TECHNICAL FEATURES of WATER CONDENSATE SEPARATOR

Correction factors for system selection depending on the Biogas Inlet Temperature variation:

T IN Biogas (°C)	C.F. T IN
70	0.87
65	1
60	1.17
55	1.40
50	1.62
45	1.98

Correction factors for system selection depending on the Biogas Outlet Temperature variation:

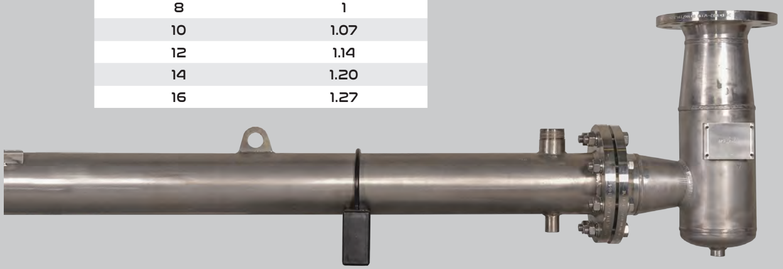
T OUT Biogas (°C)	C.F. T OUT
5	0.84
10	1
15	1.63
20	2.83

Correction factors for system selection depending on the Biogas Inlet Pressure variation:

P IN Biogas (BARG)	C.F. Pressure
0.05	0.06
0.1	0.13
0.2	0.18
0.3	0.21
0.5	0.27
1	0.37
2	0.53
4	0.74
5	0.81
7	0.98
8	1
10	1.07
12	1.14
14	1.20
16	1.27

Correction factors when selecting ONLY the chiller option based on the variation of the reference Ambient Air Temperature :

Ambient Air T (°C)	C.F. Ambient
5	0.8
10	0.84
15	0.89
20	0.95
25	1
30	1.05
35	1.1
40	1.14
45	1.2

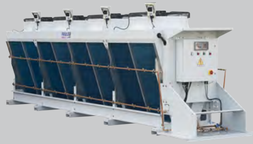


SOME OTHER UNITS AVAILABLE FROM OUR PREMIUM LINE

QBE

LIQUID CHILLERS
FROM 2 TO 25 KW

DRYCOOLERS



LIQUID COOLERS
FROM 300 TO 1200 KW

CWE/HWE

LIQUID CHILLERS/HEAT PUMPS
FROM 13 TO 140 KW

CWB/CWB FC

LIQUID CHILLERS
FROM 80 TO 570 KW

Архангельск (8182)63-90-72
Астана (7172)727-132
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8699)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

Киргизия (996)312-96-26-47
Россия (495)268-04-70
Казахстан (772)734-952-31

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FRIULAIR®
Chillers

BIOCOOL

BIOGAS SYSTEMS

FROM 5 TO 58.5 KW

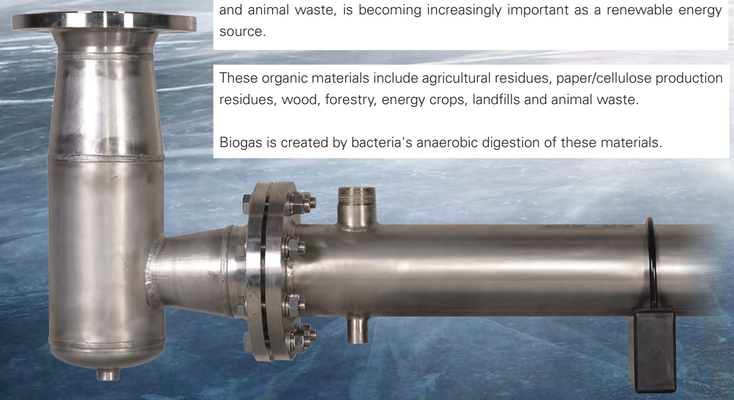
BIOCOOL

INTRODUCTION

Biogas, which is mainly produced from organic biomasses contained in plants and animal waste, is becoming increasingly important as a renewable energy source.

These organic materials include agricultural residues, paper/cellulose production residues, wood, forestry, energy crops, landfills and animal waste.

Biogas is created by bacteria's anaerobic digestion of these materials.

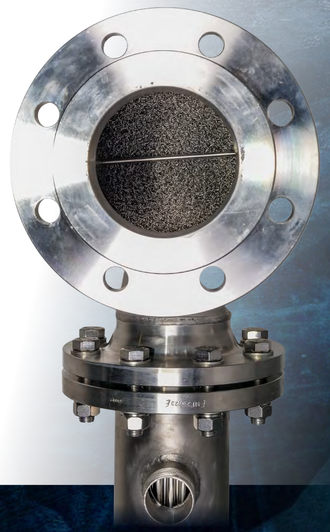


The elements that makeup biogas are methane (CH4), which determines its energy content, carbon dioxide (CO2), small quantities of hydrogen sulphide (H2S) and ammonia (NH3).

The production of Biogas for the world's energy needs, increasingly focuses on renewable sources and replaces common fossil fuels such as coal, oil and natural gas.

Before Biogas is fed into the grid, e.g. for electricity, heat or biomethane production, it must undergo filtration, to remove its high-water vapour content and screen out other impurities.

