



Chillventa 2016

CHILLERS, AIR-CONDITIONING & HT HEAT PUMPS

Honeywell

Buy Only From Authorised Dealers



PROTECT YOURSELF

Don't put your business at risk. Purchase F-gas compliant refrigerants here.

Honeywell
Authorised Dealer

 Report Unlawful Distribution



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F-gas target ~80% emissions reduction by 2030

>10million CO₂e illegal entries in EU28

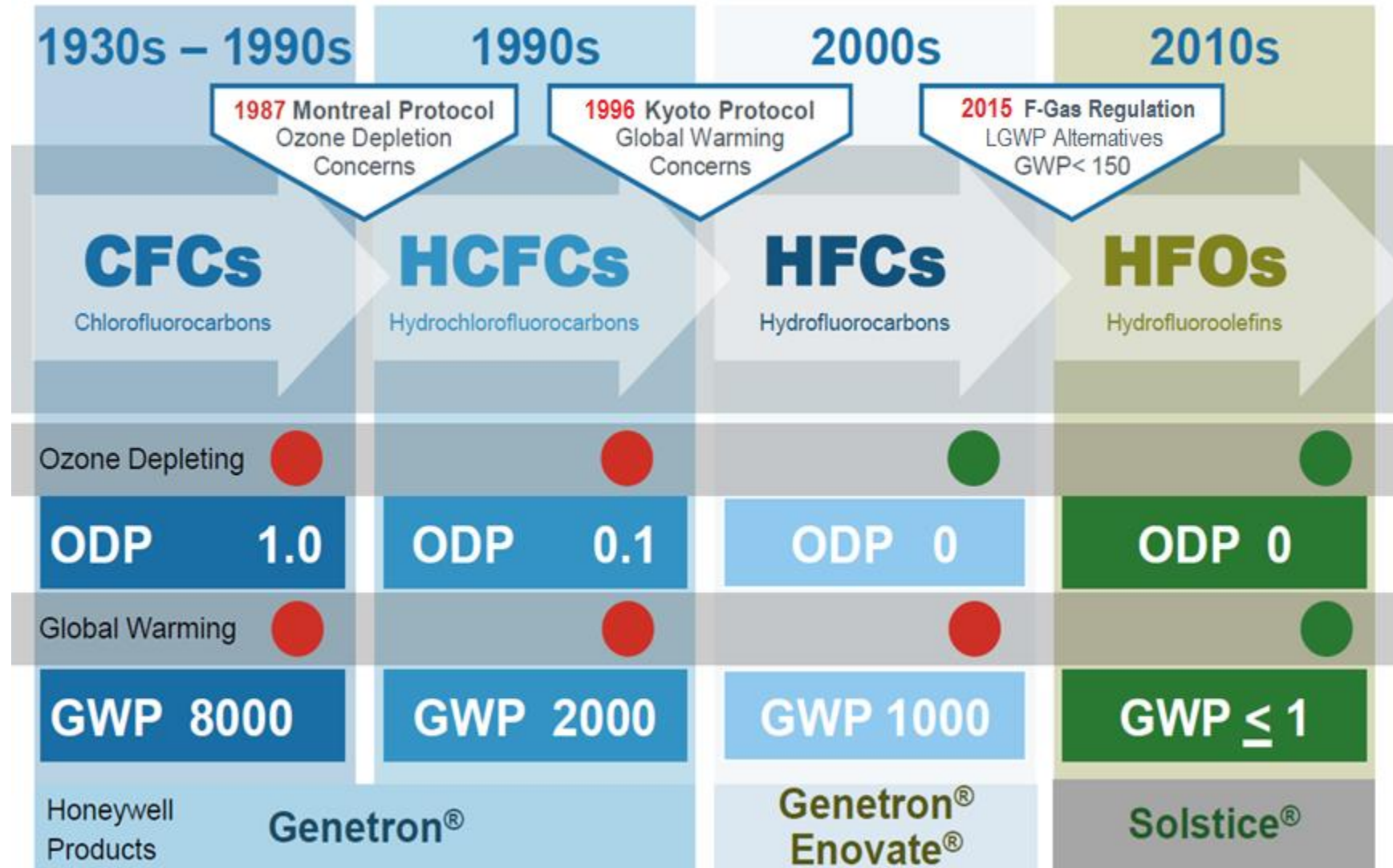
Missing EU environmental targets

Business and safety risks

Delayed development of "greener" technologies

Avoid black market: Validate the supply chain

Honeywell: History Of Innovation



Solstice® Refrigerants: Key For Your Future

Solstice® HFO Molecules

Potential Application	Current Solution	Non-flammable (A1)	Mildly Flammable (A2L)
Low Pressure Centrifugal Chillers	R-123 GWP = 79	Solstice® zd GWP* = 1	
Automobile A/C, Vending Machines	R-134a GWP = 1300		Solstice® yf GWP* < 1
Medium Pressure Chillers/Heat Pumps, Appliances, Water Heaters			Solstice® ze GWP* < 1
High Temperature Heat Pumps, Waste Heat / ORC	R-245fa GWP = 858	Solstice® zd GWP* = 1	

