

TEST REPORT: Nr.56

Date: December 26, 2020

CHILLER EFFICIENCY PERFORMANCE WITH INTELLIGENT ADIABATIC CHILLER BOOSTER SYSTEM SMART COOLING™ PRO10 FOR CARRIER 30GX267 CHILLERS

Participated in the test:

Customer: EMAAR Properties

Contractor: Carrier UTS

Instaler: Gerab Energy Systems LLC

Swiss Integrated Energy Technologies: Luca Gallarate

Project name: The Town Centre

Object address: Town Centre, 1st Road, Meadows, Emirates Hills - Dubai -
United Arab Emirates

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Introduction:

Type of building: The Town Centre, Dubai, United Arab Emirates

Cooling units: air cooled water chiller CARRIER 30GX267

Chiller booster: **Smart Cooling™** PRO 10, adiabatic technology with condenser protection.

1-unit chiller retrofit were made to reduce the energy consumption of chillers and to increase chiller COP efficiency. Chillers were equipped with intelligent adiabatic pre-cooling system **Smart Cooling™** PRO 10. Chiller booster PRO 10, based on pre-cooling of air before entering condensers using water evaporation technology - by spraying and vaporising a very fine water mist before entering the condenser (hot air comes into contact with the fine water mist, the temperature of the incoming air in the condenser is reduced).

Chiller booster components must ensure 100% condenser protection from direct contact with water.

The water must not reach the condenser.



Main components:

The protective membranes: the membranes are installed outside before the condenser covering 100% of the condenser surface, preventing the water mist from coming into direct contact with the condenser. Water filtration, water purification, water sterilisation: the system provides water purification from minerals and water sterilization to avoid the risk of bacterial occurrence.

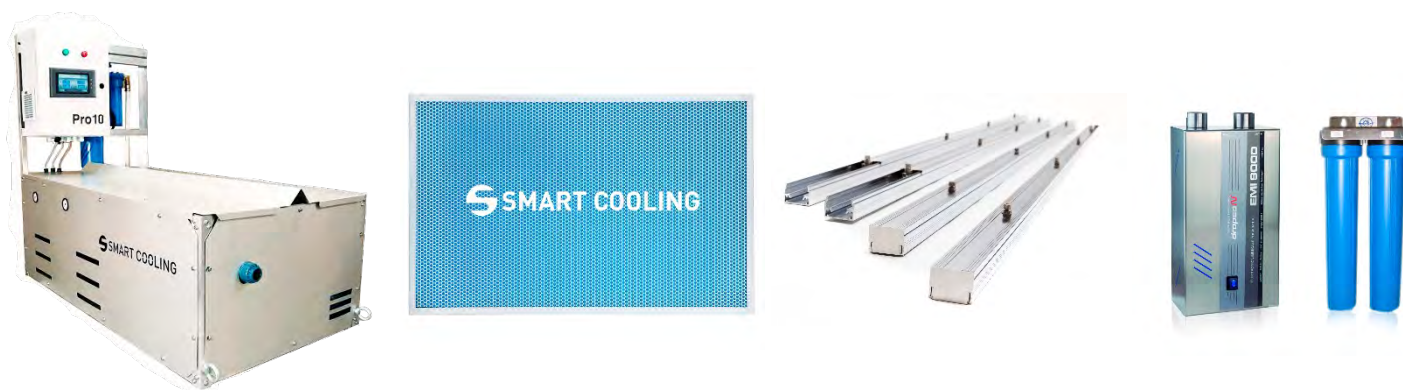
High pressure pump capable of providing water pressure up to 70 bar.

A water recirculation system that drains non-evaporated water into a water purification and pump system.

The control unit, which provides complete system control according to ambient air temperature and humidity, provides the complete operation of the system, analyses the parameters of the chiller, ambient air temperature and humidity, and provides the required amount of water in the adiabatic system according to gathered data.

A high-pressure nozzle panels that provide 5-40-micron droplet water spraying.

A set of fasteners and fixings ensuring the compatibility of the chiller booster system with the chiller.



Measuring instruments:

The energy monitoring equipment Enicope Enicope analytics, (BEST) was used to measure energy consumption.

Equipment tested: **Air cooled water chillers, CARRIER 30GX267**

Chiller without **Smart Cooling™** system



Chiller with **Smart Cooling™** system



Testing procedures:

Test has been done on chiller No.1.

Testing time: 2020/10/06 - 2020/10/12 adiabatic system **Smart Cooling™** OFF

Testing Time: 2020/10/14 – 2020/10/20 adiabatic system **Smart Cooling™** ON

Step 1

A data logger is installed on the subject HVAC equipment to collect all applicable real-time energy consumption and unit performance information. Data had collected with temperature sensor, Eniscope analytics.

Eniscope:



Step 2

Switch OFF the **Smart Cooling™** system.

