



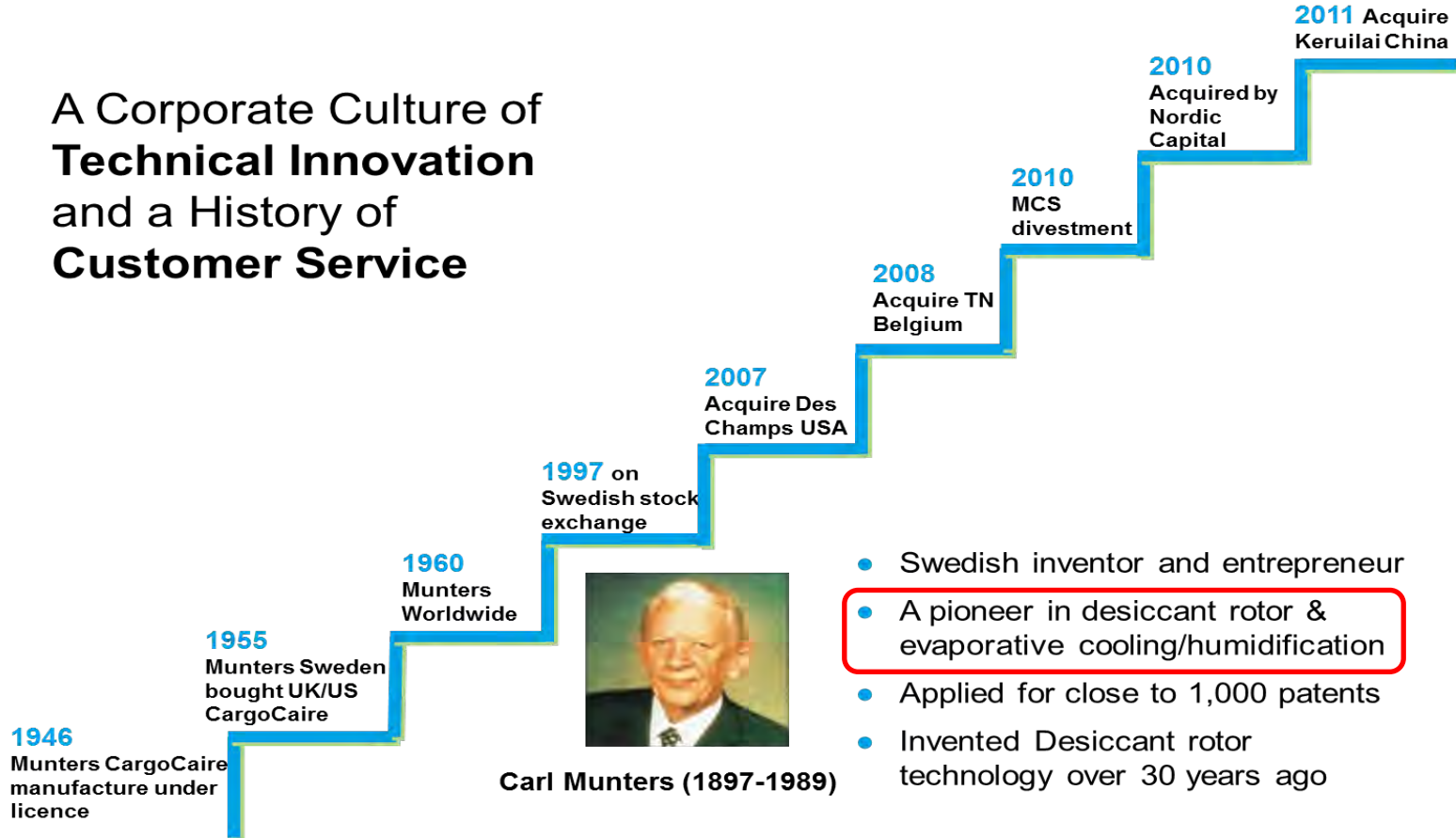
Data Center Solutions: OASIS™ Indirect Evaporative Cooler

