

**SMART COOLING™** PRO10 SYSTEM

# NOVOTEL, IBIS Hotels

Test Participants:

Project name: **NOVOTEL / IBIS FUJAIRAH** Location: **Fujairah, UAE**

Organization Responsible: **Ecovis Engineering Ltd**

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## Introduction:

**Type of structure:** Hotel complex with air-cooled water chillers.

**Cooling units:** Air cooled water chiller **Petra APSa 325-2**.

**Chiller booster:** *Smart Cooling*™ PRO 10, adiabatic technology with condenser protection (BY70).

Chillers were retrofitted with the intelligent adiabatic *Smart Cooling*™ system to reduce their electricity consumption and increase COP (Coefficient of Performance) efficiency.

The intelligent adiabatic *Smart Cooling*™ system combines an adiabatic evaporative pre-cooling process and condenser protection with mechanical air filtration. The intelligent adiabatic *Smart Cooling*™ system is mounted externally in front of the condensers of the cooling equipment. *Smart Cooling*™ initiates the adiabatic process even before the mechanical cooling kicks in and the equipment receives a temperature-reducing fine mist of processed water that within the cooling circuit.

*Smart Cooling*™ ensures 100% condenser protection from direct contact with water.



*System installation on chiller condensers*



*Existing chillers on site*

## Main components:

*Smart Cooling*™ comprises the following key components: protective membranes, water treatment and recirculation systems, high-pressure water pump, control unit, high-pressure nozzle panels, fasteners, and fixings.

- **Protective membranes** cover the condenser surface, preventing direct water contact.
- **Water system** purifies and sterilizes water to prevent mineral buildup and bacteria.
- **Pump** provides 70 bar pressure.
- **Control unit** regulates operation via real-time data (temperature, humidity, chiller parameters).
- **Nozzles** spray 5–40 µm droplets.
- A set of **fasteners and fixings** ensure the compatibility of the equipment with the chiller.



## Measuring instruments:

All measurements were collected using the following set of professional diagnostic tools:

- **ENICOPE analytics energy measurement system** — main platform for real-time energy logging (kWh, temperatures, humidity, load profiles).
- **Cooling power calculator** — modules for evaluating cooling capacity and operating parameters of the chiller.
- **Ultrasonic flowmeter RIF 600** — non-intrusive ultrasonic sensor for measuring chilled-water flow.
- **Thermal camera Testo 882** — used to detect condenser surface temperatures and visualize temperature drop provided by Smart Cooling™.
- **Clip-on current probes (ENICOPE sensors)** — for measuring electrical load and phase consumption on chiller power lines.



*ENICOPE  
analytics*



*Cooling power  
calculator*



*Thermal camera  
Testo 882*



*Current sensors,  
clip-on probes*



*Ultrasonic flowmeter  
RIF 600*

## Testing *Smart Cooling*™:

### Step 1 — Installation of data logging equipment

A data logger was installed on the **PETRA APSa 325-2** chiller system to collect all real-time energy consumption and operational parameters.

Measurements were recorded using the ENICOPE analytics energy monitoring platform.

### Step 2 — Measurement period with *Smart Cooling*™ **OFF**

The first 4 days (96 hours) were monitored without the *Smart Cooling*™ system. During this period:

- Electrical consumption: 44,264 kWh
- Water consumption: 0 m³
- Average temperature: 36.56°C
- Average humidity: 39.9% RH

### Step 3 — Activation of *Smart Cooling*™ system

The adiabatic pre-cooling system *Smart Cooling*™ BY-70 was switched **ON**

### Step 4 — Measurement period with *Smart Cooling*™ **ON**

The next 4 days (96 hours) were monitored with the system operating.

During this period:

- Electrical consumption: 34,955 kWh
- Water consumption: 69 m³
- Average temperature: 36.28°C
- Average humidity: 41.32% RH

### Step 5 — Comparative analysis

Energy consumption for both 4-day periods was compared under similar temperature and humidity conditions.