Step 3

During the period from 2020/10/06 - 2020/10/12 of the test, **Chiller # 1** measured energy used by the condenser without the **Smart Cooling™** unit. During this period the chiller consumed **28.17 MW/h**, and the Water consumption is **0 m3**, the average temperature during the period was **30 ° C**.

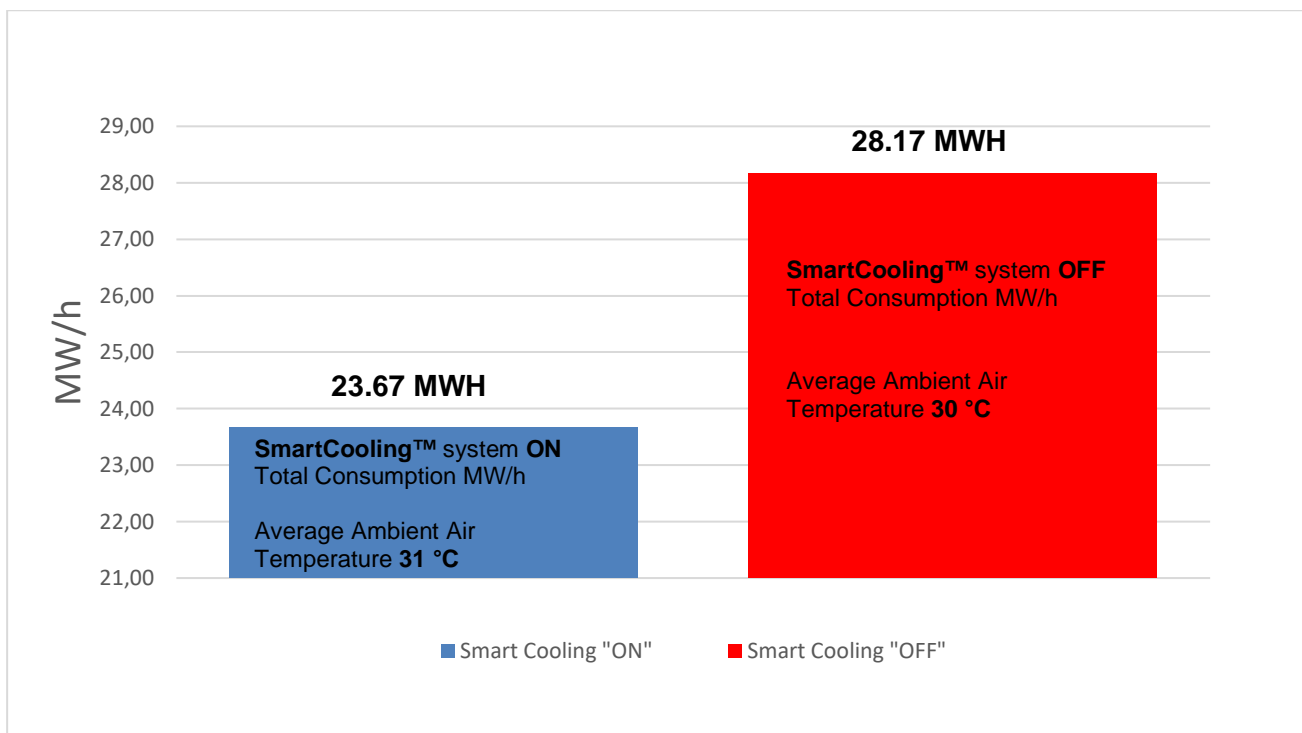
Step 4

Switch ON the **Smart Cooling™** system.

Step 5

During the period from 2020/10/14 - 2020/10/20 of the test, **Chiller # 1** measured energy used by the chiller with an Intelligent adiabatic system **Smart Cooling™**. During this period the chiller consumed **23.67 MW/h**, Water consumption **28 m3**, the average temperature during the period was **31 °C**.

Electrical RESULTS Summary



After data analysis monitoring numbers show: Difference / energy savings what provide **Smart Cooling™** system per 7 working days is **4.49 MW/h**

Customer in 7 days saved 4491 kw/h of electricity, electricity rate was 0.45 AED per kw/h, which brings 2020.5 AED in savings.

To achieve this result 28 m3 of water were used with water costs 10 AED per m3. In total 280 AED were spent on water.

Total savings after running costs is 1740 AED in 7 days.