Craig MacFadyen

EMEA & APAC Technical Sales Manager Data Center Solutions

Over 50 years of experience in Evaporative Cooling technology

A Corporate Culture of Technical Innovation and a History of Customer Service



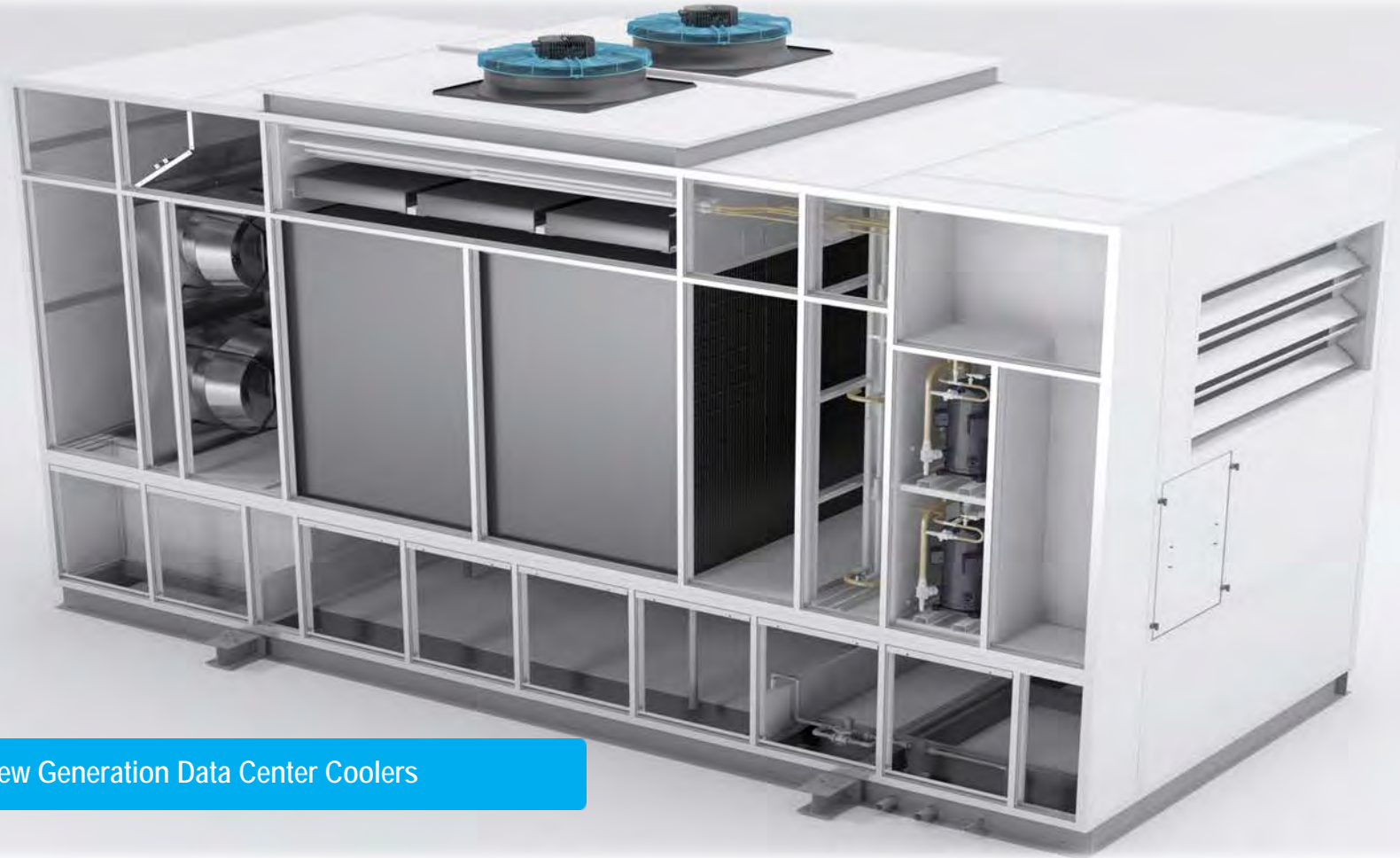
Data Center Key Drivers

- ENERGY USAGE

- FOOTPRINT

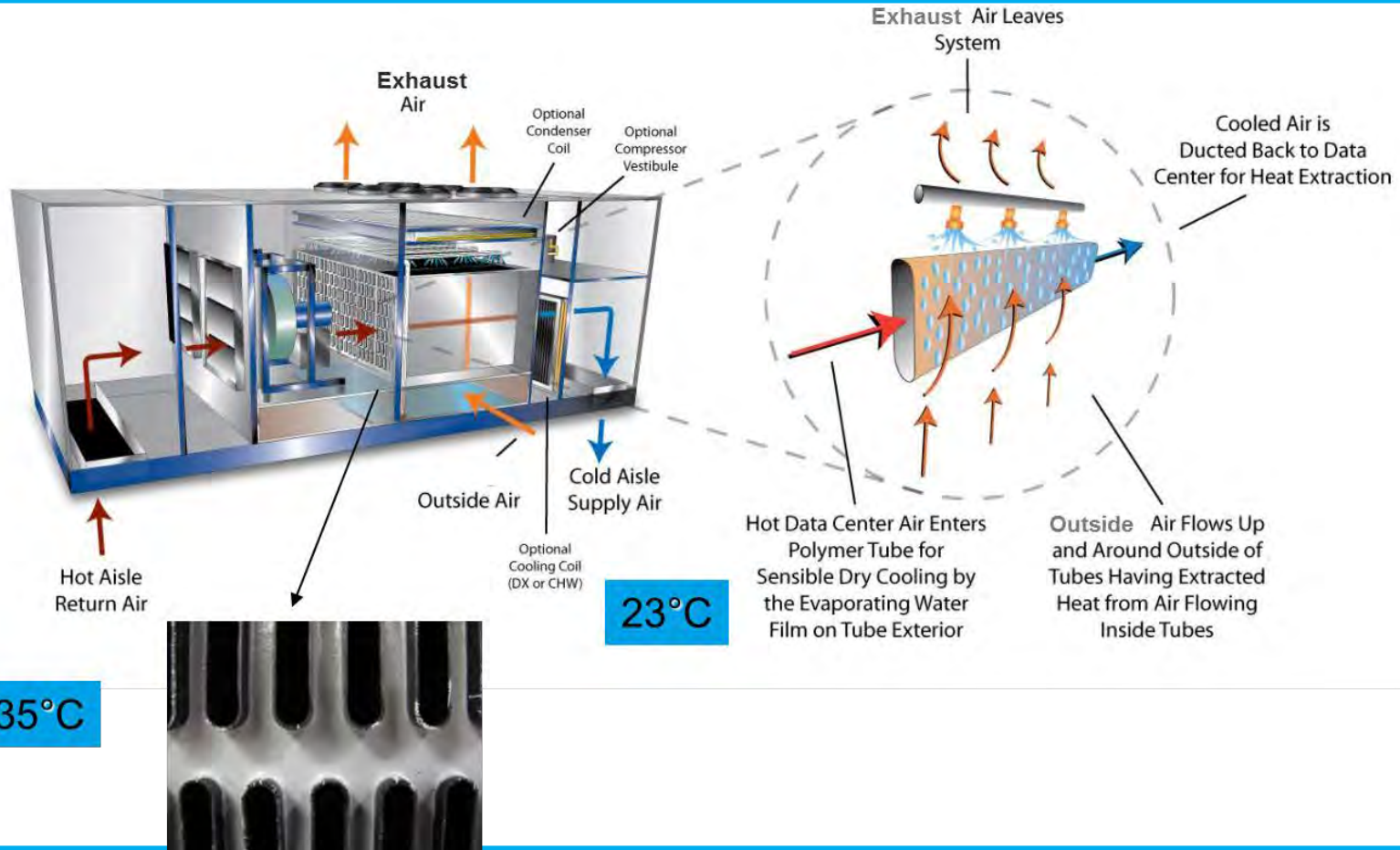
- RELIABILITY

- FLEXIBILITY

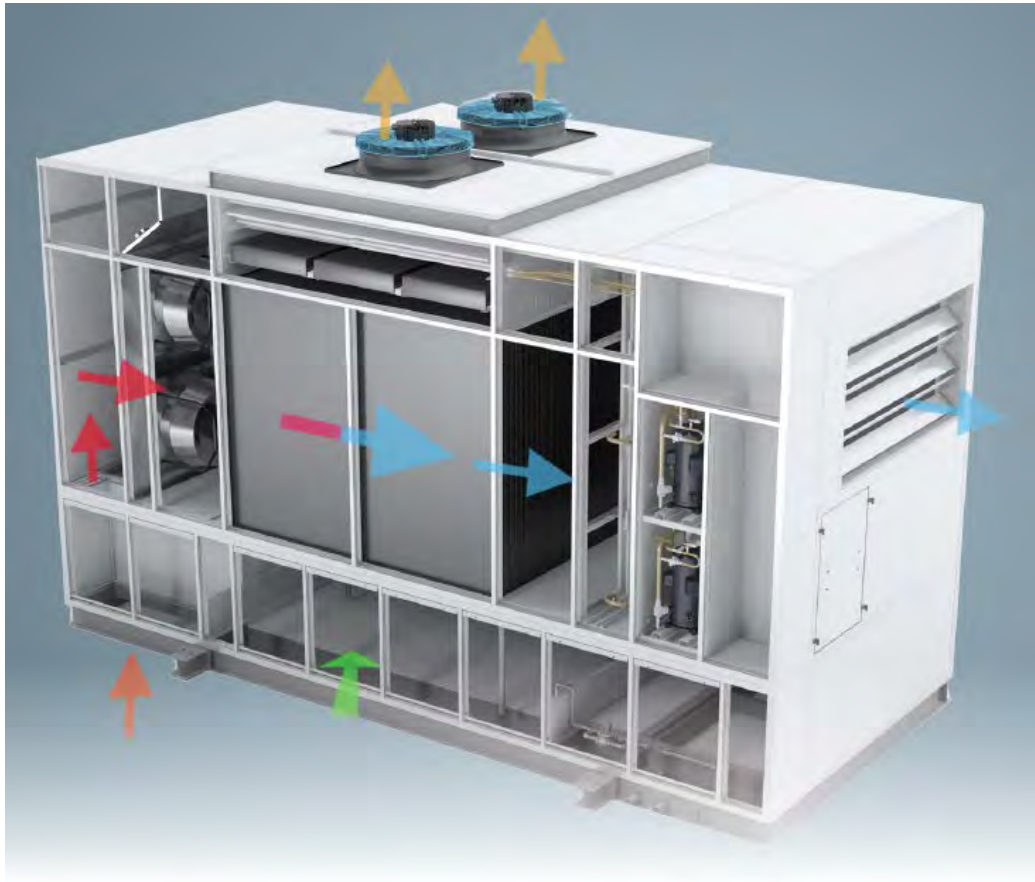


New Generation Data Center Coolers

OASIS™ IEC: EPX Technology



OASIS IEC Working principle



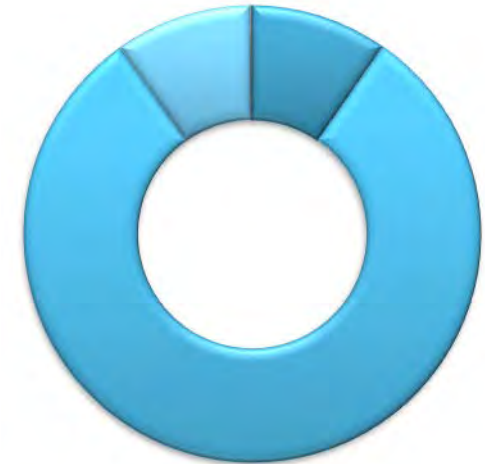