The measured energy savings delivered by *Smart Cooling*™ over the 4-day **ON** period were: 9,308 kWh saved



Air cooled water chiller  
Petra APSa 325-2

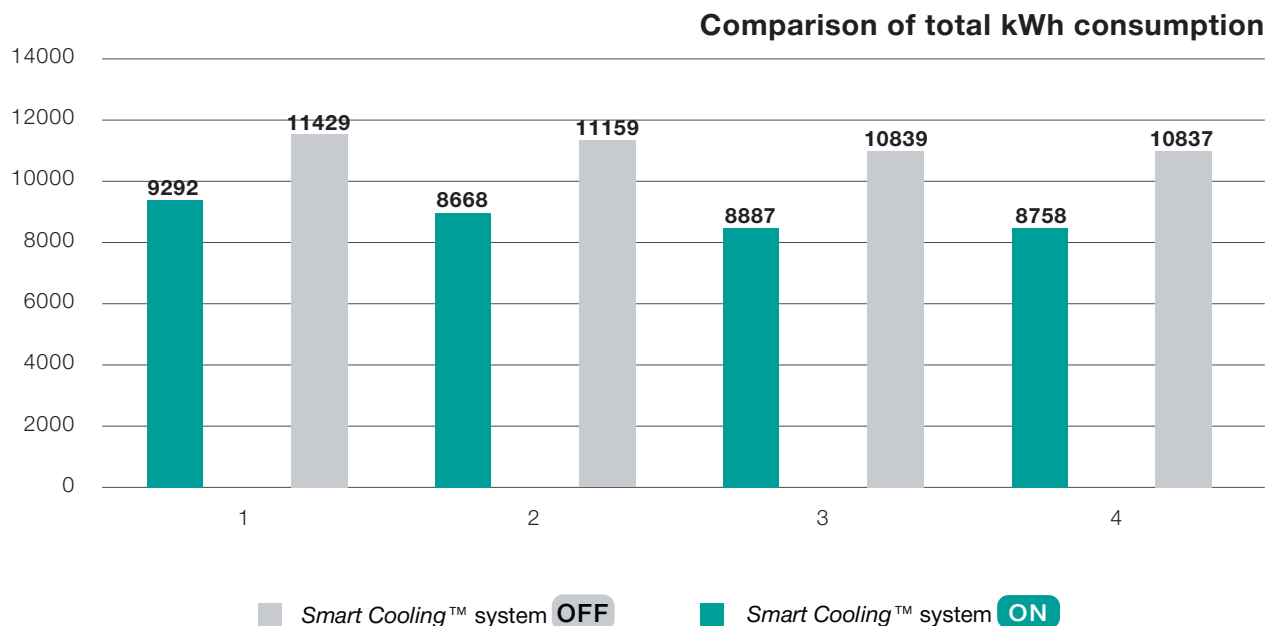
## Testing Data:

Comparison of total KWh consumed by rack «B» chiller system for 4 consecutive days with adiabatic pre-cooling system **OFF** – to 4 consecutive days with adiabatic system **ON** (with comparative temp. & RH data).

- **Equipment tested:** Air cooled water chillers **Petra APSa 325-2**.

Date	System	Time	Average Temp C	Average Humidity HR%	Saving KWh	Saving %	Hrs used per test	KWh used per test	Rain	m3 Water consumption
08.09.2017	OFF	15:01	36.20	41.55	0	0	22:15:00	11429	No	0
09.09.2017	OFF	15:00	36.01	39.47	0	0	45:15:00	11159	No	0
10.09.2017	OFF	15:04	36.60	38.52	0	0	72:00:00	10839	No	0
11.09.2017	OFF	15:00	37.42	40.40	0	0	96:00:00	10837	No	0
<b>Total</b>					<b>0</b>			<b>44264</b>		<b>0</b>
Date	System	Time	Average Temp C	Average Humidity HR%	Saving KWh	Saving %	Hrs used per test	KWh used per test	Rain	m3 Water consumption
15.09.2017	ON	14:00	36.09	42.58	2137	19%	96:00:00	9292	No	17.42
16.09.2017	ON	14:03	36.69	45.40	2209	21%	120:00:00	8868	No	15.80
17.09.2017	ON	14:05	35.25	39.57	2501	23%	144:00:00	8387	No	18.34
18.09.2017	ON	14:00	36.49	43.04	2379	22%	167:00:00	8458	No	17.99
<b>Total</b>					<b>9226</b>	<b>21.25%</b>		<b>35005</b>		<b>69.55</b>

Comparison of total KWh consumed by rack «B» chiller system for 4 consecutive days with adiabatic pre-cooling system **OFF** – to 4 consecutive days with adiabatic system **ON** (with comparative temperature & RH data).





