



R1234YF AFTERMARKET US ADOPTION UPDATE

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FEBRUARY 2021

Honeywell

HONEYWELL OVERVIEW

NYSE: HON \$35B Sales | ~970 sites | ~110,000 employees | Charlotte, N.C. headquarters | Fortune 100



AEROSPACE

More fuel-efficient aircraft. More direct and on-time flights. Safer skies and airports. We're found on virtually every commercial, defense and space aircraft.



BUILDING TECHNOLOGIES

Over 100 years ago, we defined energy efficiency by making indoor comfort automatic. Today, we redefine it in 10 million buildings using our technology.



PERFORMANCE MATERIALS & TECHNOLOGIES

We pioneered automation control. So we understand complex industrial facilities, and **how to create high-quality and high-performance chemicals** and materials.



SAFETY & PRODUCTIVITY SOLUTIONS

Each year, we keep over half a billion workers safer and more productive with voice-enabled software, barcode scanners, mobile computers and protective equipment.

Innovating For More Than 100 Years – And Now We're Creating What's Next

FLUORINE PRODUCTS PROFILE

Investing in
R&D to help
our customers
solve difficult
environmental
challenges



Honeywell Fluorine Products is the leader in the development and commercialization of low-global-warming-potential refrigerants with **99.9% lower global warming impact** than the previous generation of materials like R-134a.

AC Markets

- **Automotive air conditioning**
 - OEM
 - Aftermarket
- Residential and Commercial air conditioning
- Commercial refrigeration (supermarkets, conv. stores)
- Transport refrigeration



Products / Services

- **Solstice® 1234yf**
 - Bulk
 - Returnable cylinders
 - Disposable jugs
 - 8 oz cans
- Genetron® R-134a
 - Bulk

FLUORINE PRODUCTS HISTORY OF INNOVATION

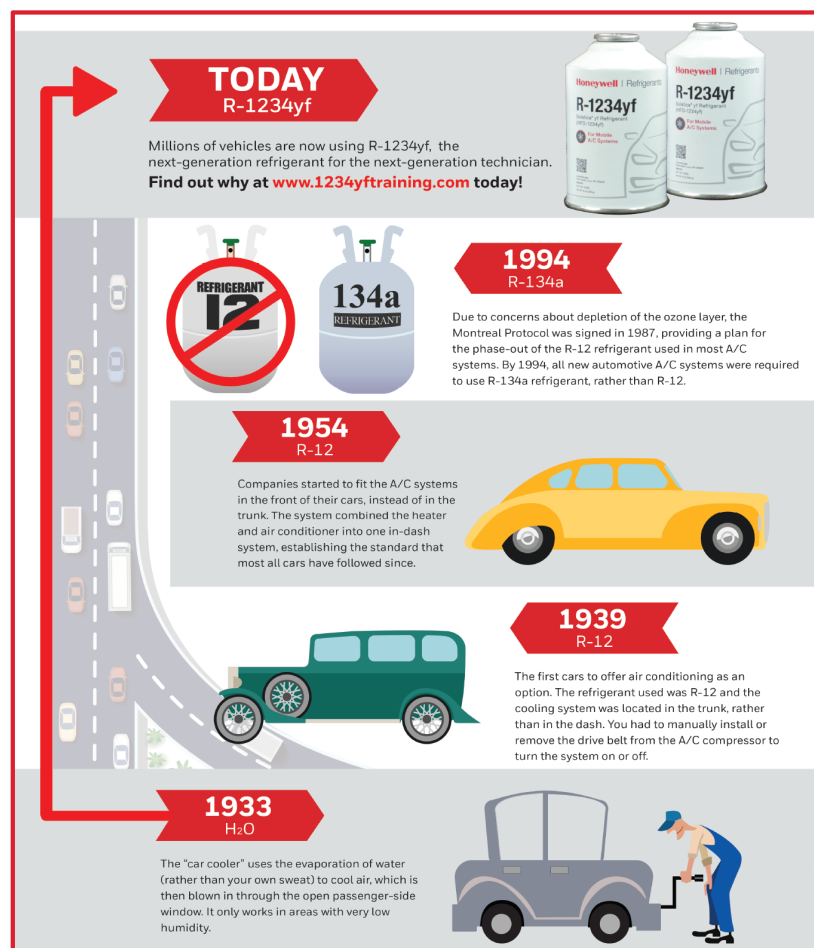
- Invented **HFC-410a** refrigerant in the 90's replacing HCFC-22 for **residential air conditioning**
- Invented **HFC-245fa** in the early 2000's replacing HCFC-141b in rigid foam insulation for **consumer refrigerators**
- Invented **HFO-1234yf** in the late 2000's replacing 134a for **Mobile AC systems**
- Invented **HFO-1233zd** in the late 2000's replacing HFC-245fa for use in **foam building insulation**
- Invented **HFO-1234ze** in the late 2000's replacing 134a in **aerosol propellants**
- Invented **R448a** in the late 2000's replacing high HFC-404a in **supermarket refrigeration**