OASIS™ Indirect Evaporative Cooler

Energy Usage within a unit

- Exhaust (scavenger) fans & Pump consume each $\pm 10\%$ AEU
- $\pm 80\%$ of the yearly energy consumption is taken by the supply airstream

⇒ Optimizing the supply airstream = Energy efficient design

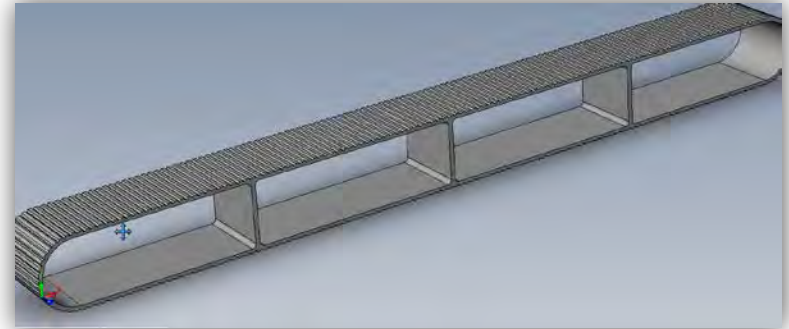


■ E Fans ■ S Fans ■ P ■ C

OASIS Supply Airstream Design

- ✓ Next Generation EPX Technology
 - 40% less pressure drop due to 25% more surface
 - Cooling performance remains
 - Increase surface area
 - Improved tube design to optimize the heat exchange efficiency
 - Results in $\pm 12\%$ drop in energy usage vs current

- ✓ Aerodynamic internal design
 - Reduces resistance in the air path
 - Optimizes fan integration



OASIS Supply Airstream Design

- ✓ Supply fans
 - 3 Different fan wall types
 - 1 high power fan solution
 - All fans in OASIS use EC Motors
 - Optimize fan-motor to each project needs
 - High efficiency @ unit operating point
 - Lower power usage
- ✓ Filters & coil integration uses the full face area
 - Lowest possible pressure drop to save power



Energy Usage – 2MW Hall in Moscow – 24/36 Supply/Return – 11xOasis 200 (N+1)