SMART COOLING™ ON				SMART COOLING™ OFF			
DATE & TIME	AMBIENT CONDITION	ELECTRICAL DATA CHILLER 1		DATE & TIME	AMBIENT CONDITION	ELECTRICAL DATA CHILLER 1	
	AMBIENT TEMPERATURE	WH	KWH		AMBIENT TEMPERATURE	WH	KWH
14.10.2020 00:00	28 °C	136946,8576	136,95	06.10.2020 00:00	24 °C	151381,5	151,38
14.10.2020 01:00	29 °C	126858,9458	126,86	06.10.2020 01:00	28 °C	131909,2	131,91
14.10.2020 02:00	26 °C	126720,7552	126,72	06.10.2020 02:00	22 °C	125313,7	125,31
14.10.2020 03:00	25 °C	123127,8003	123,13	06.10.2020 03:00	22 °C	113850,2	113,85
14.10.2020 04:00	27 °C	120225,7983	120,23	06.10.2020 04:00	23 °C	106940,7	106,94
14.10.2020 05:00	25 °C	120363,9889	120,36	06.10.2020 05:00	23 °C	103328,9	103,33
14.10.2020 06:00	25 °C	122160,4663	122,16	06.10.2020 06:00	23 °C	100188,2	100,19
14.10.2020 07:00	26 °C	124371,5155	124,37	06.10.2020 07:00	27 °C	116676,8	116,68
14.10.2020 08:00	26 °C	129622,7572	129,62	06.10.2020 08:00	27 °C	151224,5	151,22
14.10.2020 09:00	29 °C	151318,6772	151,32	06.10.2020 09:00	30 °C	168969,4	168,97
14.10.2020 10:00	33 °C	176054,7897	176,05	06.10.2020 10:00	32 °C	192524,6	192,52
14.10.2020 11:00	35 °C	192084,8961	192,08	06.10.2020 11:00	33 °C	215294,6	215,29
14.10.2020 12:00	37 °C	213366,2443	213,37	06.10.2020 12:00	34 °C	226915,2	226,92
14.10.2020 13:00	39 °C	216821,0086	216,82	06.10.2020 13:00	36 °C	208071	208,07
14.10.2020 14:00	39 °C	212260,7197	212,26	06.10.2020 14:00	37 °C	195351,2	195,35
14.10.2020 15:00	37 °C	218202,9144	218,20	06.10.2020 15:00	37 °C	206814,8	206,81
14.10.2020 16:00	37 °C	195263,2793	195,26	06.10.2020 16:00	36 °C	203517	203,52
14.10.2020 17:00	34 °C	186695,4638	186,70	06.10.2020 17:00	34 °C	175564,8	175,56
14.10.2020 18:00	33 °C	178542,22	178,54	06.10.2020 18:00	32 °C	198177,8	198,18
14.10.2020 19:00	32 °C	166381,4496	166,38	06.10.2020 19:00	33 °C	201632,6	201,63
14.10.2020 20:00	31 °C	170527,1668	170,53	06.10.2020 20:00	30 °C	184358,8	184,36
14.10.2020 21:00	31 °C	157813,6341	157,81	06.10.2020 21:00	30 °C	184672,9	184,67
14.10.2020 22:00	30 °C	132524,7593	132,52	06.10.2020 22:00	28 °C	176978,2	176,98
14.10.2020 23:00	29 °C	123127,8003	123,13	06.10.2020 23:00	28 °C	166299,8	166,30
15.10.2020 00:00	28 °C	121469,5134	121,47	07.10.2020 00:00	27 °C	148240,8	148,24
15.10.2020 01:00	29 °C	121054,9417	121,05	07.10.2020 01:00	29 °C	135363,9	135,36
15.10.2020 02:00	26 °C	107374,075	107,37	07.10.2020 02:00	28 °C	127669,2	127,67
15.10.2020 03:00	25 °C	101293,6898	101,29	07.10.2020 03:00	27 °C	124528,6	124,53
15.10.2020 04:00	25 °C	101984,6427	101,98	07.10.2020 04:00	27 °C	126098,9	126,10
15.10.2020 05:00	25 °C	110967,0299	110,97	07.10.2020 05:00	27 °C	115734,6	115,73
15.10.2020 06:00	26 °C	111934,3639	111,93	07.10.2020 06:00	26 °C	114635,4	114,64
15.10.2020 07:00	26 °C	122436,8475	122,44	07.10.2020 07:00	27 °C	113850,2	113,85
15.10.2020 08:00	27 °C	141230,7653	141,23	07.10.2020 08:00	28 °C	126255,9	126,26
15.10.2020 09:00	31 °C	94245,97061	94,25	07.10.2020 09:00	29 °C	170539,7	170,54
15.10.2020 10:00	35 °C	177574,886	177,57	07.10.2020 10:00	32 °C	209484,3	209,48
15.10.2020 11:00	38 °C	149245,8186	149,25	07.10.2020 11:00	33 °C	206186,6	206,19
15.10.2020 12:00	40 °C	154773,4415	154,77	07.10.2020 12:00	34 °C	209170,3	209,17
15.10.2020 13:00	41 °C	171218,1196	171,22	07.10.2020 13:00	35 °C	208385,1	208,39
15.10.2020 14:00	41 °C	165966,8779	165,97	07.10.2020 14:00	35 °C	216393,9	216,39
15.10.2020 15:00	39 °C	169836,2139	169,84	07.10.2020 15:00	34 °C	199748,2	199,75