Honeywell Co

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EVOLUTION OF AUTOMOTIVE REFRIGERANTS



Regulation
High Global
Warming

Regulation
Ozone
Depletion

Innovation
Target

- R1234yf – Low Global Warming Refrigerant

- GWP <1

- R134a – Regulation drives innovation

- Montreal Protocol – Signed 1987

- Safe for the Ozone / High Global Warmer

- Fully converted fleet by 1994

- 34 Year life span

- R12 – First Refrigerant cooled vehicles

- 55 Year life span

- Initially located in trunk, on/off switch was install/remove belt on compressor

- 1954 – First vehicles with AC under the hood

- Incorporated heating and cooling

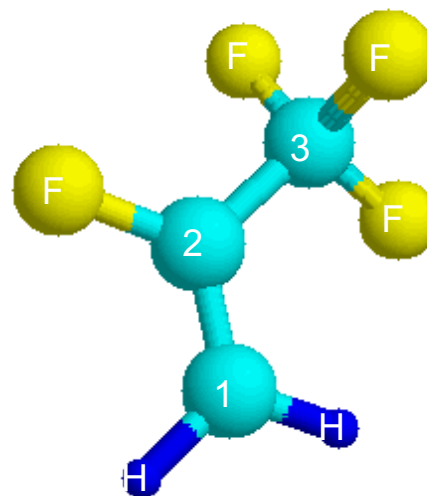
- Remains the standard design today

- 1933 First vehicles with passenger cooling

- Evaporative system

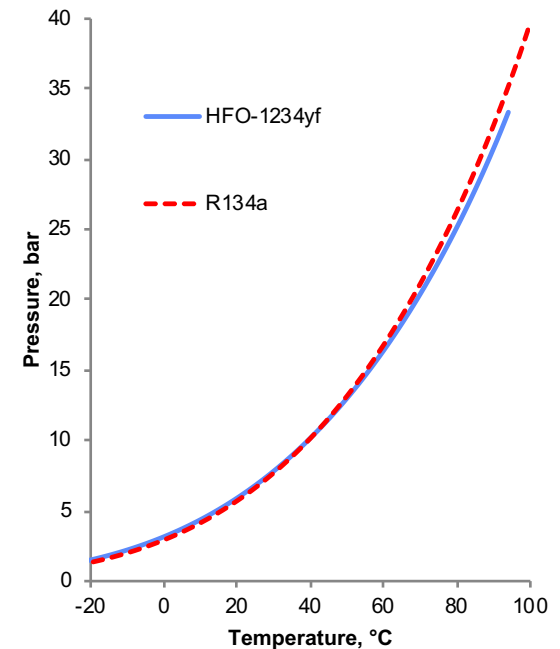
WHAT IS HFO-1234YF?

- **HFO means: HydroFluoroOlefin**
 - Hydrofluoro : contains hydrogen and fluorine
 - Olefin – designation of a carbon chain molecule with a double bond
- **Why the name 1234yf – ASHRAE Standards:**
 - 1** : 1 double bond (olefin)
 - 2** : 3 carbon atoms (propene)
 - 3** : 2 hydrogen atoms
 - 4** : 4 fluorine atoms
 - y** : CF- group
 - f** : CH₂ group



R1234YF ENVIRONMENTAL BENEFIT

- **ODP** (Ozone Depletion Potential) = 0
- **100 Year GWP_{1234yf}** (Global Warming Potential) < 1
100 Year GWP_{134a} = 1300
- **Atmospheric Lifetime = 11 days**
 - 13 years for R-134a
 - 500+ years for CO₂