Friulair Srl, with its decades of experience in the treatment, cooling and dehumidification, separation and filtration of pressurised fluids, approaches this market with a dedicated range of process chillers and tube bundle heat exchangers and condensate separators. These can be equipped with particle filters and assembled on compact skids.



BIOGAS SYSTEM CHILLERS

These are process cooling units derived from our QBE and CWE ranges, developed for outdoor installation and for working in particularly aggressive environments.

With the wide choice of models (nine in total) and configurations, we can meet the following requirements:

- Biogas flow rates from 120 m³/h to 1,800 m³/h
- Maximum operating pressures of Biogas up to 16 BARG
- Chiller cooling capacity from 5 kW to 58.5 kW at nominal operating conditions

In addition to the full ranges of options that we offer with QBE and CWE chiller products we list the main features of our Biogas treatment system below:

- High energy and cooling efficiency and reduced electricity consumption
- Inspectable tube bundle heat exchangers made entirely from (AISI316L) stainless steel on the tubing and outer casing to ensure maximum durability. Compact and suitable for wall or skid installation
- Maximum cooling efficiency
- Low load loss on the Biogas and Water side
- High-efficiency demister condensate separators, to separate the condensation generated by the decrease in Biogas temperature in the tube bundle heat exchanger. Complete internal and external AISI 316L stainless steel
- Maximum precision on the water outlet temperature control and the Biogas, thanks to electronic precision valves on the refrigerant gas (VBE or VBM option)
- Anti-corrosion treatment (E-Coating option) on condensing chiller batteries for aggressive environments
- Continuous fan speed control (CA and CE option)
- Particle filters (optional)
- If you want to improve your plant's energy efficiency further, or if the Biogas exceeds inlet temperatures of 65°C, the Biogas/Air pre-coolers are available as an accessory in our catalogue as part of our DryCooler range

NOMINAL WORKING CONDITIONS:

- Clean exchanger and separator
- Biogas consists of a 60% CH4 and 40% CO2 mixture
- Inlet pressure on the Biogas side = 8 BARG
- Biogas inlet temperature = 65 °C (100% UHR)
- Biogas outlet temperature = 10 °C (100% UHR)
- water inlet temperature to the exchanger = 5 °C
- water outlet temperature from the exchanger = 7 °C
- Max pressure drop on the Biogas side = 200 mBAR

TECHNICAL FEATURES of COOLER HEAT-EXCHANGER (Shell&Tube model):

	BIOGAS Flow	MAX WORKING PRESSURE (BIOGAS SIDE)	WATER FLOW	CONNECTIONS		DIMENSIONS	
Model	Nm3/h	BARG	m3/h	Biogas	Water	External diameter (mm)	length (mm)
BIOCOOL 120	120	16	1.68	DN065	DN040	114.3	1800 (*)
BIOCOOL 180	180	16	2.48	DN065	DN040	114.3	1800 (*)
BIOCOOL 240	240	16	3.31	DN100	DN040	114.3	2200
BIOCOOL 300	294.6	16	4.11	DN100	DN040	114.3	2200
BIOCOOL 500	500	16	6.97	DN125	DN050	139.7	2500
BIOCOOL 700	700	16	9.64	DN125	DN050	139.7	2500
BIOCOOL 900	900	16	12.59	DN200	DN065	193.7	2500
BIOCOOL 1200	1200	16	16.55	DN200	DN065	193.7	2500
BIOCOOL 1500	1500	16	20.54	DN200	DN065	193.7	2500
BIOCOOL 1800	1800	16	24.57	DN200	DN080	193.7	2500

- (*) = the overall size of the DN100/DN065 reduction, when applied to the heat exchanger, must be added

NOTE

- AISI316L stainless steel plate exchangers, are available on request.

TECHNICAL FEATURES of WATER CONDENSATE SEPARATOR:

	MATCHING WITH COOLER HEAT-EXCHANGER	BIOGAS OUTLET CONNECTION	DIMENSIONS	
Model			diameter (mm)	height (mm)
SEPCOOL 120	BIOCOOL 120	G 1"	88,9	275
SEPCOOL 180	BIOCOOL 180	G 1"	88,9	275
SEPCOOL 240	BIOCOOL 240	G 1.1/2"	139,7	359
SEPCOOL 300	BIOCOOL 300	G 1.1/2"	139,7	359
SEPCOOL 500	BIOCOOL 500	G 2"	168,3	435
SEPCOOL 700	BIOCOOL 700	G 2.1/2"	219,1	454
SEPOOL 900	BIOCOOL 900	G 2.1/2"	219,1	454
SEPCOOL 1200	BIOCOOL 1200	DN80	273	669
SEPCOOL 1500	BIOCOOL 1500	DN80	273	669
SEPCOOL 1800	BIOCOOL 1800	DN80	273	669

Standard couplings BIOCOOL heat exchanger and Chiller:

Heat-Exchanger Model	Chiller Model	Heat-Exchanger Model	Chiller Model
BIOCOOL 120	QBE007	BIOCOOL 700	CWE036
BIOCOOL 180	QBE009	BIOCOOL 900	CWE046
BIOCOOL 240	QBE012	BIOCOOL 1200	CWE068
BIOCOOL 300	QBE014	BIOCOOL 1500	CWE075
BIOCOOL 500	QBE025	BIOCOOL 1800	CWE085