

# **Blowing Agent – Regulatory Environment**

**Workshop on Management of HFCs: Technical Issues**

**BASF Corporation**

**April 21<sup>st</sup>, 2015**



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# Evolution of Blowing Agents

1<sup>st</sup> Generation  
High ODP  
High GWP

CFC-11

CFC-12

2<sup>nd</sup> Generation  
Low ODP  
High GWP

HCFC 141b

HCFC R-22

3<sup>rd</sup> Generation  
Zero ODP

HC  
Cyclopentane

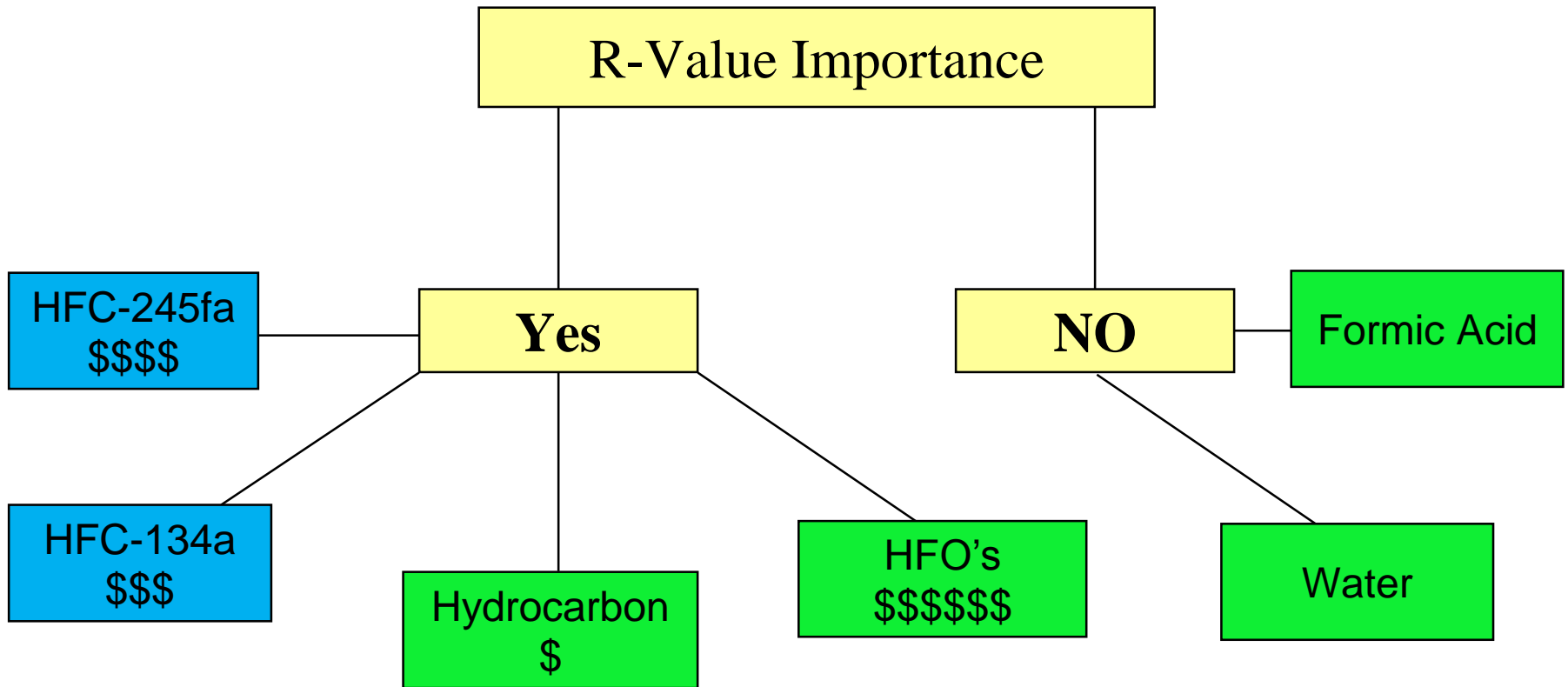