Best Of Best – Preforms As Well As R134a, Environmental Impact < CO₂

HONEYWELL - PRODUCTION FACILITY



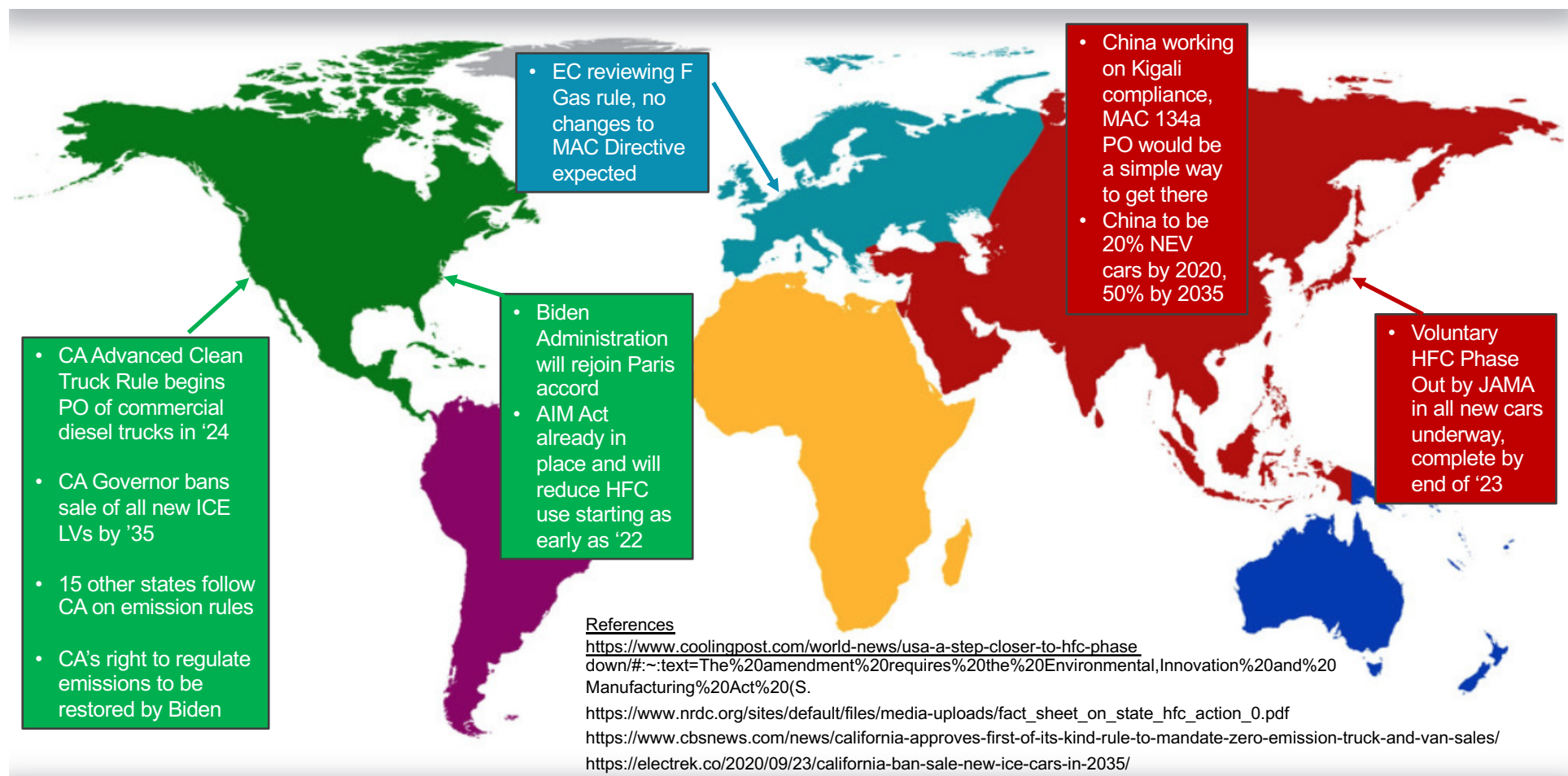
Largest operating yf plant in the world
Honeywell Geismar, LA, Start Up 2017