Today

Solstice® Blends

Potential Application	Current Solution	Non-flammable (A1)	Mildly Flammable (A2L)
Medium Pressure Chillers/Heat Pumps, Appliances, Water Heaters	R-134a GWP = 1300	Solstice® N13 (R-450A) GWP* = 547	
High Pressure Chillers/Heat Pumps, Air-Conditioning (Split/VRF/Rooftop)	R-410A GWP = 1923		Solstice® L40X (R-455A) GWP* = 145
High Temperature Air-conditioning / Process Chillers	R-22 GWP = 1760		Solstice® L41y (R-452B**) GWP* = 675
			Solstice® L20 (R-444B**) GWP* = 295

Coming Soon

*IPCC, AR5

** Provisionnel ASHRAE number

SOLSTICE® HIGH PERFORMANCE SOLUTIONS

The Future of Refrigerants

GWP <750

A1

Solstice® N13 (R-450A)

A2L

Solstice® L20 (R-444B)

Solstice® L41y (R-452B)

GWP <150

A1

Solstice® zd (R-1233zd)

Watch for our new A1,
GWP<150 refrigerants
under development

A2L

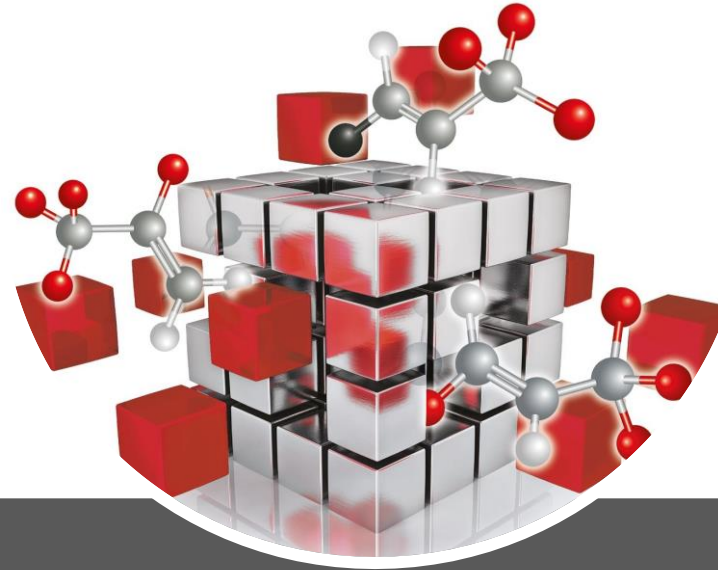
Solstice® ze (R-1234ze)

Solstice® yf (R-1234yf)

Solstice® L40X (R-455A)

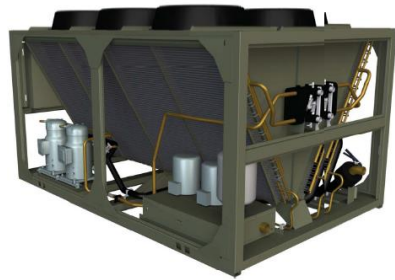
Did you know that:

- HFOs are NOT considered fluorinated greenhouse gases
 - Solstice® ze
 - Solstice® zd
 - Solstice® yf



Chiller Applications

Chiller Applications



Scroll Chiller
(High Pressure)



Screw Chiller
(Medium Pressure)



Centrifugal Chiller
(Low Pressure)

Solstice® HFO Molecules/Blends - Recommendation By Application

Application	Current Solution	Non-flammable (A1)	Mildly Flammable (A2L)
Centrifugal Chiller (Low Pressure)	R-123 GWP = 79	Solstice® zd GWP* = 1	
Screw Chiller (Medium Pressure)	R-134a GWP = 1300	Solstice® N13 (R-450A) GWP* = 547	Solstice® ze GWP* < 1
Scroll Chiller (High Pressure)	R-410A GWP = 1923		Solstice® L41y (R-452B**) GWP* = 675
			Solstice® L40X (R-455A) GWP* = 145

*IPCC, AR5

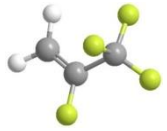
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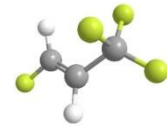
Multiple options for chillers – available today