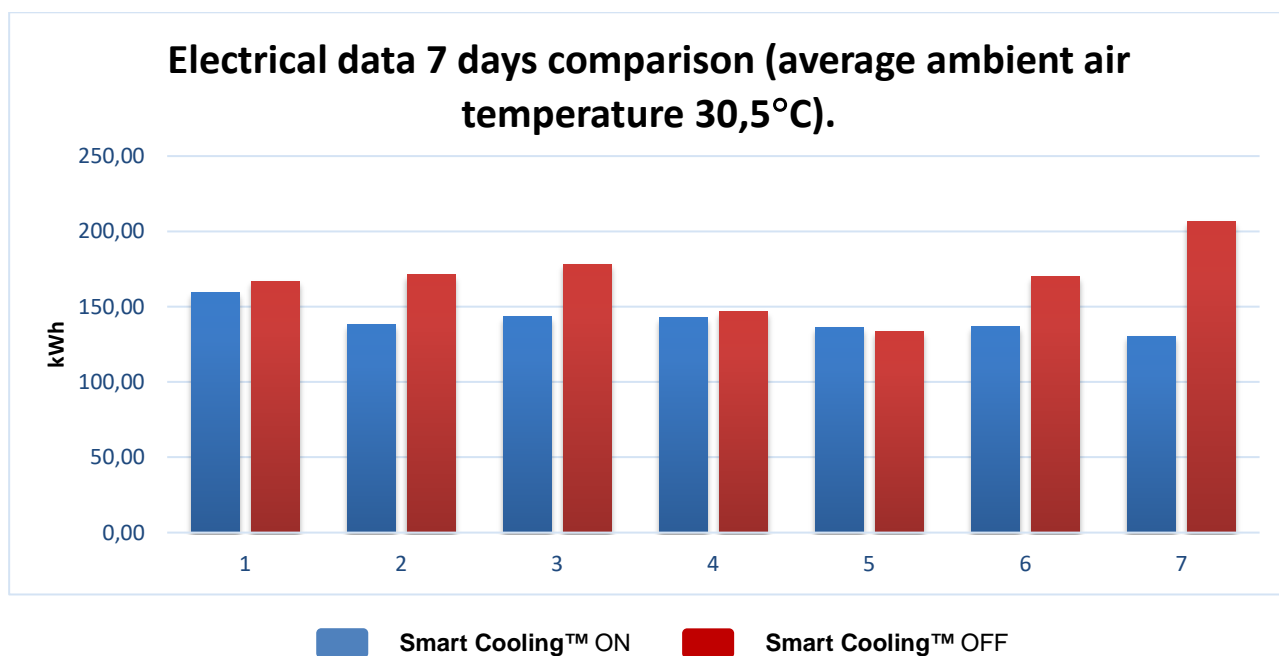
SMART COOLING™ ON				SMART COOLING™ OFF			
DATE & TIME	AMBIENT CONDITION	ELECTRICAL DATA CHILLER 1		DATE & TIME	AMBIENT CONDITION	ELECTRICAL DATA CHILLER 1	
	AMBIENT TEMPERATURE	WH	KWH		AMBIENT TEMPERATURE	WH	KWH
15.10.2020 16:00	38 °C	162926,6853	162,93	07.10.2020 16:00	33 °C	195351,2	195,35
15.10.2020 17:00	37 °C	153115,1546	153,12	07.10.2020 17:00	32 °C	196764,5	196,76
15.10.2020 18:00	35 °C	154911,6321	154,91	07.10.2020 18:00	31 °C	192053,5	192,05
15.10.2020 19:00	33 °C	147863,9128	147,86	07.10.2020 19:00	32 °C	204459,2	204,46
15.10.2020 20:00	32 °C	153391,5358	153,39	07.10.2020 20:00	30 °C	204302,2	204,30
15.10.2020 21:00	30 °C	148969,4374	148,97	07.10.2020 21:00	30 °C	195822,3	195,82
15.10.2020 22:00	30 °C	139572,4785	139,57	07.10.2020 22:00	29 °C	187185,4	187,19
15.10.2020 23:00	29 °C	130866,4724	130,87	07.10.2020 23:00	29 °C	179333,7	179,33
16.10.2020 00:00	28 °C	129760,9478	129,76	08.10.2020 00:00	29 °C	178077,4	178,08
16.10.2020 01:00	30 °C	122022,2757	122,02	08.10.2020 01:00	27 °C	170382,7	170,38
16.10.2020 02:00	26 °C	107926,8373	107,93	08.10.2020 02:00	27 °C	148397,8	148,40
16.10.2020 03:00	26 °C	111796,1734	111,80	08.10.2020 03:00	27 °C	131124	131,12
16.10.2020 04:00	25 °C	105163,0259	105,16	08.10.2020 04:00	26 °C	129867,7	129,87
16.10.2020 05:00	24 °C	115527,3188	115,53	08.10.2020 05:00	26 °C	117147,9	117,15
