Hyperchill BioEnergy

Water Chillers for Biogas & Landfill Gas Cooling Applications

Short Description

Bioenergy is renewable energy stored in organic materials such as plant matter and animal waste, known as biomass. The wide variety of biomass fuel sources include agricultural residue, pulp/paper mill residue, urban wood waste, forest residue, energy crops, landfills and animal waste. Anaerobic digestion is the process that occurs when bacteria decompose organic materials in the absence of oxygen to generate biogas.

Biogas is primarily composed of methane and carbon dioxide with smaller amounts of hydrogen sulphide and ammonia. Trace amounts of other gases like hydrogen, nitrogen or carbon monoxide are also present in the biogas. Usually the mixed gas is saturated with water-vapour and may contain dirt particles.
For biogas as a fuel, most of the impurities have to be removed, as they can cause contamination, deposits and damage to equipment. In particular, biogas needs to be dried by cooling it to temperatures close to 5 °C, using water-cooled heat exchangers fed by water chillers. Hyperchill Bioenergy is a key component in this biogas treatment process.

Extremely compact and easy to use, Hyperchill Bioenergy ensures an accurate control of the water temperature. It has been specifically designed for Biogas applications and provides safe and reliable operation in the harshest of environments, typically found in Anaerobic Digesters and landfill Biogas production areas.

Features and Benefits

- Special protective treatment of condensers and copper piping to ensure reliable operation in the most aggressive of ambient atmospheres at biogas plants and landfill sites.
- Pump and tank installed inside the chiller provides a compact and easy to install solution.
- Closed water temperature operation with high working limits and low running costs.
- Large built-in water tank that provides a large thermal mass / storage capacity thus reducing the number of refrigerant compressor stop/starts and short cycling and thereby increasing the compressor and chiller lifetime.
- Designed to provide cooling water where low temperature water is required as standard (Air Conditioning units do not normally need to provide water at less than 10 °C).
- Use of compliant scroll compressors designed specifically for high efficiency and long life in industrial applications.
- Low ambient speed-control on fan-motor ensures constant performances at different temperatures, long lifetime of the fans and a reduction in absorbed power when ambient temperature is low.
- Maximum working ambient temperature up to 48 °C for ICEP models, up to 45 °C for ICE models, prevents downtime even under extremely harsh conditions

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The performance of biogas as a fuel depends on effective cooling and treatment. Saturated biogas contains water and impurities that need to be removed to avoid damage to equipment and to reach more efficient combustion, whilst maintaining the desired dew point

- **Water and refrigerant manometers** permit full control of the working conditions.
- **Microprocessors:** allow complete control of the unit parameters. Proprietary software allows a wide range of programming and remote monitoring options.
- **Compliant scroll compressors:** with less moving parts and compliant-technology, they provide excellent efficiency, high reliability, and very low noise levels.
- **Air cooled with axial fans:** suitable for outdoor installation.
- **Water pump (std 1,5 bar):** available with different head pressures to suit the end-users application. Configurable as a twin-system, for 100% redundancy.
- **Mesh filters:** condenser protection against dirt and contamination, reduces maintenance costs and the risk of downtime.
- **Evaporator:** located inside the water tank from ICE029 - reduces the overall dimension of the unit, increases the efficiency and improves temperature control.
- **Water by-pass:** protects the pump and supplies constant flow to the evaporator, avoiding alarms and freezing.
- **Water tank:** stainless steel up to ICEP024 generously dimensioned to guarantee high reliability and improved temperature-control.
- ICEP020 and ICEP024 designed with fan control in order to work as standard in low ambient temperatures down to -10 °C.
- Maximum ambient temperature 48 °C up to ICEP024, 45 °C from ICE029.

Options

- **Special and multiple-pumps:** higher (P30-3bar) head pressure available to suit different hydraulic circuits. Double stand-by pump for greater reliability.
- **Antifreeze heating:** avoids freezing when the unit is switched off. Can also be used as a heater to warm up the system.
- **Water fill-kits:** pressurized, automatic or ambient manual kits, for water filling in any installation.
- **Remote control kits:** base version for remote ON/OFF and general alarm monitoring. Advanced version for complete remote unit management.
- **Wheels (up to ICEP014 BioEnergy):** for ease of transport.