HFC 134a  
HFC 245fa

4<sup>th</sup> Generation  
Low GWP

HC  
Cyclopentane

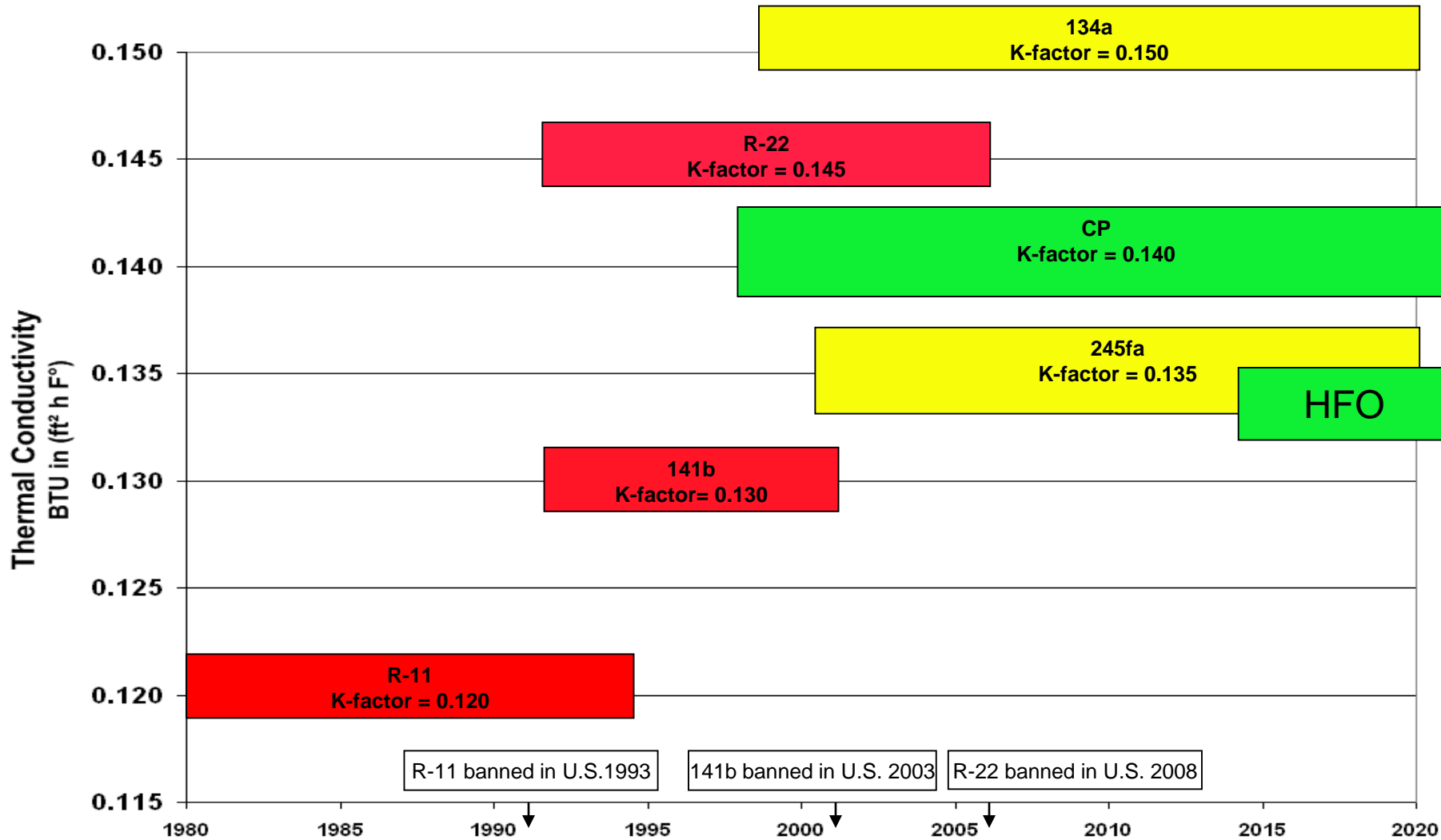
HFO  
Formacel 1100  
Forane® 1233zd  
Solstice™ 1233zd(E)

# Is Insulation Critical?

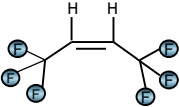
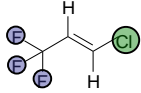
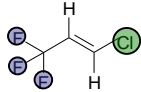
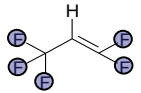


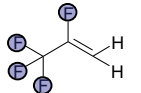
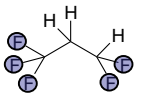