## Chillers energy consumption

16.09.2017 Smart Cooling™ system **ON** vs 09.09.2017 Smart Cooling™ system **OFF**

date	timestamp	Adiabatic on Chiller 6 - E	Adiabatic OFF Chiller 6 09/09/2017	Difference in % Adiabatic on chiller 2 - E	Adiabatic OFF chiller 2 09/09/2017	Difference in % Adiabatic on chiller 3 - E	Adiabatic OFF chiller 3 09/09/2017	Difference in %
16.09.2017 00:00	1505505600	150544	216359	31%	113379	151486	29%	107621
16.09.2017 01:00	1505509200	146680	222988	34%	89372	150128	36%	105527
16.09.2017 02:00	1505512800	147089	225513	34%	81127	149511	36%	87583
16.09.2017 03:00	1505516400	143109	221838	34%	91080	150535	39%	87734
16.09.2017 04:00	1505520000	148356	216116	33%	80557	150130	40%	68162
16.09.2017 05:00	1505523600	146804	219535	27%	89924	150544	40%	74120
16.09.2017 06:00	1505527200	148312	221000	27%	82349	150649	39%	80088
16.09.2017 07:00	1505530800	179124	226863	21%	93279	151580	39%	80925
16.09.2017 08:00	1505534400	177354	278580	36%	119473	177854	38%	84380
16.09.2017 09:00	1505538000	184045	283186	35%	120289	184778	35%	110238
16.09.2017 10:00	1505541600	188929	279941	34%	119481	185824	36%	110238
16.09.2017 11:00	1505545200	188651	284338	34%	120289	184045	35%	111390
16.09.2017 12:00	1505548800	195582	278512	31%	122173	184359	34%	113274
16.09.2017 13:00	1505552400	188232	282244	33%	121331	180207	34%	113170
16.09.2017 14:00	1505556000	187280	278789	33%	121126	182170	34%	113379
16.09.2017 15:00	1505559600	187340	278580	29%	120603	173262	30%	113274
16.09.2017 16:00	1505563200	231489	282139	18%	118300	165526	28%	110762
16.09.2017 17:00	1505566800	234878	278103	19%	117881	161013	27%	110543
16.09.2017 18:00	1505570400	220886	275135	20%	115882	160804	28%	110554
16.09.2017 19:00	1505574000	217650	277951	22%	113379	158918	29%	74748
16.09.2017 20:00	1505577600	217231	269159	19%	112946	158834	29%	89137
16.09.2017 21:00	1505581200	215242	271879	21%	111599	156778	28%	86189
16.09.2017 22:00	1505584800	218917	268948	19%	111215	155150	28%	84908
16.09.2017 23:00	1505588400	152638	249591	39%	104271	154103	32%	64189
TOTAL IN KW/H		4437	6200	28%	2623	3930	33%	2210
Difference in KW/H		1743			1306			-912
Total consumption OFF 24h					1 14 29			
Total consumption ON 24h					92 92			19%
Difference Kw/h total 3 units in 24h					21 37			

## Chillers energy consumption

17.09.2017 Smart Cooling™ system **ON** vs 10.09.2017 Smart Cooling™ system **OFF**

date	timestamp	Adiabatic on Chiller 6 - E	Adiabatic OFF Chiller 6 10/09/17 17:09	Difference in % Adiabatic on chiller 2 - E	Adiabatic OFF Chiller 2 10/09/17 17:09	Difference in % Adiabatic on chiller 3 - E	Adiabatic OFF Chiller 3 10/09/17 17:09	Difference in %
17.09.2017 00:00	1505592000	114217	223354	51%	92032	183057	40%	63756
17.09.2017 01:00	1505595600	137931	222144	45%	90661	184103	41%	63861
17.09.2017 02:00	1505599200	174099	235447	26%	92650	184103	40%	65012
17.09.2017 03:00	1505602800	185301	231460	20%	91604	182114	40%	65526
17.09.2017 04:00	1505606400	182160	229589	21%	91708	182638	40%	64698
17.09.2017 05:00	1505610000	182893	229375	20%	96733	181591	36%	61558
17.09.2017 06:00	1505613600	182998	228957	20%	112542	181905	26%	67734
17.09.2017 07:00	1505617200	188546	233458	19%	114321	183685	26%	76005
17.09.2017 08:00	1505620800	222780	240787	7%	115473	175251	34%	109087
17.09.2017 09:00	1505624400	226653	255338	11%	117567	191687	39%	112546
17.09.2017 10:00	1505628000	233563	262667	11%	120603	183626	34%	114217
17.09.2017 11:00	1505631600	234505	262248	11%	121440	185720	35%	112227
17.09.2017 12:00	1505635200	233668	262143	11%	122173	189288	28%	113274
17.09.2017 13:00	1505638800	232621	265912	13%	122068	161432	24%	114635
17.09.2017 14:00	1505642400	181113	271584	33%	120184	164468	27%	115892
17.09.2017 15:00	1505646000	151277	272298	44%	117482	183521	36%	115578
17.09.2017 16:00	1505649600	153475	272194	44%	121440	177135	31%	96001
17.09.2017 17:00	1505653200	150649	278161	46%	119870	170854	30%	68572
17.09.2017 18:00	1505656800	145205	267587	46%	118195	156721	25%	67211
17.09.2017 19:00	1505660400	146880	264028	44%	116310	157139	26%	66792
17.09.2017 20:00	1505664000	140389	263818	47%	109610	156825	30%	67106
17.09.2017 21:00	1505667600	143844	262353	45%	109401	155883	30%	79460
17.09.2017 22:00	1505671200	143949	261924	45%	102491	153260	34%	78622
17.09.2017 23:00	1505674800	141331	250913	44%	74539	154941	52%	77575
TOTAL IN KW/H		4720	6069	30%	2611	3923	33%	2037
Difference in KW/H		1849			1312			-870
Total consumption OFF 24h					1 11 59			
Total consumption ON 24h					88 58			21%
Difference Kw/h total 3 units in 24h					22 90			