IATF 16949 Certified
Most stringent quality standard

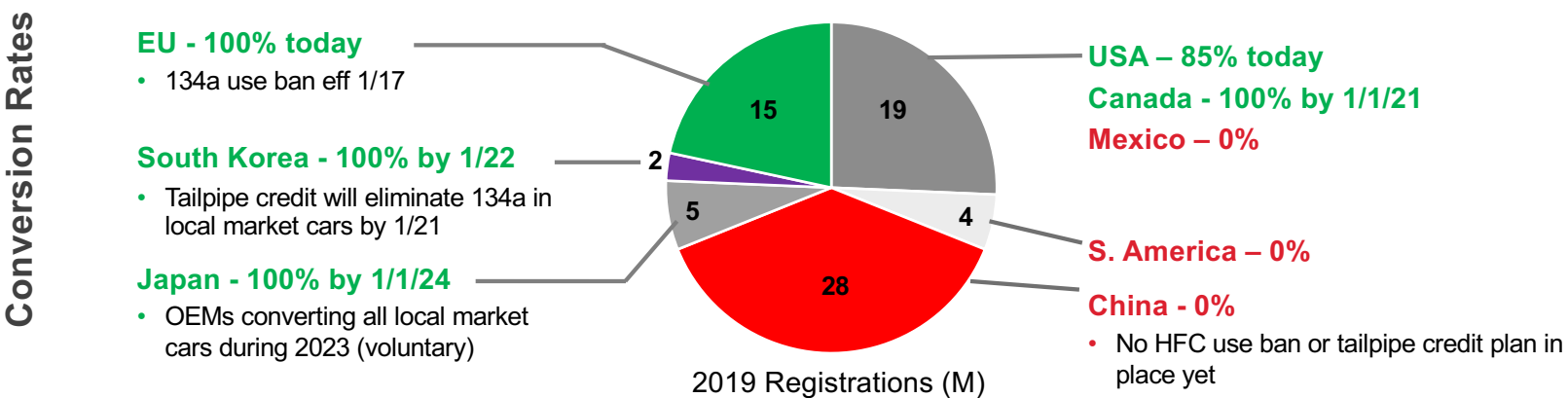
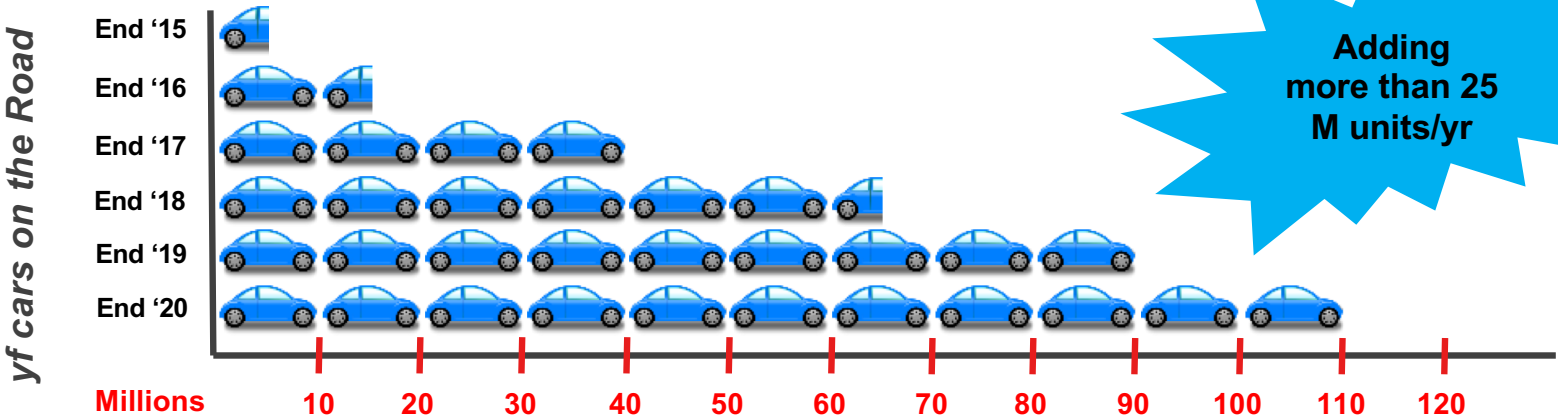
Investing In The Future Of Automotive Refrigerants

REGULATORY UPDATE – YE 2020



Federal action on HFC phase-down now likely in USA

1234YF ADOPTION STATUS



China is the largest remaining unconverted market

WHAT'S DRIVING US R1234YF AM DEMAND?