16.10.2020 06:00	25 °C	111105,2205	111,11	08.10.2020 06:00	25 °C	124214,5	124,21
16.10.2020 07:00	26 °C	113730,8414	113,73	08.10.2020 07:00	25 °C	133479,5	133,48
16.10.2020 08:00	28 °C	130451,9007	130,45	08.10.2020 08:00	26 °C	175250,8	175,25
16.10.2020 09:00	35 °C	152424,2017	152,42	08.10.2020 09:00	29 °C	208699,2	208,70
16.10.2020 10:00	36 °C	157675,4435	157,68	08.10.2020 10:00	30 °C	211211,7	211,21
16.10.2020 11:00	37 °C	163755,8287	163,76	08.10.2020 11:00	32 °C	220947,9	220,95
16.10.2020 12:00	39 °C	165414,1156	165,41	08.10.2020 12:00	33 °C	227386,3	227,39
16.10.2020 13:00	39 °C	179647,7446	179,65	08.10.2020 13:00	34 °C	245602,3	245,60
16.10.2020 14:00	40 °C	189597,4658	189,60	08.10.2020 14:00	34 °C	269628,7	269,63
16.10.2020 15:00	40 °C	185451,7486	185,45	08.10.2020 15:00	33 °C	222675,3	222,68
16.10.2020 16:00	39 °C	172323,6442	172,32	08.10.2020 16:00	33 °C	192210,5	192,21
16.10.2020 17:00	38 °C	156569,9189	156,57	08.10.2020 17:00	32 °C	179490,7	179,49
16.10.2020 18:00	35 °C	153806,1075	153,81	08.10.2020 18:00	31 °C	177292,2	177,29
16.10.2020 19:00	34 °C	147449,3411	147,45	08.10.2020 19:00	31 °C	177606,3	177,61
16.10.2020 20:00	31 °C	151595,0583	151,60	08.10.2020 20:00	31 °C	170068,6	170,07
16.10.2020 21:00	30 °C	145652,8637	145,65	08.10.2020 21:00	29 °C	163787,2	163,79
16.10.2020 22:00	28 °C	136946,8576	136,95	08.10.2020 22:00	28 °C	154051,1	154,05
16.10.2020 23:00	28 °C	131281,0441	131,28	08.10.2020 23:00	29 °C	150439,3	150,44