Solstice[®] zd / ze

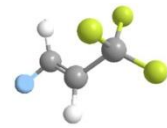
Solstice[®] Family



Solstice[®] yf



Solstice[®] ze



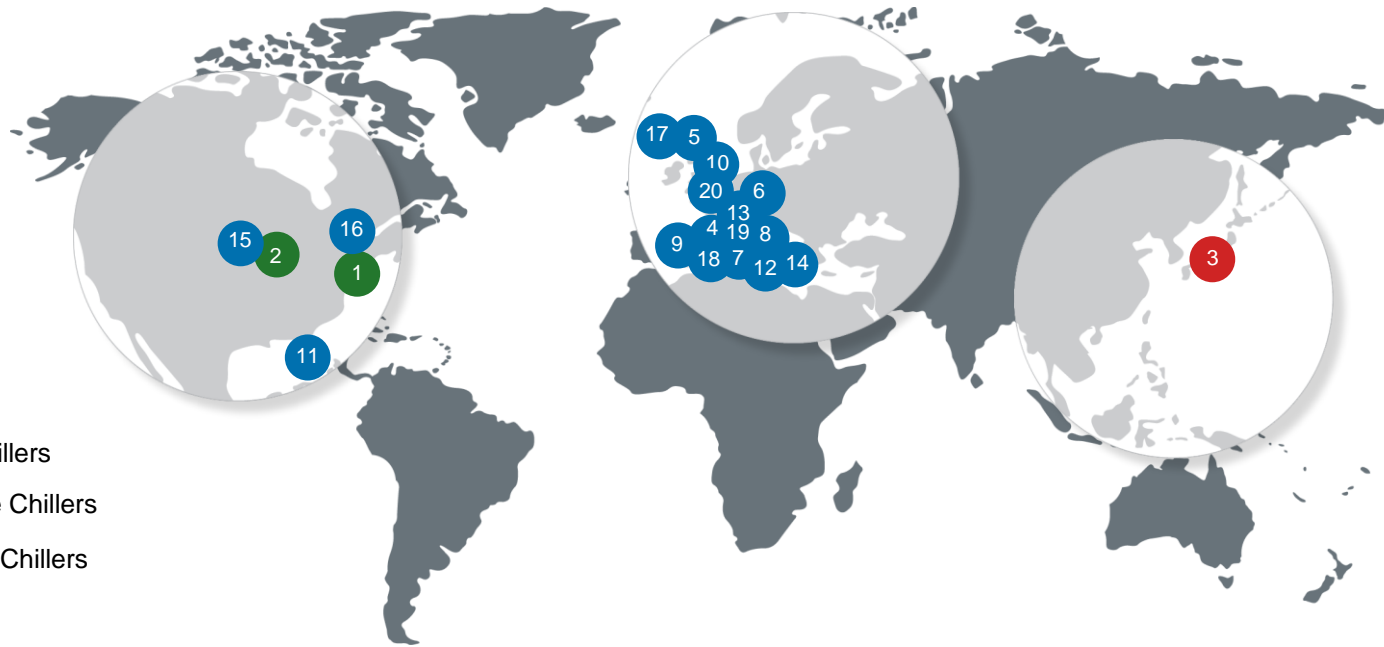
Solstice[®] zd

Commercialized; Plants operating

- Environment: GWP of ≤ 1
- Performance: Higher Cooling & Heating Efficiency
- Safety: Meet Safety Requirements
- Cost: Near Drop-in Replacement
- Carrier & Trane + 18 major manufacturers launched Solstice[®] ze /zd chillers

Honeywell is the only company that produces all 3 molecules on a commercial production scale.

Recent LGWP Chiller Launches



- Solstice® zd Low Pressure Chillers
- Solstice® ze Medium Pressure Chillers
- Solstice® zd and Solstice® ze Chillers

<p>1 </p> <p>2 </p> <p>3 </p> <p>4 </p>	<p>5 </p> <p>6 </p> <p>7 </p> <p>8 </p>	<p>9 </p> <p>10 </p> <p>11 </p> <p>12 </p>	<p>13 </p> <p>14 </p> <p>15 </p> <p>16 </p>	<p>17 </p> <p>18 </p> <p>19 </p> <p>20 </p>
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Locations noted are the headquarters of the companies; launches are primarily focused in Europe