- US EPA CAFÉ Standard gives tailpipe credits to OEMs if they build cars with 1234yf instead of 134a
- Credit can be worth 1-2 MPG – big for OEMs selling lots of trucks and SUVs
- GM, FCA and Ford converted since 2018. Everyone else mostly converted by end of 2021
- First US model converted to yf; MY12 Cadillac XTS
- First high vol US car with yf was MY14 Jeep Cherokee, now out of warranty
- Initial aftermarket demand was dealer warranty repairs and crash work
- Today there are millions of cars out of warranty going to independent shops for AC repairs

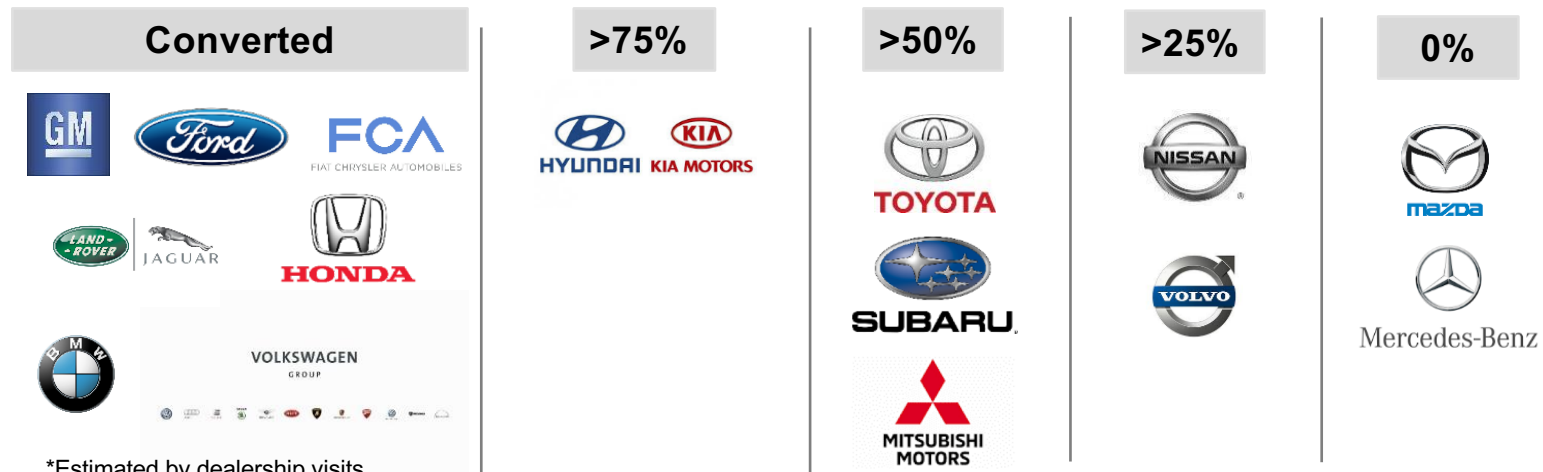


Demand Increasing Quickly As Cars Age Out Of Warranty

US AUTO MARKET R1234YF CONVERSIONS

- ~85% of MY20 passenger cars were built using R1234yf
- By YE 2020, ~110M VIO with yf globally, with more than 50M in the USA
- US OEM conversions to R1234yf are not slowing down – R1234yf is the future

MY20 Estimated U.S Adoption Rate 1234yf by Carmaker*



Expect US Cars To Be Fully Converted By End Of '21

TOP 10 US SALES MODELS BY REFRIGERANT

Rank	Model	OEM	Units '2019	Refrigerant 2020
1	F Series	Ford	896,526	R1234yf
2	Ram	Dodge	633,694	R1234yf
3	Silverado	Chevrolet	575,600	R1234yf
4	RAV4	Toyota	448,071	R1234yf
5	CR-V	Honda	384,168	R1234yf
6	Rouge	Nissan	350,447	Both
7	Equinox	Chevrolet	346,048	R1234yf
8	Camry	Toyota	336,978	R1234yf
9	Civic	Honda	325,650	R1234yf
10	Corolla	Toyota	304,850	R1234yf