SMART COOLING™ ON				SMART COOLING™ OFF			
DATE & TIME	AMBIENT CONDITION	ELECTRICAL DATA CHILLER 1		DATE & TIME	AMBIENT CONDITION	ELECTRICAL DATA CHILLER 1	
	AMBIENT TEMPERATURE	WH	KWH		AMBIENT TEMPERATURE	WH	KWH
17.10.2020 00:00	27 °C	126306,1835	126,31	09.10.2020 00:00	28 °C	155778,5	155,78
17.10.2020 01:00	28 °C	122851,4192	122,85	09.10.2020 01:00	28 °C	150596,3	150,60
17.10.2020 02:00	26 °C	110552,4582	110,55	09.10.2020 02:00	24 °C	133793,6	133,79
17.10.2020 03:00	25 °C	103642,9296	103,64	09.10.2020 03:00	24 °C	136463,2	136,46
17.10.2020 04:00	26 °C	106821,3127	106,82	09.10.2020 04:00	23 °C	122644,1	122,64
17.10.2020 05:00	25 °C	111934,3639	111,93	09.10.2020 05:00	24 °C	98774,85	98,77
17.10.2020 06:00	24 °C	110690,6488	110,69	09.10.2020 06:00	23 °C	107097,7	107,10
17.10.2020 07:00	25 °C	114698,1754	114,70	09.10.2020 07:00	24 °C	112279,8	112,28
17.10.2020 08:00	27 °C	131695,6158	131,70	09.10.2020 08:00	26 °C	147926,7	147,93
17.10.2020 09:00	29 °C	148969,4374	148,97	09.10.2020 09:00	29 °C	176193	176,19
17.10.2020 10:00	31 °C	157951,8247	157,95	09.10.2020 10:00	31 °C	179333,7	179,33
17.10.2020 11:00	34 °C	164861,3533	164,86	09.10.2020 11:00	33 °C	175878,9	175,88
17.10.2020 12:00	36 °C	170250,7856	170,25	09.10.2020 12:00	35 °C	182317,3	182,32
17.10.2020 13:00	39 °C	202449,1891	202,45	09.10.2020 13:00	35 °C	195665,3	195,67
17.10.2020 14:00	36 °C	181029,6503	181,03	09.10.2020 14:00	36 °C	172895,3	172,90
17.10.2020 15:00	35 °C	187248,2261	187,25	09.10.2020 15:00	34 °C	168812,3	168,81
17.10.2020 16:00	34 °C	180891,4597	180,89	09.10.2020 16:00	33 °C	166456,8	166,46
17.10.2020 17:00	33 °C	155878,9661	155,88	09.10.2020 17:00	32 °C	151538,5	151,54
17.10.2020 18:00	32 °C	148969,4374	148,97	09.10.2020 18:00	31 °C	144000,9	144,00
17.10.2020 19:00	32 °C	146205,626	146,21	09.10.2020 19:00	31 °C	145100,1	145,10
17.10.2020 20:00	31 °C	143994,5768	143,99	09.10.2020 20:00	29 °C	130495,9	130,50
17.10.2020 21:00	30 °C	141230,7653	141,23	09.10.2020 21:00	29 °C	133479,5	133,48
17.10.2020 22:00	30 °C	127964,4704	127,96	09.10.2020 22:00	28 °C	123743,4	123,74
17.10.2020 23:00	28 °C	130590,0912	130,59	09.10.2020 23:00	27 °C	114792,4	114,79
18.10.2020 00:00	28 °C	114974,5565	114,97	10.10.2020 00:00	27 °C	113850,2	113,85
18.10.2020 01:00	29 °C	115112,7471	115,11	10.10.2020 01:00	28 °C	105527,3	105,53
18.10.2020 02:00	26 °C	102951,9767	102,95	10.10.2020 02:00	25 °C	101287,4	101,29
18.10.2020 03:00	26 °C	101570,071	101,57	10.10.2020 03:00	25 °C	96576,37	96,58
18.10.2020 04:00	25 °C	99635,40295	99,64	10.10.2020 04:00	24 °C	90137,94	90,14
18.10.2020 05:00	25 °C	107512,2656	107,51	10.10.2020 05:00	23 °C	89509,8	89,51
18.10.2020 06:00	25 °C	106544,9316	106,54	10.10.2020 06:00	22 °C	90766,08	90,77
18.10.2020 07:00	25 °C	117323,7963	117,32	10.10.2020 07:00	27 °C	95948,23	95,95
18.10.2020 08:00	29 °C	133768,4744	133,77	10.10.2020 08:00	26 °C	136777,3	136,78
18.10.2020 09:00	32 °C	145100,1014	145,10	10.10.2020 09:00	30 °C	169911,6	169,91
18.10.2020 10:00	34 °C	149660,3903	149,66	10.10.2020 10:00	32 °C	186871,3	186,87
18.10.2020 11:00	36 °C	156155,3472	156,16	10.10.2020 11:00	34 °C	193309,8	193,31
18.10.2020 12:00	38 °C	166381,4496	166,38	10.10.2020 12:00	35 °C	198648,9	198,65
18.10.2020 13:00	40 °C	180615,0786	180,62	10.10.2020 13:00	34 °C	171639	171,64
18.10.2020 14:00	39 °C	175363,8368	175,36	10.10.2020 14:00	37 °C	167399	167,40
18.10.2020 15:00	40 °C	165966,8779	165,97	10.10.2020 15:00	36 °C	171953	171,95
18.10.2020 16:00	37 °C	159333,7304	159,33	10.10.2020 16:00	34 °C	165043,5	165,04
18.10.2020 17:00	36 °C	154497,0603	154,50	10.10.2020 17:00	33 °C	140075	140,07
18.10.2020 18:00	34 °C	148278,4846	148,28	10.10.2020 18:00	31 °C	141174,2	141,17
18.10.2020 19:00	33 °C	147449,3411	147,45	10.10.2020 19:00	32 °C	123900,4	123,90
18.10.2020 20:00	31 °C	144685,5297	144,69	10.10.2020 20:00	29 °C	128140,3	128,14
18.10.2020 21:00	31 °C	136117,7142	136,12	10.10.2020 21:00	29 °C	119032,3	119,03
18.10.2020 22:00	30 °C	122713,2286	122,71	10.10.2020 22:00	28 °C	104114	104,11
18.10.2020 23:00	28 °C	111657,9828	111,66	10.10.2020 23:00	28 °C	103800	103,80
19.10.2020 00:00	27 °C	103366,5484	103,37	11.10.2020 00:00	27 °C	98617,82	98,62
19.10.2020 01:00	29 °C	106130,3599	106,13	11.10.2020 01:00	28 °C	91865,32	91,87
19.10.2020 02:00	26 °C	96457,01978	96,46	11.10.2020 02:00	26 °C	93278,64	93,28
19.10.2020 03:00	25 °C	93278,63661	93,28	11.10.2020 03:00	27 °C	91394,22	91,39
19.10.2020 04:00	24 °C	93002,25546	93,00	11.10.2020 04:00	27 °C	91080,15	91,08