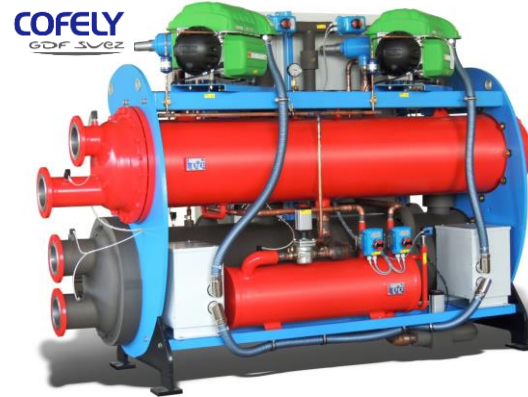
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The industry has chosen Solstice® ze/zd as the new standard

Solstice® ze/zd In Chiller Applications



Solstice® ze centrifugal chiller
RC, Turbocor Compressor



Solstice® ze centrifugal chiller
Cofely, Turbocor Compressor



Solstice® ze Turbochill
Airedale, Turbocor Compressor



Solstice® ze centrifugal chiller
Rhoss, Turbocor Compressor



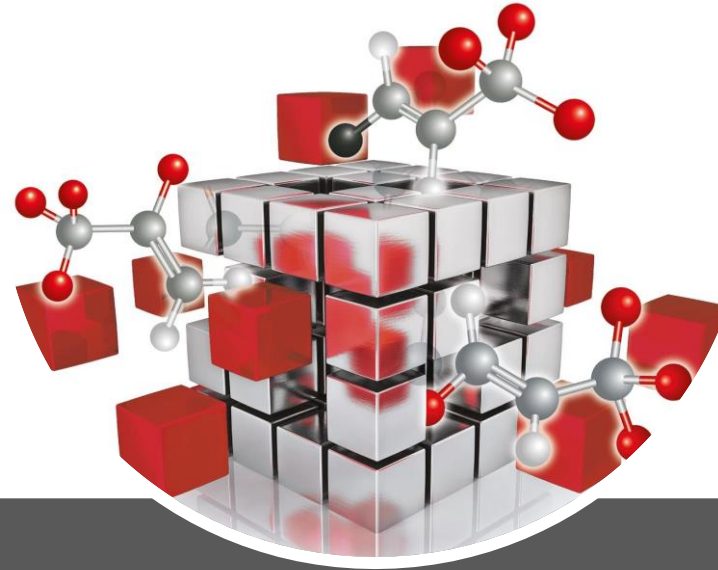
Solstice® ze screw chiller
Blue Box, Bitzer



Solstice® zd centrifugal chiller
Trane, Centrifugal Compressor



Solstice® zd centrifugal chiller
Mitsubishi, Centrifugal Compressor



High Temperature Heat Pump Applications

High Temperature Heat Pump Applications



HPTD / HPDW



District H/C



Waste Heat (ORC)

Application	Current Solution	Nonflammable (A1)	Mildly Flammable (A2L)
District Heating/Cooling	R-134a GWP = 1300		Solstice[®] ze GWP* < 1
Waste Heat Recovery/ORC	R-245fa GWP = 858	Solstice[®] zd GWP* = 1	
HPTD / HPDW	R-134a GWP = 1300	Solstice[®] N13 (R-450A) GWP* = 547	Solstice[®] ze GWP* < 1