Top 10 Models All Use R1234yf for MY20

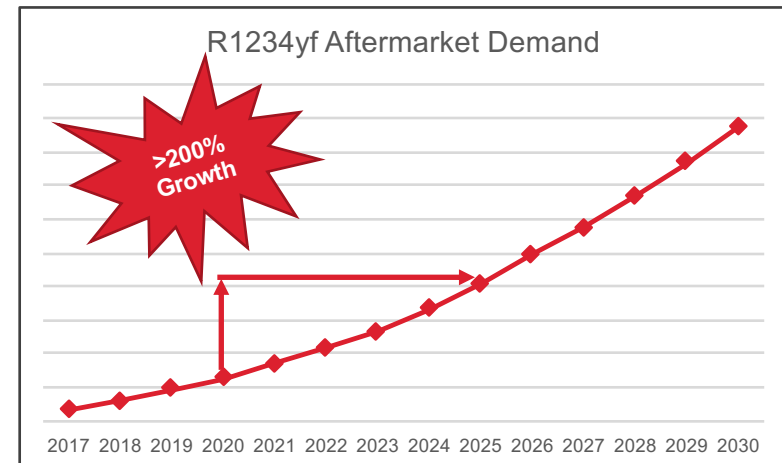
US OEM CONVERSION TO R1234YF*

OEM (Sales)	2015 %	2016 %	2017 %	2018 %	2019 %	2020 % est
BMW	8	52	99	100	100	100
FCA	70	78	89	90	91	92
Ford	0	26	65	71	95	91
GMC	2	30	81	92	94	94
Honda	0	1	62	87	97	98
Hyundai	0	0	17	47	85	87
JLR	61	82	94	100	100	100
Mazda	0	0	0	0	0	0
Mercedes	0	0	0	0	0	0
Mitsubishi	0	0	0	8	50	50
Nissan	0	0	0	5	31	36
Subaru	0	0	37	32	68	97
Toyota	2	8	9	35	67	78
VW	2	4	22	59	94	99
Volvo	0	0	0	0	0	35

*Estimated by dealership visits

Sales by Year	# of Units (M)	Rolling Total (M)
2014	1.0	1.1
2015	1.8	2.9
2016	3.8	6.7
2017	8.2	14.9
2018	10.6	25.4
2019	13.4	38.9

**Added
~12M
in 2020**



Over 80% Of MY20 Vehicles Built Will Use R1234yf

HELPING DRIVE PRO & DIY CUSTOMER AWARENESS

Print Advertisement

R-1234yf, Coming Soon in Service Cans

Honeywell Solstice yf (R-1234yf) is easy to use as R-134a, performs just as well, and will soon be available in service cans. R-1234yf has been used in more than 1.5 million cars, and that number is expected to more than double by the end of 2017. It's ready to be used in the new R-1234yf service cans. Be ready! Stock up on the new R-1234yf service cans. Learn more at honeywell-refrigerants.com.

Coming soon to:

Honeywell | Refrigerants

Shelf Tags



Counter Mats

Solstice® yf (R-1234yf)
The Next-Generation Refrigerant For Automotive Air Conditioning

FAQs:

Do automobiles have different connections for R-1234yf?
Yes, an R-1234yf AC system has unique connections specified by the Society of Automotive Engineers (SAE).

Do I need special equipment to use R-1234yf?
Yes, the SAE has specific standards for equipment that services R-1234yf systems, such as 1991 machines (J2843), hoses and fittings (J2886), Refrigerant ID (J2012), and others.

How do I store R-1234yf?
Similar to R-134a, cylinders should be stored out of direct sunlight and at temperatures lower than 125°F.

Do I need special training to service an R-1234yf system?
AC systems operate nearly identically to R-134a systems. Also the R-134a, Section 609 Certification is applicable to R-1234yf AC system servicing, and the original equipment manufacturer (OEM) procedures must be followed.

How many cars currently use R-1234yf?
As of September 2015, more than 5 million cars are using R-1234yf.