Mid point temp (°C)	Average temp (°C)	Humidity (g/kg)	Time (h)	Electric energy process fan (kWh)	Electric energy process fan (kW)	Electric energy scavenger fan (kWh)	Electric energy scavenger fan (kW)	Pump energy cooling (kWh)	Pump energy cooling (kW)	Electric energy Dx cooling (kWh)	Electric energy Dx cooling (kW)	Total electric energy (kWh)	Total electric energy (kW)	Water (m³)	Water sewage (m³)	Evaporative cooling (kW)	Dx cooling (kW)
31	30.6	12.36	4	34.9	8.73	43.4	10.85	4	1.00	53.3	13.33	135.6	33.90	1.2	0.24	144.1	51.7
29	28.6	11.48	49	426.1	8.70	523.6	10.69	49	1.00	491.6	10.03	1490.3	30.41	14.5	2.9	155.86	38.12
27	26.8	11.54	69	600.6	8.70	733.6	10.63	69	1.00	616.2	8.93	2019.4	29.27	19.25	3.85	161.97	30.97
25	24.8	10.11	110	954.7	8.68	1147.1	10.43	110	1.00	671	6.10	2882.8	26.21	31.43	6.29	177.92	12.61
23	22.8	9.3	174	1462.4	8.40	1097	6.30	174	1.00	0	0.00	2733.4	15.71	45.96	9.19	184.83	0
21	20.9	9.47	279	2346.5	8.41	1094.9	3.92	279	1.00	0	0.00	3720.4	13.33	65.48	13.1	184.95	0
19	18.9	8.88	425	3574.9	8.41	863.7	2.03	425	1.00	0	0.00	4863.6	11.44	91.4	18.28	185.19	0
17	16.9	8.89	518	4363	8.42	941.5	1.82	518	1.00	0	0.00	5822.5	11.24	104.86	20.97	185.29	0
15	14.9	8.04	573	4826.3	8.42	810.9	1.42	573	1.00	0	0.00	6210.2	10.84	110.37	22.07	184.38	0
13	13	7.22	634	5337.1	8.42	597.5	0.94	634	1.00	0	0.00	6568.5	10.36	117.81	23.56	184.3	0
11	10.9	6.6	650	5466.8	8.41	421.9	0.65	650	1.00	0	0.00	6538.7	10.06	116.82	23.36	184.35	0
9	9	5.91	522	4391.9	8.41	237.1	0.45	522	1.00	0	0.00	5151	9.87	91.82	18.36	184.25	0
7	7	5.07	485	4087.5	8.43	171	0.35	485	1.00	0	0.00	4743.5	9.78	83.95	16.79	184.32	0
5	4.9	4.2	420	3544.2	8.44	1257.7	2.99	0	0.00	0	0.00	4801.8	11.43	0	0	183.59	0
3	2.8	3.85	644	5444.8	8.45	1396.3	2.17	0	0.00	0	0.00	6841.1	10.62	0	0	183.53	0
1	1	3.47	726	6156.2	8.48	1220.4	1.68	0	0.00	0	0.00	7376.6	10.16	0	0	183.43	0
-1	-1.1	2.84	559	4718.2	8.44	805.9	1.44	0	0.00	0	0.00	5524.1	9.88	0	0	184.03	0
-3	-2.9	2.37	511	4308.3	8.43	676.6	1.32	0	0.00	0	0.00	4984.9	9.76	0	0	184.05	0
-5	-5.1	1.93	360	3028.2	8.41	411.2	1.14	0	0.00	0	0.00	3439.3	9.55	0	0	183.27	0
-7	-6.9	1.65	263	2214.4	8.42	251.9	0.96	0	0.00	0	0.00	2466.3	9.38	0	0	183.16	0
-9	-8.9	1.43	187	1564	8.36	152.9	0.82	0	0.00	0	0.00	1716.9	9.18	0	0	183.07	0
-11	-11	1.17	171	1439.8	8.42	120.7	0.71	0	0.00	0	0.00	1560.4	9.13	0	0	183.16	0
-13	-13	0.97	89	745.2	8.37	53.1	0.60	0	0.00	0	0.00	798.3	8.97	0	0	182.93	0
-15	-15	0.8	140	1165	8.32	70.1	0.50	0	0.00	0	0.00	1235.1	8.82	0	0	182.87	0
-17	-17	0.68	121	1001.6	8.28	54.6	0.45	0	0.00	0	0.00	1056.2	8.73	0	0	182.89	0
-19	-18.9	0.59	39	323.6	8.30	16.1	0.41	0	0.00	0	0.00	339.7	8.71	0	0	182.76	0
-21	-20.9	0.5	23	190.9	8.30	8.6	0.37	0	0.00	0	0.00	199.5	8.67	0	0	182.7	0
-23	-23.2	0.4	12	98.8	8.23	4	0.33	0	0.00	0	0.00	102.8	8.57	0	0	182.59	0
-25	-24.2	0.35	3	25.4	8.47	1	0.33	0	0.00	0	0.00	26.4	8.80	0	0	182.76	0
Unit Totals			8760	73841.3		15184.3		4492		1832.1		95349.3		894.85	178.96		
Site Total												1048842.3		9843.4	1968.56		

Typical Energy Use with Chiller/CRAC with COP of 3 would be 5,840,000 kWh – Above uses approx 1,050,000 kWh – a saving of 82%