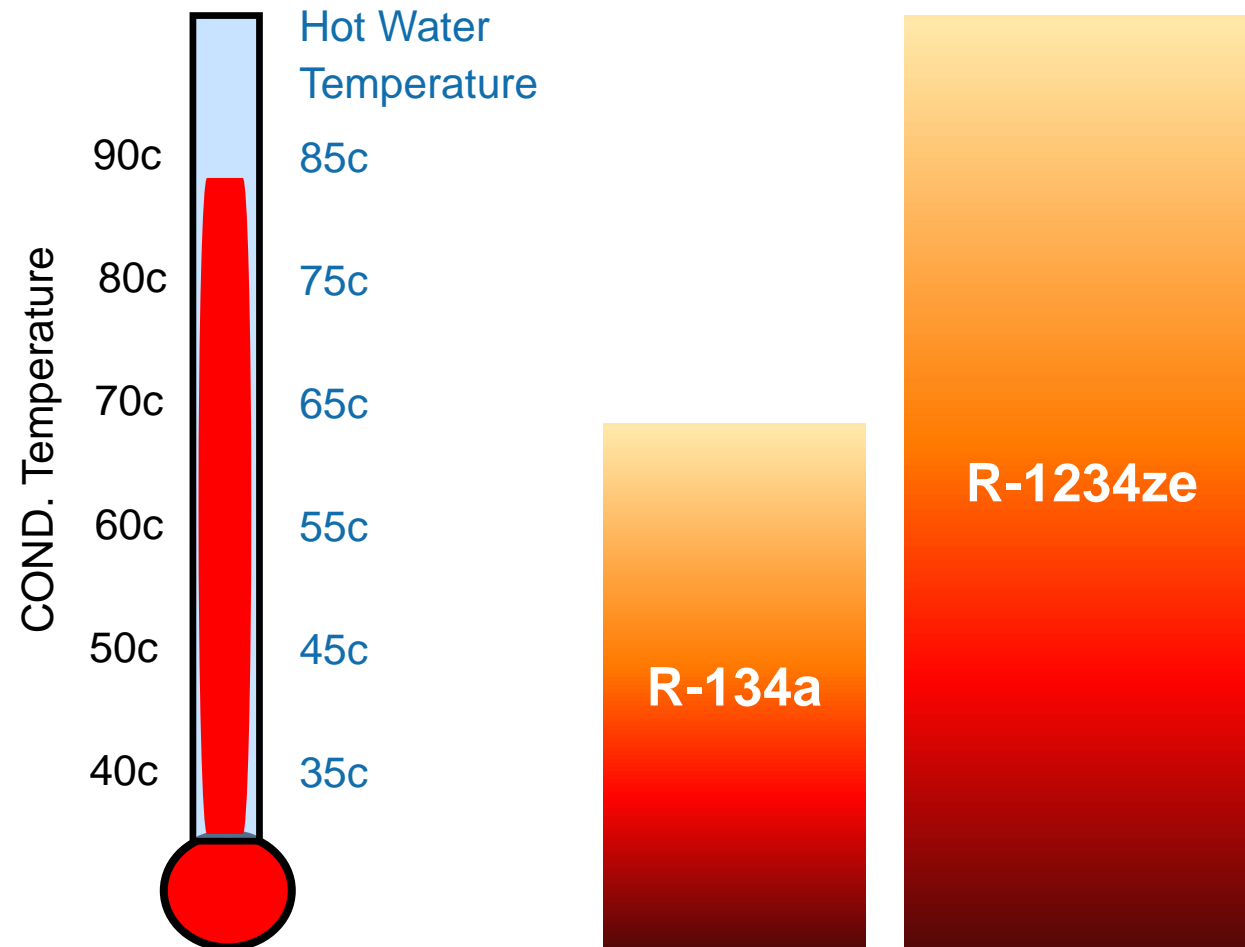
*IPCC, AR5

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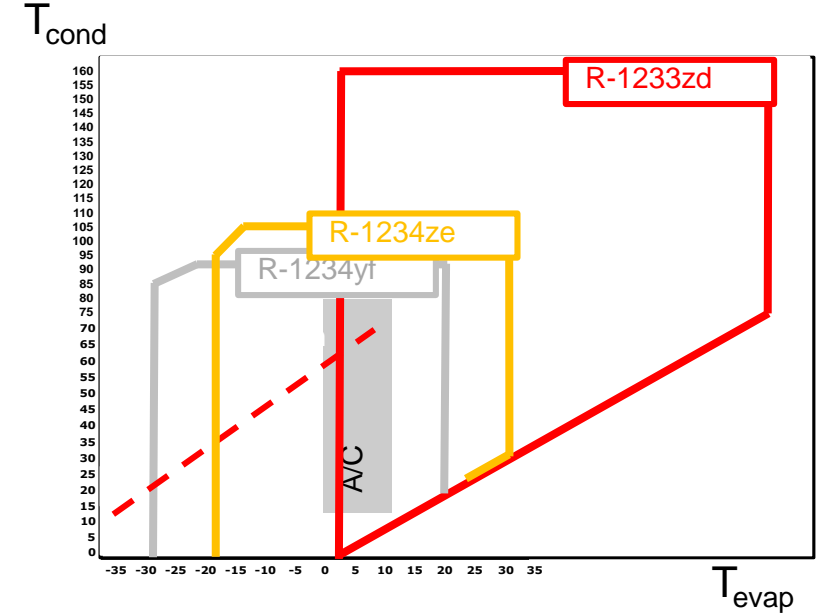
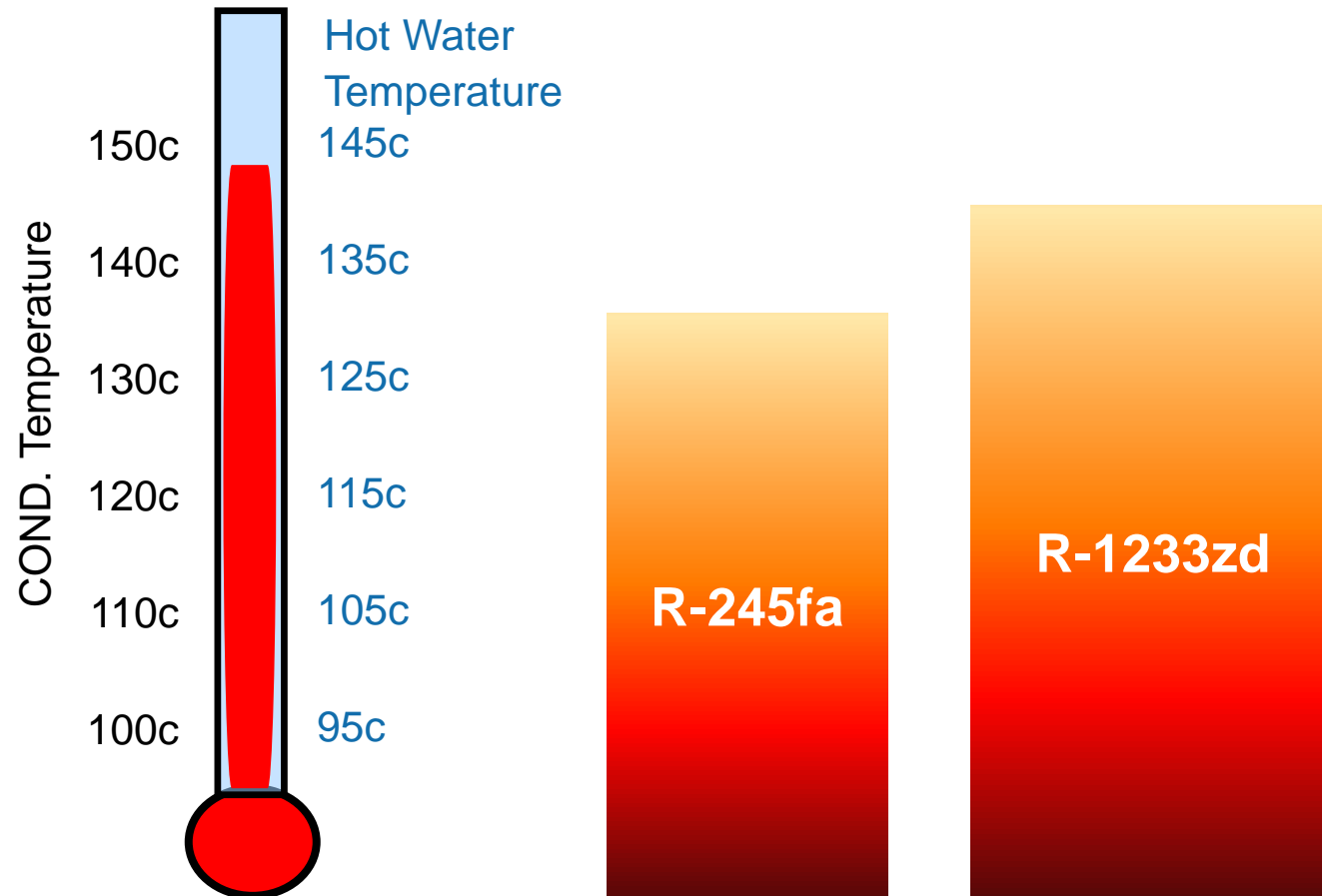
Solstice[®] ze/zd can open a new High Temp market

Solstice[®] ze Vs R-134a In District H/C And HPTD Applications



Solstice[®] ze outperforms R-134a achieving higher efficiency (up to 5%), higher T_{cond} (105°C) and 99.9% lower GWP!