## Chillers energy consumption

18.09.2017 Smart Cooling™ system **ON** vs 11.09.2017 Smart Cooling™ system **OFF**

date	timestamp	Adiabatic on	Adiabatic OFF	Difference in % Adiabatic on		Adiabatic OFF	Difference in % Adiabatic on		Adiabatic OFF	Difference in %	
		chiller 6 - E	chiller 6 11/09/2017	chiller 2 - E	chiller 2 08/09/2017	chiller 3 - E	chiller 3 08/09/2017	chiller 3 - E	chiller 3 08/09/2017	chiller 3 - E	chiller 3 08/09/2017
18.09.2017 01:00	1505682000	153933	233343	42%	72445	153999	53%	79335	19837		
18.09.2017 02:00	1505685600	141750	250527	39%	71713	155560	54%	78622	41981		
18.09.2017 03:00	1505689200	135573	232830	42%	71294	154627	54%	78413	33710		
18.09.2017 04:00	1505692800	142017	228538	38%	71922	152324	53%	78517	19891		
18.09.2017 05:00	1505696400	142064	228234	38%	72027	151905	53%	78823	14188		
18.09.2017 06:00	1505700000	135992	228653	40%	72341	152324	53%	78821	37793		
18.09.2017 07:00	1505703600	164372	250632	29%	81972	152999	47%	79200	30670		
18.09.2017 08:00	1505707200	182474	240577	24%	113274	187709	40%	80718	58511		
18.09.2017 09:00	1505710800	218741	272508	23%	114113	176507	35%	84328	66478		
18.09.2017 10:00	1505714400	228657	276800	17%	116520	143425	19%	110887	66897		
18.09.2017 11:00	1505718000	221524	277742	20%	114112	164258	31%	109181	87734		
18.09.2017 12:00	1505721600	144377	278894	48%	114112	182684	38%	109181	87734		
18.09.2017 13:00	1505725200	133480	279312	52%	113065	182056	38%	90033	87630		
18.09.2017 14:00	1505728800	158818	279208	44%	112960	179545	37%	78528	87630		
18.09.2017 15:00	1505732400	187709	277833	32%	112856	179962	37%	101340	87630		
18.09.2017 16:00	1505736000	217864	280359	22%	110971	178857	38%	115264	87001		
18.09.2017 17:00	1505739600	212320	283500	25%	110029	178601	38%	108401	85641		
18.09.2017 18:00	1505743200	207914	271247	23%	108563	174099	38%	75785	81976		
18.09.2017 19:00	1505746800	206538	265589	22%	108877	154841	30%	78089	30607		
18.09.2017 20:00	1505750400	207391	281465	18%	108401	156674	30%	110134	10488		
18.09.2017 21:00	1505754000	204983	236078	13%	108394	157454	31%	98304	52031		
18.09.2017 22:00	1505757600	162897	235040	30%	96838	155569	38%	67211	31193		
18.09.2017 23:00	1505761200	138714	232411	40%	89510	153478	42%	68572	48881		
TOTAL IN KW/H		4023	5849	31%	2287	3780	40%	2047	1209		
Difference in KW/H		1825			1513			-837			
Total consumption OFF 24h					1 08 39						
Total consumption ON 24h					83 37					23%	
Difference Kw/h total 3 units in 24h					25 01						