OASIS™ IEC Range overview

OASIS 100



< 125.00 kW

10000 - 24000 Sm³/h

5.92 x 1.36 x 4.17 m / 8.05 m²

OASIS 200



< 240.00 kW

22000 - 48000 Sm³/h

5.92 x 2.58 x 4.17 m / 15.27 m²

OASIS 300



< 365.00 kW

32000 - 72000 Sm³/h

5.92 x 3.94 x 4.17 m / 23.32 m²

OASIS 400

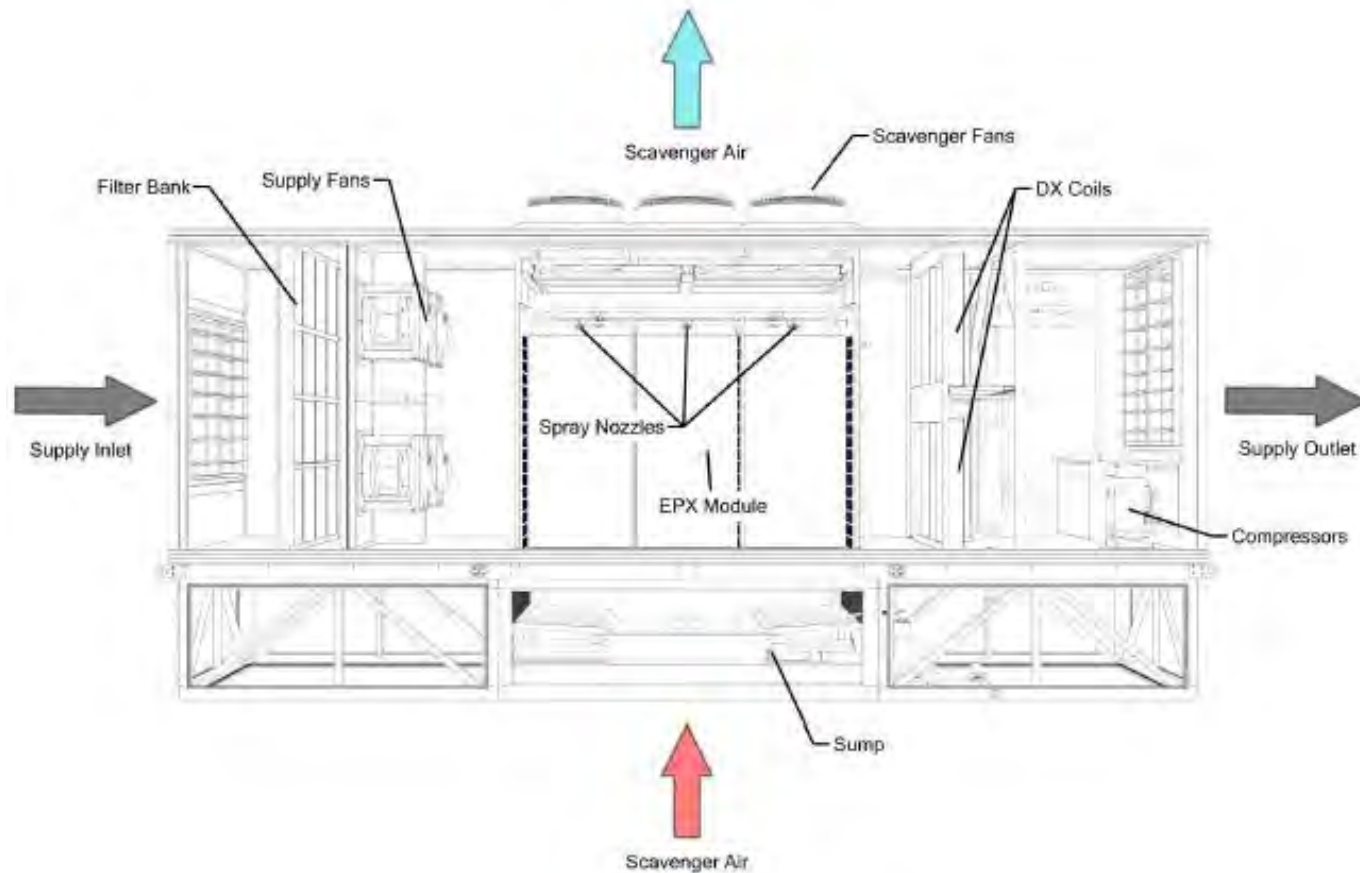


< 480.00 kW

44000 - 96000 Sm³/h

5.92 x 5.16 x 4.17 m / 30.55 m²

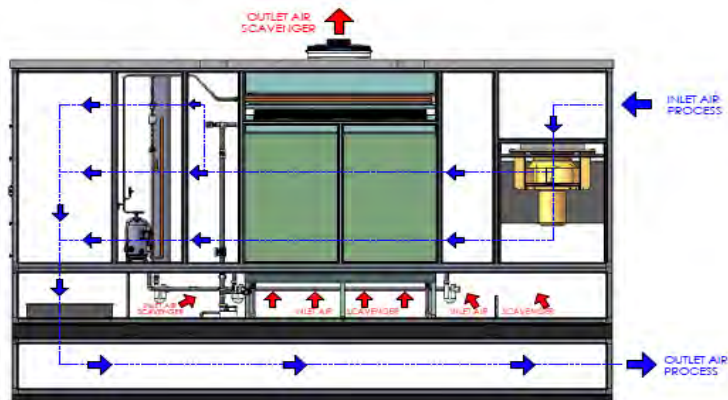
Oasis DCiE



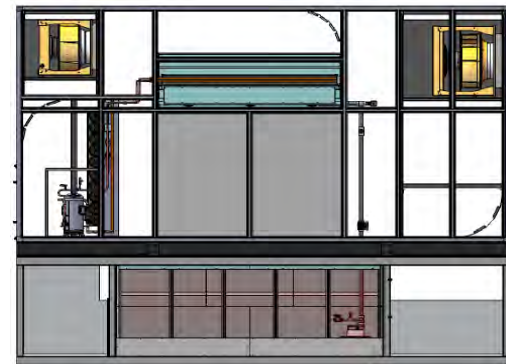
OASIS™ IEC Range overview: Direct Perimeter Connection

Return Plenum

BACK VIEW

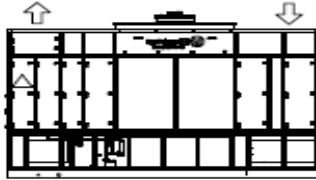


Full Side Flow

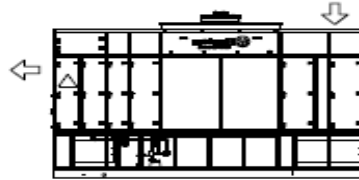


OASIS™ IEC Range overview: Connections

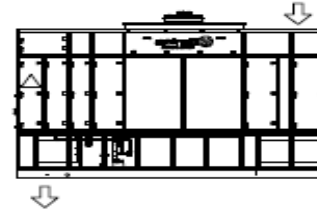
TOP - TOP



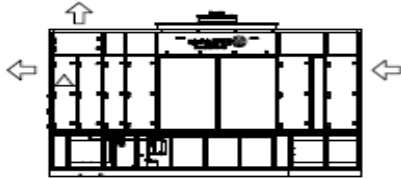
TOP - SIDE



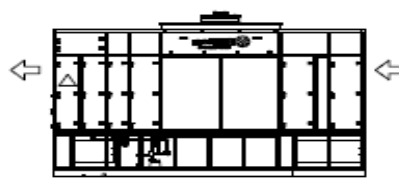
TOP - BOTTOM