# Blowing Agent Evolution

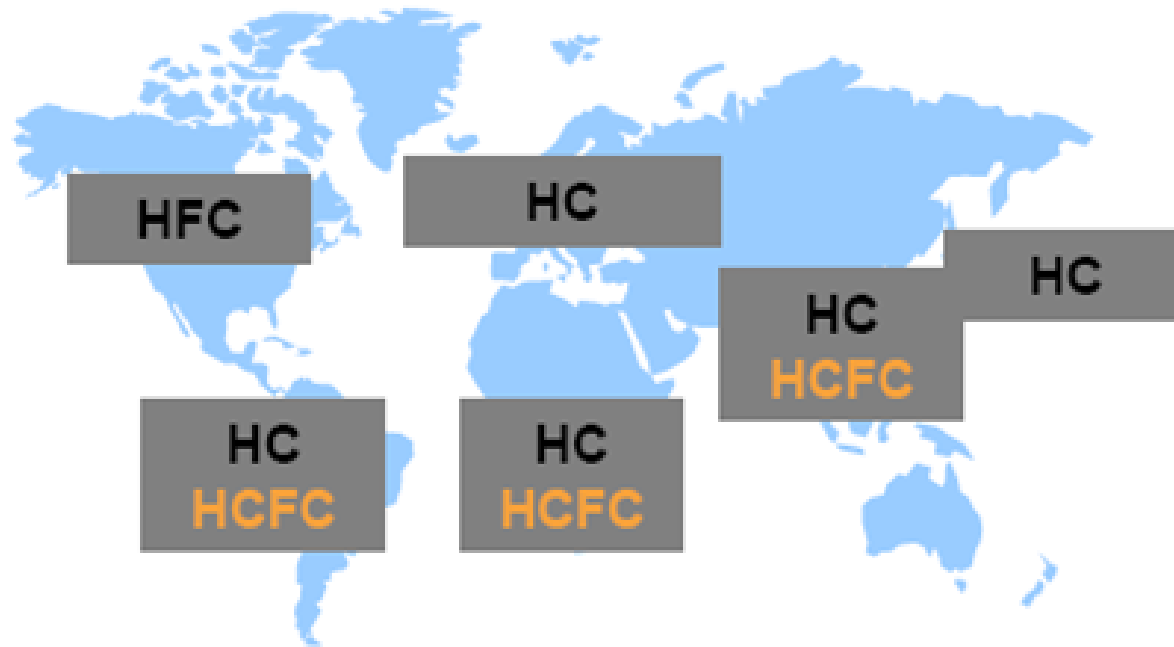
## Thermal Effectiveness



# HFO Blowing Agents

Supplier	Name	Structure	MW	Phys. State	BP (°F)	$\lambda$	ODP	GWP
Dupont	FEA 1100		164	Liquid	90	10.7	0	5
Arkema	Forane 1233zd AFA-L1		131	Liquid	66	10	0.0005	<5
Honeywell	Solstice 1233zd(E) HBA-2		131	Liquid	66	10	0.0005	1
Honeywell	HBA1 / HFO1234ze		114	Gas	< 5	13	0	6
Honeywell/ Dupont	 Solstice HFO 1234yf 		114	Gas	-20	13	0	4
Honeywell	HFC-245fa		134	Liquid	59	12.7	0	1030
Exxon	 Cyclopentane 		70	Liquid	120	13	0	11

# Global Blowing Agent Technology Appliances (Refrigerator/Freezers)



# HFC Regulations in the USA

- US EPA is looking at SNAP to regulate blowing agents
  - ▶ Federal Register released on August 6, 2014
  - ▶ Proposal to delist most HFCs in all foam blowing sectors except spray foam on January 1, 2017
  - ▶ Public Hearing was on August 27, 2014
  - ▶ Comments were due to the EPA on October 20, 2014
    - BASF comments
      - US EPA needs to look at each industry area
        - Some industries will be able to convert earlier than others
      - January 1, 2020 or longer is a more reasonable timeframe to convert customers to new technologies
  - ▶ Waiting for final ruling

# BASF New Offerings

## ■ HFOs

- ▶ Currently working with all three manufacturers
  - Received enough material to optimize systems
    - New system ready and commercialized with Honeywell Solstice blowing agent
- ▶ Cooperative work with Asia and Europe



# Developments in the phase-in of low-GWP chemicals in various PU sectors

- Most foams used for refrigeration have already converted to low-GWP blowing agents. This includes Whirlpool, Electrolux, and GE in the USA. They have not completed the conversions but are the farthest along. Commercial refrigeration accounts that make ice makers, display cases for supermarkets, and reach in coolers are also converting away from HFC blowing agents now. These two markets will change first.
- Any industry that requires outside agency approvals such as fire rated panels or marine will need more time. These tests are very expensive and time consuming. We are working on non HFC systems but the amount of time required to convert all of the customers will be longer than 2020. This is why we feel we need at least until 2020 to complete this work.
- Water heater customers have already changed over to cyclopentane.



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