Temp	R-1234yf	R-134a
0	8.9	6.2
5	11.6	8.8
10	14.6	11.6
15	17.7	14.6
20	21.2	18.0
25	24.9	21.6
30	28.9	25.6
35	33.3	29.9
40	37.9	34.3
45	42.9	39.5
50	48.2	44.9
55	54.0	50.7
60	60.2	56.9
65	66.7	63.6
70	73.7	70.7
75	81.1	78.3
80	88.9	86.4
85	97.2	95.1
90	106.1	104.3
95	115.4	114.1
100	125.3	124.4
105	135.7	135.4
110	146.7	147.0
115	158.2	159.3
120	170.4	172.2

For an MSDS and more information please scan:

Honeywell

Online Training: Literature and Video Library

Solstice® yf Service Cans
The Refrigerant You Need, When You Need It

Honeywell® yf, also known as R-1234yf, is the new standard refrigerant being adopted by automakers around the world. Now you can service the A/C systems in those cars easier than ever with new smaller, more convenient Solstice yf service cans.

Easy as 1-2-3-4

1. Connect to the system using a Standard Gauge Set specifically designed for R-1234yf.
2. Use a R-1234yf Can Tap with depressure to open the self-sealing valve on the can.
3. Charge the R-1234yf system using the same safety practices you use for R-134a systems.
4. Change the R-1234yf system using the same safety practices you use for R-134a systems.

See Solstice yf In Action
For more about Solstice yf, please visit www.honeywell-refrigerants.com or call 1-800-421-4136.

SEPA
Solstice yf is The Trusted Choice
As more governments worldwide adopt environmental regulations calling for the phaseout of R-134a due to its high global warming potential (GWP), Solstice yf has become the refrigerant standard for air conditioning and will continue to lead well into the future.

Convenient Solstice yf 4-packs are available at thousands of auto aftermarket retailers nationwide.

Related to Certification for purchase:

Refrigerant	Can Type	Can Size	Can Weight	Can Volume
R-134a	Non-Standard	Can	2.2 lbs	0.25 cu ft
R-1234yf	Non-Standard	Can	1.1 lbs	0.125 cu ft

Learn More
For more information about Solstice yf and Honeywell refrigerants, please visit www.honeywell-refrigerants.com or call 1-800-421-4136.

Honeywell Climate Protection
Honeywell is a registered provider of continuing education.

Honeywell

Proper Procedure
Honeywell Solstice® yf service cans contain 8 ounces (226 grams) of R-1234yf refrigerant.

Why R-1234yf?

Quiz/Certificate

Paul DeQuisepel
Proven one stop service delivery no frills

Quiz/Certificate

Working With Partners To Create Value And A Positive User Experience

R1234YF SERVICE CAN BENEFITS



Honeywell Service Can

Fill Size = 8 Ounces

- Much Lower Shelf Cost
- 1 Can = Top Off
- 2 Cans = Full Charge
- 4 can case = low cost to enter vs jug

\$40
per can
sell price

No Certification Required

- No restrictions on purchases
- Designed for service techs
- DIY friendly and familiar

Industry Standard Connection

- Self Sealing Valve
- Complies with California Regulations
- Complies with EPA Section 608
- Multiple sources for fitting

Training Built In

- Scan QR Code = How To Video
- Free Web Training
1234yftraining.com

Chemours Service Can

Fill Size = 12 Ounces

- Higher retail price
- Too much for a top off
- Not enough for a full charge
- Harder sell to Pros and DIYers

> \$70
per can
sell price

Certification Required

- Restricted purchase to certified tech's
- Production no longer permitted
- DIY'er can't purchase

Non-Standard Connection

- Piercing Style Cap
- Left Hand Piercing valve required
- Piercing valve obsolete
- No supplier will reproduce

Online Training Support

- None found

8 oz Can The Proven Winner On The Retail Shelf

WHY HONEYWELL

- Number 1 R1234yf supplier in the US aftermarket
- Developed in the USA, Made in the USA, Packaged in the USA
- Supply almost every car OEM on the planet
- Multiple packaging and warehousing locations across the US
- First to build, First to start up, First to offer a yf service can
- Provide OEM Conversion data to better manage category



Working to innovate and grow the category

WE'RE EVERYWHERE. CONNECT WITH US.

Honeywell