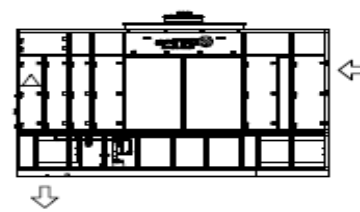
SIDE - TOP



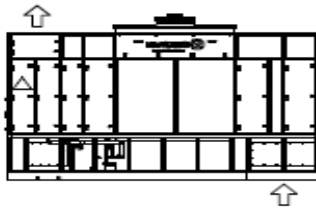
SIDE - SIDE



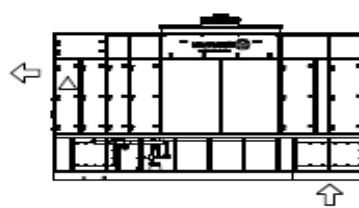
SIDE - BOTTOM



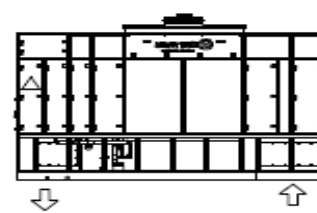
BOTTOM - TOP



BOTTOM - SIDE



BOTTOM - BOTTOM



Free Cooling Options

- **Direct Evaporative Solutions:**
 - Evaporative Pads – GlasDek, CellDek, DataDek
 - FA6 – standard “Wet Sections”
 - WetDek - customized “Wet Sections”
 - Standalone Humimax evaporative coolers
 - Custom, large scale AHU Airside Economizers
- **Indirect Evaporative Solutions:**
 - Oasis Indirect Evaporative Coolers
 - TelcOasis for Telecoms applications
 - DCiE Indirect Evaporative Coolers
 - Customized IEC units, for maximum flexibility
- **Make-up Air Solutions (MUA)**
 - Modular MUA's, controlling humidity and filtration
- **Other Custom Solutions**
 - Fluid Coolers
 - Airside Economizers with Heat Wheels