Product-Specification

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Model		ICEP					ICE											
		007	010	014	020	024	029	039	046	057	076	090	116	150	183	230	310	360
Cooling Capacity[1]	kW	7,8	10,8	14,6	20,3	23,6	28,1	38,2	45,2	56,4	76,0	90,2	115,5	149,2	182,3	228	305,1	359,7
Compr. abs. power[1]	kW	1,7	2,5	3,2	4,4	5,4	5,7	7,7	10,1	12,3	15,4	20,3	24,9	30,8	40,1	51,4	64,2	81,5
Cooling Capacity[2]	kW	4,4	5,6	7,6	11,5	13,5	16,7	21,8	26,1	32,4	43,2	51,7	66,1	85,3	104,2	130,2	180,5	205,7
Compr. abs. power[2]	kW	1,4	1,9	2,7	3,5	4,3	6,0	8,2	10,3	13,2	16,4	20,8	26,4	32,5	41,4	55,1	63,4	83,2
Power supply	V/ph/Hz	400/3/50 no neutral																
Protection class		54																
Refrigerant		R407C																
Compressors																		
Type		scroll					hermetic compliant scroll											
Compressor / circuits		1/1					2/2							4/2				
Max. abs. power-1 compr.	kW	2,4	3,8	4,4	5,7	6,6	7,8	11,1	13,7	16,8	11,1	13,7	16,8	11,1	13,7	16,8	23,3	28,7
Axial fans																		
Quantity	N°	1			2		3							2		3	4	
Max. abs. power-1 fan	kW	0,3	0,3	0,4	0,4	0,4	0,78	0,61	0,61	0,61	0,78	0,78	0,78	2	2	2	2	2
Total air flow	m³/h	3437	3437	4337	6878	6159	9200	12400	12000	17400	25500	25000	26400	47000	46000	66000	88000	88000
PumpP15																		
Type		centrifugal					centrifugal											
Max. abs. power	kW	0,4	0,4	0,4	0,5	0,5	0,75	0,75	0,75	0,75	1,1	1,1	1,1	1,5	1,5	2,2	on request	
Water flow (nom/max)[1)]	m³/h	1,3/4,2	1,8/4,2	2,5/4,2	3,4/7,2	4,1/7,2	4,5/18	6,3/18	7,6/18	9,3/18	12/25	15/825	19/44	25/44	30/44	39/48		
Head pressure (nom/min)[1)]	mH_2O	19/9	15/9	17/9	18/7	17/7	17/10	16/10	16/10	15/10	15/8	15/8	13/6	12/6	10/6	14/8		
Water flow (nom/max)[2)]	m³/h	0,9/4,2	1,2/4,2	1,6/4,2	2,4/7,2	2,8/7,2	3,2/18	4,5/18	5,5/18	6,7/18	9,0/25	11/25	13/44	18/44	22/44	28/48		
Head pressure (nom/min)[2)]	mH_2O	20/9	19/9	17/9	20/7	19/7	17/10	17/10	17/10	16/10	16/8	16/8	13/6	11/6	12/6	20/8		
Dimensions & Weight																		
Depth	mm	756	756	756	756	756	1650	1650	1650	2200	2200	2200	2200	3000	3000	3260	4200	4200
Width	mm	806	806	806	1206	1206	744	744	744	744	898	898	898	1287	1287	1287	1500	1500
Height	mm	1405	1405	1405	1405	1405	1358	1358	1358	1358	1984	1984	1984	2298	2298	2298	2240	2240
Connection in / out	in	3/4"	3/4"	3/4"	1"	1"	1½"	1½"	1½"	1½"	2"	2"	2"	2½"	2½"	2½"	4"	4"
Tank Capacity	l	125	130	140	175	185	180	180	250	300	500	500	500	1000	1000	1000	400	400
Weight (axial)[3)]	kg	n/a	n/a	140	175	185	380	410	430	520	800	900	1000	1500	1800	2100	2900	2900
Noiselevel																		
Noise level[4)]	dB(A)	53	53	50	50	50	53	52	52	56	58	58	58	62	62	64	65	65

[1)] data refers to water inlet/outlet temperature = 20/15 °C, glycol 0 %, ambient temperature 25 °C.
[2)] data refers to water inlet/outlet temperature = 5/1 °C, glycol 10 %, ambient temperature 35 °C.
[3)] weights are inclusive of pallet and refrigerant charge.
[4)] in free field conditions at a distance of 10m from the unit, measured on condenser side, 1m from ground.
All models supplied with R407C and with power supply 400V / 3ph / 50Hz.

Correctionfactors

A) Ambient temp. (air-cooled models) correction factor (f1)	°C	5	10	15	20	25	30	35	40	45
		1,05	1,05	1,05	1,05	1	0,95	0,89	0,83	0,77
B) Water outlet temperature correction factor (f2)	°C	5		10		15		20		25
		0,72		0,86		1		1		1
C) Glycol correction factor (f3)	%	0		10		20		30		40	50
		1		0,99		0,98		0,97		0,96	0,94

To obtain the required cooling capacity multiply the value at nominal conditions by the above correction factors (i.e. cooling capacity = Pxf1xf2xf3xf4, where P is the cooling capacity at conditions (1)). The above correction factors are approximative: for a precise selection always refer to the software selection program.