## Chillers energy consumption

19.09.2017 Smart Cooling™ system **ON** vs 12.09.2017 Smart Cooling™ system **OFF**

date	timestamp	Adiabatic on	Adiabatic OFF	Difference in % Adiabatic on		Adiabatic OFF	Difference in % Adiabatic on		Adiabatic OFF	Difference in %	
		chiller 6 - E	chiller 6 12/09/2017	chiller 2 - E	chiller 2 08/09/2017	chiller 3 - E	chiller 3 08/09/2017	chiller 3 - E	chiller 3 08/09/2017	chiller 3 - E	chiller 3 08/09/2017
19.09.2017 00:00	1505764800	140703	230108	39%	89510	143121	37%	66792	40410		
19.09.2017 01:00	1505768400	142483	216498	34%	89510	141959	37%	67211	37060		
19.09.2017 02:00	1505772000	146461	212102	31%	88149	143216	38%	66478	43237		
19.09.2017 03:00	1505775600	141845	211284	33%	89029	143216	37%	69723	28476		
19.09.2017 04:00	1505779200	157982	210950	35%	90138	142483	37%	69467	18428		
19.09.2017 05:00	1505782800	141817	209278	33%	90432	143331	38%	68781	21289		
19.09.2017 06:00	1505786400	164886	208856	21%	102957	142169	27%	80821	27219		
19.09.2017 07:00	1505790000	170854	211997	19%	109934	143944	24%	80192	51403		
19.09.2017 08:00	1505793600	173157	235138	26%	112437	147927	24%	81867	55287		
19.09.2017 09:00	1505797200	177884	276921	36%	114221	144886	31%	83857	60092		
19.09.2017 10:00	1505800800	213567	282348	24%	118110	171188	32%	86578	61244		
19.09.2017 11:00	1505804400	232621	283500	18%	120079	172424	30%	88777	61787		
19.09.2017 12:00	1505808000	238189	282663	16%	123011	173262	29%	81080	61558		
19.09.2017 13:00	1505811600	237123	282977	16%	124478	170644	27%	83441	61662		
19.09.2017 14:00	1505815200	235133	283091	17%	122487	170854	28%	81918	61159		
19.09.2017 15:00	1505818800	154322	284338	46%	120184	172125	30%	90973	60720		
19.09.2017 16:00	1505822400	133081	288944	54%	120707	188027	28%	90871	60720		
19.09.2017 17:00	1505826000	137144	278783	50%	118718	166437	29%	88882	59259		
19.09.2017 18:00	1505829600	134738	172612	51%	117983	163526	28%	87821	54533		
19.09.2017 19:00	1505833200	136201	140787	43%	102015	162060	36%	86788	39573		
19.09.2017 20:00	1505836800	135573	235637	42%	87362	161118	40%	87311	50251		
19.09.2017 21:00	1505840400	134845	232097	42%	89001	158386	38%	87207	48613		
19.09.2017 22:00	1505844000	137144	175188	39%	89582	161177	37%	86693	48613		
19.09.2017 23:00	1505847600	136097	116499	37%	89302	147653	36%	85930	48995		
TOTAL IN KW/H		3932	5909		2548	3763		1977	1165		
Difference in KW/H		1977			1215			-813			
Total consumption OFF 24h					1 08 37						
Total consumption ON 24h					84 58					22%	
Difference Kw/h total 3 units in 24h					23 79						

## Conclusion:

The *Smart Cooling*™ adiabatic pre-cooling system demonstrated a clear and measurable improvement in chiller efficiency during the testing period.

Across two comparable four-day cycles, the system reduced electrical consumption from **44,264 kWh OFF** to **34,955 kWh ON**, resulting in a total saving of **9,308 kWh** over the 4-day **ON** period.

Based on these results, the projected monthly savings amount to **69,195 kWh**, corresponding to **USD 7,611.45** at an electricity rate of **\$0.11/kWh**.

The reduction in energy use equates to a decrease of more than 13,000 pounds of CO<sub>2</sub> emissions per month.

Considering the achieved savings, the Return on Investment (ROI) for installing the *Smart Cooling*™ system at this site is estimated to be 12 months.

*Smart Cooling*™ effectively lowered chiller energy consumption under similar temperature and humidity conditions, confirming its ability to enhance system efficiency and reduce operating costs.

Alexander Alzamora

September 20, 2017