Data Center Test Facility

- ✓ Leakage testing
- ✓ Controls and Alarm simulation testing
- ✓ A visual inspection of the unit
- ✓ Variable load/performance testing, 1.7°C up to 33°C WB
- ✓ Real server rack simulation over 300kW load



Tests performing in accordance
with ASHRAE-std143-2015

Fully Calibrated & Certified by
LEUVEN KUL University

Existing Installations

DataInn, Lithuania – Oasis IEC key to advanced cost efficiency



“Munters cooling solutions enable us to achieve an annual PUE of 1.3 or less, which will make us very cost-effective and competitive in the market.

Every 0.01 reduction in our PUE represents an energy saving of approximately 210,000 kWh in our data centre.”

- Secure, reliable data hall climate
- Data centre air fully separated from outside air
- 65% lower energy than common free cooling solutions
- 25% reduction in generator s



Data Inn Development Manager Edvinas Bakanas, says:

“The Lithuanian electric energy sector, data communication operators and biggest banks need their data to be safe and accessible without interruptions, as well as cost-effective and eco friendly. The high efficiency and innovative design were our main reasons for choosing Munters’ Oasis™ IEC”

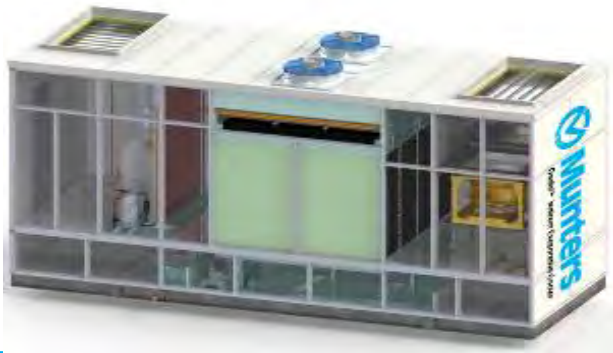
“The proven technology fits well with the climate conditions in Vilnius and offers a high degree of flexibility, operating in different cooling modes – depending on weather conditions.”

DigiPlex Oslo – Largest Indirect Evaporative Cooled DC in Europe

Energy efficiency of 1.12 PUE

DigiPlex

- Annual pPUE of 1.06
- Data centre air fully separated from outside
- Lower capital costs on refrigeration/switchgear
- 52 Oasis IEC 200's



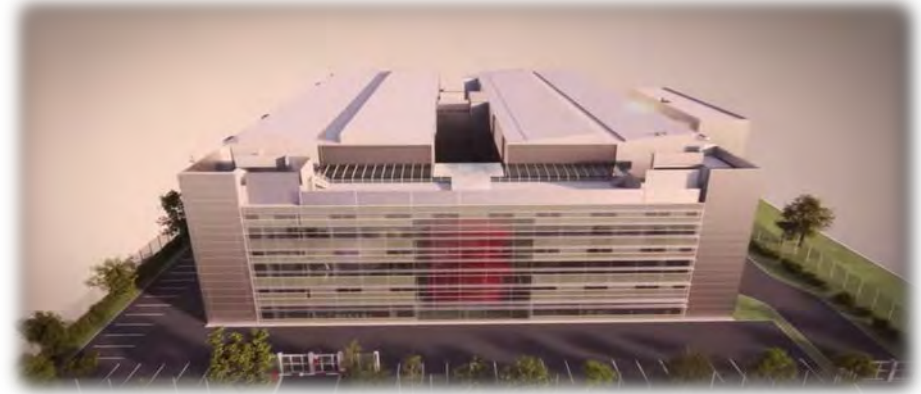
Greg McCulloch DigiPlex's Chief Operating Officer:

"Driving energy efficiency in our industry is a major focus for us and this system halves the amount of energy used to keep our servers working at an ideal temperature."

"This not only helps save our customers thousands of pounds in energy costs but also ensures that our facilities are amongst the most sustainable in the sector"

Summary Equinix LD6

- One of the most energy efficient data centres in Equinix Portfolio
- 8,000m²
- Two three-storey, air-cooled buildings, for Phase 1
 - 2,770 Cabinets
 - 8MW IT Load
 - 40 x Munters Oasis IEC on Phase 1
 - Aim to become accredited to LEED Platinum Level
 - Predicted cooling pPUE 1.06
 - Predicted project PUE1 1.2
 - Building Innovative design
 - Mechanical plant on top level to be closer to the airflow entry
 - Rainwater harvesting system



Thank You

Thank You

Any questions, please come and see us at Munters Stand