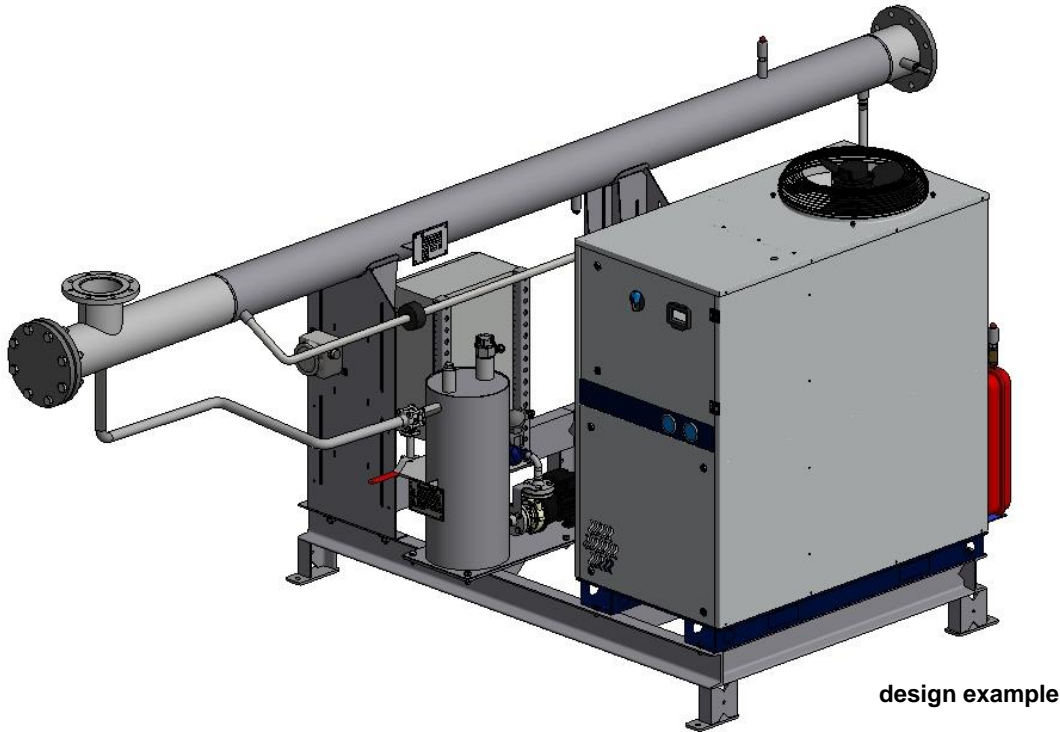


APROVIS Gas Dehumidifier FriCon-100/228-68-5-1-IB



Customer: ONE LNG

Project: PR Bakken Demo Unit

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1. Description of equipment – FriCon

The equipment dehumidifies and dries gases for subsequent use in combined heat and power plants (CHP plants) or biogas upgrading plants.

The benefits of gas drying are:

- reduced plant downtimes and increased operating safety
- optimised combustion process of the CHP
- optimal conditioning of the process gas for further cleaning steps (e.g. activated carbon filtration).

Dehumidification of the process gas is performed according to the condensation drying principle. Gas cooling takes place in a water-cooled shell-and-tube heat exchanger. By cooling the gas flow, water condenses and can be removed from the gas.

Accumulated condensate can be discharged by using a condensate collection vessel with level control and condensate pump.

In addition to gas line and power connection there is generally no additional peripheral equipment or supply required

Long service life is ensured as all parts in contact with the gas are made of stainless steel AISI 316 Ti or equivalent.

An air-cooled liquid chiller with integrated hydraulic module provides the necessary cooling water. The equipment control comprises a microprocessor to regulate the cold-water temperature and to monitor the operating data. By using a buffer storage tank the activation frequency of the chiller in part-load operation is reduced and like this the lifetime of the device is extended.

Following the cooling, the gas could be directed through a demister unit (optional). Through the knitted wire fabric, up to 99% of the dragged-along condensate droplets could be separated and removed from the gas flow.

2. Technical data – FriCon

General data

gas flow		251	kg/hr
		228	Nm ³ /hr
process gas		62.2	% CH ₄
		19.4	% C ₂ H ₆
inlet temperature		68	°C
outlet temperature *		5	°C
max. operating temperature		90	°C
relative humidity (inlet)	(saturated @ 35°C)	19.7	%
relative humidity (outlet)		100	%
pressure loss (without demister)		10	mbar
operating pressure		7	barg
min. operating pressure		-0.2	barg
max. operating pressure		16	barg
required refrigeration power		9.5	kW
accumulated condensate		~1.1	kg/hr

Air Cooled Liquid Chiller

installed refrigeration power		12.7	kW
at ambient temperature		35	°C
cold water inlet temperature		6	°C
cold water outlet temperature		2	°C
water-glycol with		34	Vol-%
refrigerant		R-410A	
rated power consumption (incl. pump and ventilator) **		6.62	kW
max. power current		12.9	A
voltage supply		460 / 3 / 60	V / Ph / Hz
buffer storage tank		115	ltr.
sound pressure level @ 10 m open field (+/- 2 dB(A))		56	dB(A)

* Lower gas outlet temperatures are possible in running operation by lowering the cooling water temperatures.