Solstice[®] zd Vs R-245fa In ORC/Industrial Applications



Solstice[®] zd creates new HTHP opportunities with highest T_{evap} and T_{cond} !

Solstice[®] ze/zd Open A New Door To HTHP Market




District heating & cooling (16.4MW)

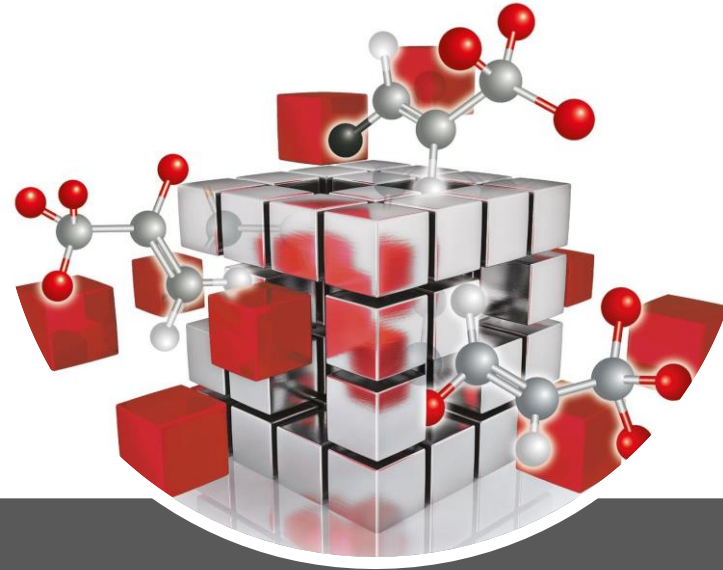


Waste heat HP (280kW)



clauger 

Food processing (200kW)