SMART COOLING™ ON				SMART COOLING™ OFF			
DATE & TIME	AMBIENT CONDITION	ELECTRICAL DATA CHILLER 1		DATE & TIME	AMBIENT CONDITION	ELECTRICAL DATA CHILLER 1	
	AMBIENT TEMPERATURE	WH	KWH		AMBIENT TEMPERATURE	WH	KWH
19.10.2020 05:00	24 °C	90238,44401	90,24	11.10.2020 05:00	25 °C	91080,15	91,08
19.10.2020 06:00	26 °C	91896,73088	91,90	11.10.2020 06:00	25 °C	97989,68	97,99
19.10.2020 07:00	26 °C	116218,2717	116,22	11.10.2020 07:00	28 °C	101915,5	101,92
19.10.2020 08:00	28 °C	129208,1855	129,21	11.10.2020 08:00	27 °C	130809,9	130,81
19.10.2020 09:00	31 °C	137637,8105	137,64	11.10.2020 09:00	29 °C	151381,5	151,38
19.10.2020 10:00	33 °C	163341,257	163,34	11.10.2020 10:00	31 °C	157191,8	157,19
19.10.2020 11:00	35 °C	163203,0664	163,20	11.10.2020 11:00	34 °C	159861,4	159,86
19.10.2020 12:00	37 °C	177989,4577	177,99	11.10.2020 12:00	33 °C	142744,6	142,74
19.10.2020 13:00	38 °C	191532,1338	191,53	11.10.2020 13:00	34 °C	193152,7	193,15
19.10.2020 14:00	39 °C	183793,4618	183,79	11.10.2020 14:00	36 °C	272455,3	272,46
19.10.2020 15:00	39 °C	179233,1729	179,23	11.10.2020 15:00	34 °C	274810,8	274,81
19.10.2020 16:00	38 °C	166381,4496	166,38	11.10.2020 16:00	33 °C	269942,7	269,94
19.10.2020 17:00	36 °C	153529,7263	153,53	11.10.2020 17:00	33 °C	248429	248,43
19.10.2020 18:00	34 °C	151180,4866	151,18	11.10.2020 18:00	31 °C	227700,4	227,70
19.10.2020 19:00	33 °C	145929,2448	145,93	11.10.2020 19:00	31 °C	230684	230,68
19.10.2020 20:00	32 °C	144547,3391	144,55	11.10.2020 20:00	30 °C	235709,1	235,71
19.10.2020 21:00	30 °C	143027,2428	143,03	11.10.2020 21:00	29 °C	214666,5	214,67
19.10.2020 22:00	28 °C	129899,1384	129,90	11.10.2020 22:00	29 °C	203517	203,52
19.10.2020 23:00	28 °C	127411,7081	127,41	11.10.2020 23:00	28 °C	208542,1	208,54
20.10.2020 00:00	27 °C	114559,9848	114,56	12.10.2020 00:00	27 °C	207599,9	207,60
20.10.2020 01:00	26 °C	114421,7942	114,42	12.10.2020 01:00	27 °C	205087,4	205,09
20.10.2020 02:00	25 °C	108894,1713	108,89	12.10.2020 02:00	26 °C	201004,5	201,00
20.10.2020 03:00	24 °C	108755,9808	108,76	12.10.2020 03:00	26 °C	195822,3	195,82
20.10.2020 04:00	25 °C	99911,7841	99,91	12.10.2020 04:00	27 °C	196450,5	196,45
20.10.2020 05:00	24 °C	89409,30057	89,41	12.10.2020 05:00	25 °C	192995,7	193,00
20.10.2020 06:00	25 °C	97838,92551	97,84	12.10.2020 06:00	26 °C	206343,7	206,34
20.10.2020 07:00	24 °C	113454,4602	113,45	12.10.2020 07:00	25 °C	98303,75	98,30
20.10.2020 08:00	28 °C	125200,6589	125,20	12.10.2020 08:00	27 °C	191946,7	191,95
20.10.2020 09:00	31 °C	139296,0973	139,30	12.10.2020 09:00	30 °C	221795,9	221,80
20.10.2020 10:00	33 °C	150351,3432	150,35	12.10.2020 10:00	32 °C	248052,1	248,05
20.10.2020 11:00	36 °C	159610,1115	159,61	12.10.2020 11:00	33 °C	245564,6	245,56
20.10.2020 12:00	37 °C	153529,7263	153,53	12.10.2020 12:00	34 °C	247637,5	247,64
20.10.2020 13:00	38 °C	157122,6812	157,12	12.10.2020 13:00	37 °C	248604,8	248,60
20.10.2020 14:00	39 °C	153667,9169	153,67	12.10.2020 14:00	36 °C	251506,8	251,51
20.10.2020 15:00	36 °C	152838,7735	152,84	12.10.2020 15:00	36 °C	249157,6	249,16
20.10.2020 16:00	35 °C	146620,1977	146,62	12.10.2020 16:00	34 °C	232712,9	232,71
20.10.2020 17:00	34 °C	140539,8125	140,54	12.10.2020 17:00	33 °C	214333,6	214,33
20.10.2020 18:00	32 °C	136532,2859	136,53	12.10.2020 18:00	32 °C	210187,9	210,19
20.10.2020 19:00	32 °C	135564,9519	135,56	12.10.2020 19:00	32 °C	204660,2	204,66
20.10.2020 20:00	29 °C	138328,7633	138,33	12.10.2020 20:00	30 °C	206180,3	206,18
20.10.2020 21:00	29 °C	139157,9068	139,16	12.10.2020 21:00	29 °C	185866,3	185,87
20.10.2020 22:00	26 °C	129069,9949	129,07	12.10.2020 22:00	28 °C	151456,9	151,46
20.10.2020 23:00	26 °C	127688,0892	127,69	12.10.2020 23:00	27 °C	149798,6	149,80