** At temperature below the above mentioned ambient temperature the average power consumption drops considerably.

Installation and connection

place of installation	outside installation; no ex zone		
max. installation altitude		<500	m a.s.l.
min. ambient temperature		- 20	°C
max. ambient temperature		42	°C
max. operating temperature gas side		70	°C
gas piping	Inlet:	4/150	inch
	Outlet:	4/150	inch
condensate drain		R2"	
condensate drain with condensate collection vessel		G½"	

Dimensions of equipment (overall)

length	approx.	3300	mm
width	approx.	1660	mm
height	approx.	1630	mm
transport weight	approx.	1800	kg
operating weight	approx.	2100	kg

3. Scope of supply – FriCon

Pos. 1.1 GAS COOLER



Designed as one-way shell-and-tube heat exchanger;
Process gas inside of the tubes; cooling water in the shell

- All parts in contact with the process gas made of stainless steel 316Ti or 316L; heat exchanger shell made of stainless steel
- Designed with gas outlet chamber outlet connection radial; inspection opening axial
- Official acceptance according to **ASME Sec. VIII Div.1, Edition 2021 with U-stamp**; data report/NO lethal service

Pos. 1.2 AIR-COOLED LIQUID CHILLER (CERTIFIED ACC. TO UL NORM)



Air-cooled chiller for outdoor installation; **mounted outside of explosive zone**

- Fully hermetic rotary- or scroll-type compressor
- Liquefier register made of copper tubes with continuous surface-corrugated aluminium fins
- Blower blades in low-noise design
- PID microprocessor control with temperature control and equipment protection function
- Cold water circuit with pump, buffer storage tank and safety valve
- Including high- and low-pressure manometers for on-site verification of the coolant pressure
- **Higher corrosion resistance by coating the capacitors and copper piping**

Pos. 1.3 BASE FRAME FOR GAS DEHUMIDIFIER



For design as compact unit, ready for connection

- Hot dip galvanized steel beam base frame
- Including piping between gas cooler and liquid chiller

Pos. 1.4 INSULATION OF COMPONENTS CARRYING THE COLD BRINE



Insulation with galvanized sheet-metal jacket, resistant to steam diffusion

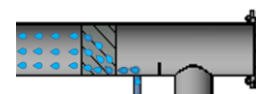
- Suitable for outdoor installation
- Removable insulation at openings

Pos. 1.5 DEMISTER DN100



Up to 99 % removal of condensate drops

- Completely made of stainless steel alloy 904L
- Additional pressure drop approx. 3 mbar



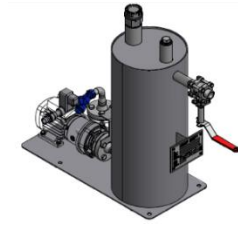
design example

Pos. 1.6 CONDENSATE COLLECTION VESSEL


For discharging of accumulated, 100 % conductive condensate,

Max. operating pressure 16 barg

ASME Sec. VIII Div.1, Edition 2021 with U-stamp



design example



- Vessel of stainless steel 316Ti or 316L
 - Radar electrode for high, high-high, low, low-low water levels
- Strainer, solenoid valve and non-return valve
- Control box incl. wiring **certified acc. to UL Norm; mounted outside of explosive zone**
Electrical connection 460V/3ph/ 60Hz
- Indicator lamps for low / high water alarm



If trace heating and insulation are included in the scope of supply, the condensate collection vessel will be insulated by APROVIS

Pos. 1.7 TRACE HEATING (CERTIFIED ACC. TO UL NORM)


Prevents condensate from freezing e.g. in condensate collection vessel

- Thermostat control
- Connection: 277 VAC, 1Ph +N+PE 50Hz



Electrical connection and fuse with FI/LS combination 10A/30mA if there is no APROVIS control box

4. To be done by customer – FriCon

- Planning and building permission
- Transport
- Baseplate
- Gas piping, condensate piping, wiring and power supply
- Installation of lightning arresters and potential equalisation
- Supply of the cold brine, if it is not included in the scope of supply (Antifrogen N; other substances only after approval by APROVIS Energy Systems GmbH; engine glycol is not applicative)
- Anti-freeze protection, if it is not included in the scope of supply or not necessary due to installation location
- Avoid direct sun radiation, especially in the noon and afternoon time
- Insulation of equipment carrying the cold brine, if it is not included in the scope of supply. Insulation suitable for refrigeration systems
- Assembly and acceptance test by a qualified person