Air-Conditioning Applications

Air-Conditioning Applications



VRF



Split



Air to Water HP

Solstice® Blends - Recommendation By Application			
Application	Current Solution	Non-flammable (A1)	Mildly Flammable (A2L)
VRF	R-410A GWP = 1923		Solstice® L40X (R-455A) GWP* = 145
			Solstice® L41y (R-452B**) GWP* = 675
Split	R-410A GWP = 1923 R-22 GWP = 1760 R-407C GWP = 1624 R-32 GWP = 675		Solstice® L20 (R-444B**) GWP* = 295
			Solstice® L41y (R-452B**) GWP* = 675
			Solstice® L40X (R-455A) GWP* = 145
			Solstice® L41y (R-452B**) GWP* = 675
A2W Heat Pump	R-410A GWP = 1923		Solstice® L41y (R-452B**) GWP* = 675
			Solstice® L40X (R-455A) GWP* = 145

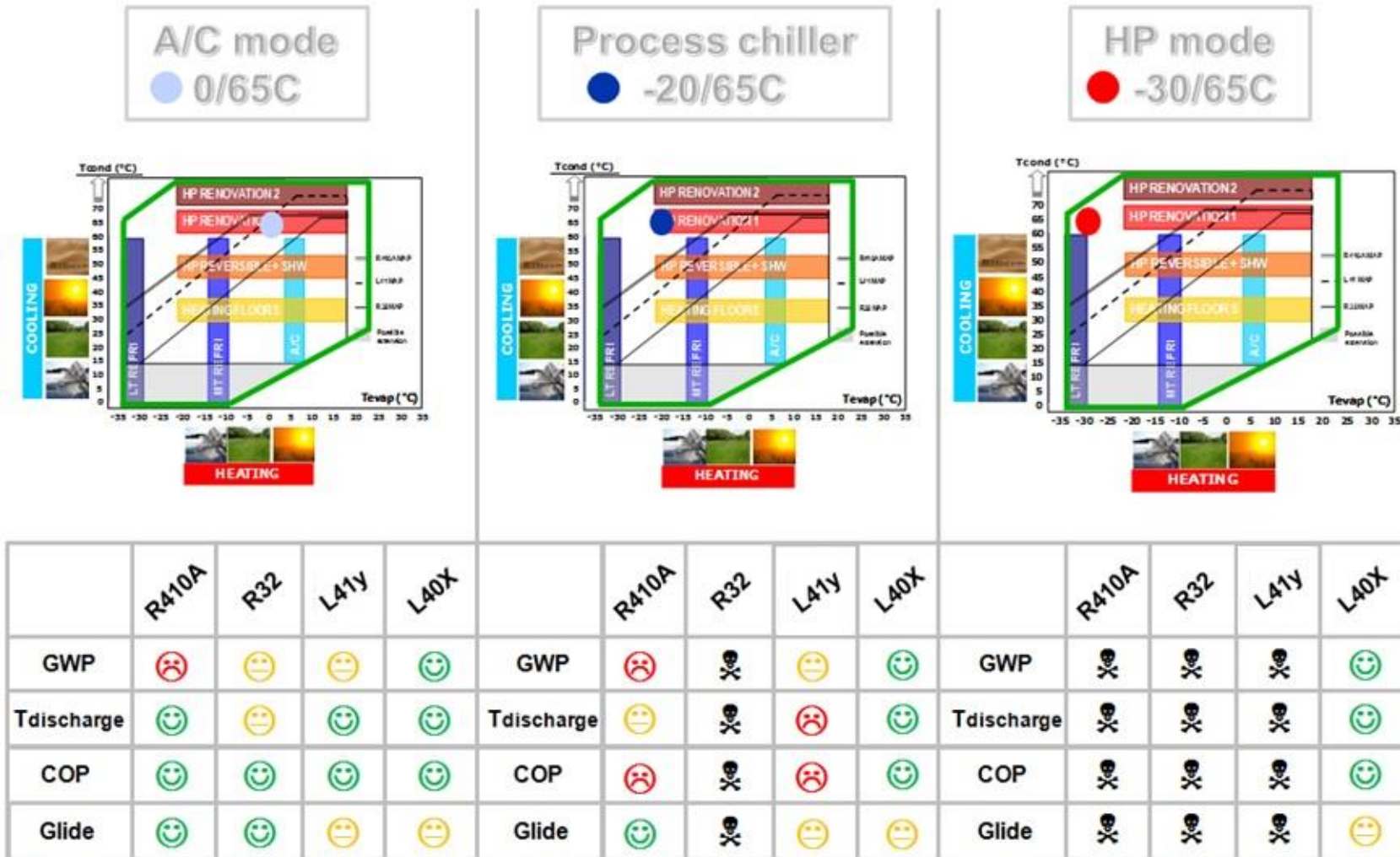
*IPCC, AR5

** Provisionnel ASHRAE number

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Solstice® L40X is the most optimized R-410A replacement solution