Testing Summary:

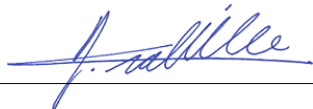
SMART COOLING™ FOR CHILLER 1		
Status of Smart Cooling™	ON	OFF
Operating Date	14/10/2020 - 20/10/2020	06/10/2020 -12/10/2020
Average Ambient Temperature "°C"	31,09	29,63
Total Electrical Consumption "MWH"	23,67	28,17
Average Electrical Consumption "KWH"	140,92	167,65
Total Electrical Saving per 7 days "KWH"	4491,36	
Total Electrical Saving per 1 days "KWH"	561,42	
Electrical Consumption %	↓ 15,95%	



Conclusion:

Test results data shows that adiabatic equipment **Smart Cooling™** in average increasing chiller performance by **15.95%** during 7 operational Days.

Ali Soufan



December 26, 2020

Annex



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RIF600 | Clamp-on Ultrasonic Meter Calibration Report

Pipe diameter	DN80	Date	15/12/2018
Ambient temperature	29°C	Model:	RIF600W
Standard Device before test	Normal		
Standard Device After Test	Normal		
Test result	Qualified		
Measured Medium	Water		
Accuracy	1%		
Signal Strength	UP: 90 DOWN: 90		
Standard device name	Static volumetric method/standard Meter Method Water Flow/Standard Device		
Standard device accuracy	0,20%		

Test	Standard Meter flow		Temperature	Pressure	Tested Meter Flow		Basic Error		Repeatability	
Point	m3/h		°C	Mpa	m3/h		%		%	
Point 1	101,52	101,47	25,0	0,300	102,27	102,10	0,739	0,759	-0,147	0,147
	101,47		25,0	0,300	102,07		0,591			
	101,42		25,0	0,300	101,97		0,542			
Point 2	71,27	71,27	25,0	0,300	71,75	71,75	0,673	0,759	-0,146	0,147
	71,19		25,0	0,300	71,65		0,646			
	71,34		25,0	0,300	71,86		0,729			
Point 3	26,32	26,36	25,0	0,300	26,51	26,55	0,722	0,759	-0,132	0,147
	26,36		25,0	0,300	26,56		0,759			
	26,39		25,0	0,300	26,58		0,720			

Verification Based on JIG 1030-2007 < Ultrasonic flowmeter verification procedures >
 Scale Factor=1



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RIF600 | Test Report misuratore di portata ad ultrasuoni clamp on

Diametro tubazione	DN80	Date	15/12/2018
Temperatura ambiente	29°C	Model:	RIF600W
Dispositivo standard prima del test	Normale		
Dispositivo standard dop il test	Normale		
Risultato del test	Qualified		
Liquido	Acqua		
Accuratezza	1%		
Potenza dei segnali	UP: 90 DOWN: 90		
Tipo di dispositivo standard	Metodo volumetrico statico/Misuratore di portata volumetrico		
Accuratezza del dispositivo standa	0,20%		

Test	Misuratore standard	Temperatura	Pressione	Misuratore testato	errore base	Ripetibilità
Punti	m3/h	°C	Mpa	m3/h	%	%
Punto 1	101,52	25,0	0,300	102,27	0,739	-0,147
	101,47	25,0	0,300	102,07	0,591	
	101,42	25,0	0,300	101,97	0,542	
Punto 2	71,27	25,0	0,300	71,75	0,673	-0,146
	71,19	25,0	0,300	71,65	0,646	
	71,34	25,0	0,300	71,86	0,729	
Punto 3	26,32	25,0	0,300	26,51	0,722	-0,132
	26,36	25,0	0,300	26,56	0,759	
	26,39	25,0	0,300	26,58	0,720	

Verification Based on JIG 1030-2007 < Ultrasonic flowmeter verification procedures >
 Scale Factor=1