R-410A Replacement For Different Operating Modes



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Solstice® L40X can cover all applications

Solstice® Refrigerants Roadmap

AIR CONDITIONING / INDUSTRIAL

HEAT PUMPS / INDUSTRIAL

TRADITIONAL: R-407C / R-410A / R-134a / R-22 / R-123

USE

Chillers
 Roof tops
 Split systems
 VRF
 Data centers
 District cooling
 Milk cooling
 Apple storage ...

FUTURE

- **R-1234ze** (<1, A2L)*
- **R-1233zd** (1, A1)
- **R-455A** (145, A2L)
- **R-452B** (676, A2L)
- **R-444B** (295, A2L)

TRADITIONAL: R-410A / R-134a

USE

District heating
 Boilers
 Water heaters
 Distillation
 Sterilization
 Laundering
 Clothes driers ...

FUTURE

- **R-1234ze** (<1, A2L)
- **R-1233zd** (1, A1)
- **R-455A** (145, A2L)

TRADITIONAL: R-404A / R-507 / R-134a / R-22

USE

Supermarkets
 Cold rooms
 Self-contained
 Process chiller
 Ice machine
 Warehouses
 Food processing
 Food-service
 Transport ...

FUTURE

- **R-407F** (1674, A1)
- **R-448A** (1273, A1)
- **R-455A** (145, A2L)
- **R-1234ze** (<1, A2L)
- **R-450A** (547 A1)

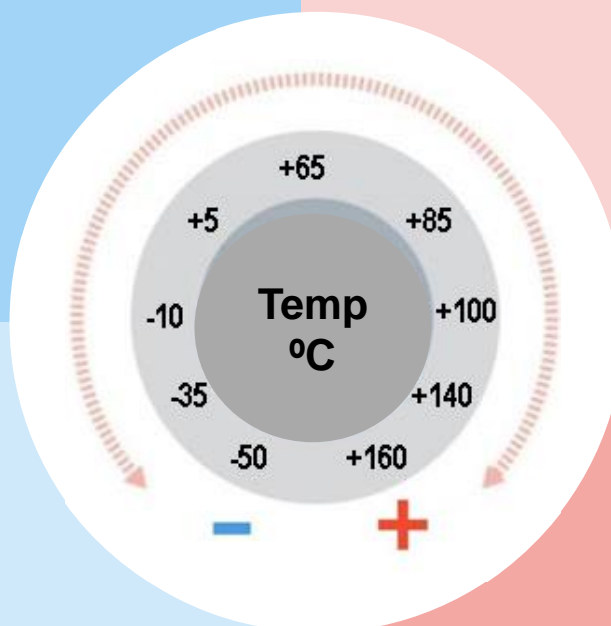
TRADITIONAL: R-134a / R-245fa

USE

ORC
 Drying
 Cooking
 Vaporizing
 Distillation
 Food processes
 Chemical processes ...

FUTURE

- **R-1233zd** (1, A1)

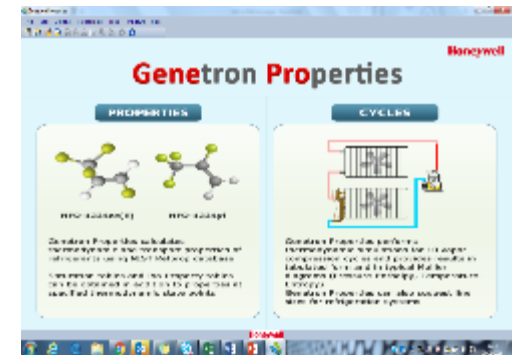


REFRIGERATION

ORC / INDUSTRIAL

Honeywell Apps, Online And Software Tools

- Genepro simulation software
- PT chart
- Refrigerants selection
- Components chart for Solstice[®]
- Website
- LinkedIn
- Slideshare
- Savings calculator Genetron Performax[®] LT
- Savings calculator Solstice[®] N40
- etc...



GET ACCURATE DATA

For decision-making on the go with Honeywell mobile applications.



Honeywell