

ENGINEERING  
TOMORROW



# How to make more safe and efficient Ammonia systems

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10%

of the world's  
CO<sub>2</sub> emissions  
is produced by  
cooling



# Content



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Sustainability and the  
refrigerants transition

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Old versus new systems

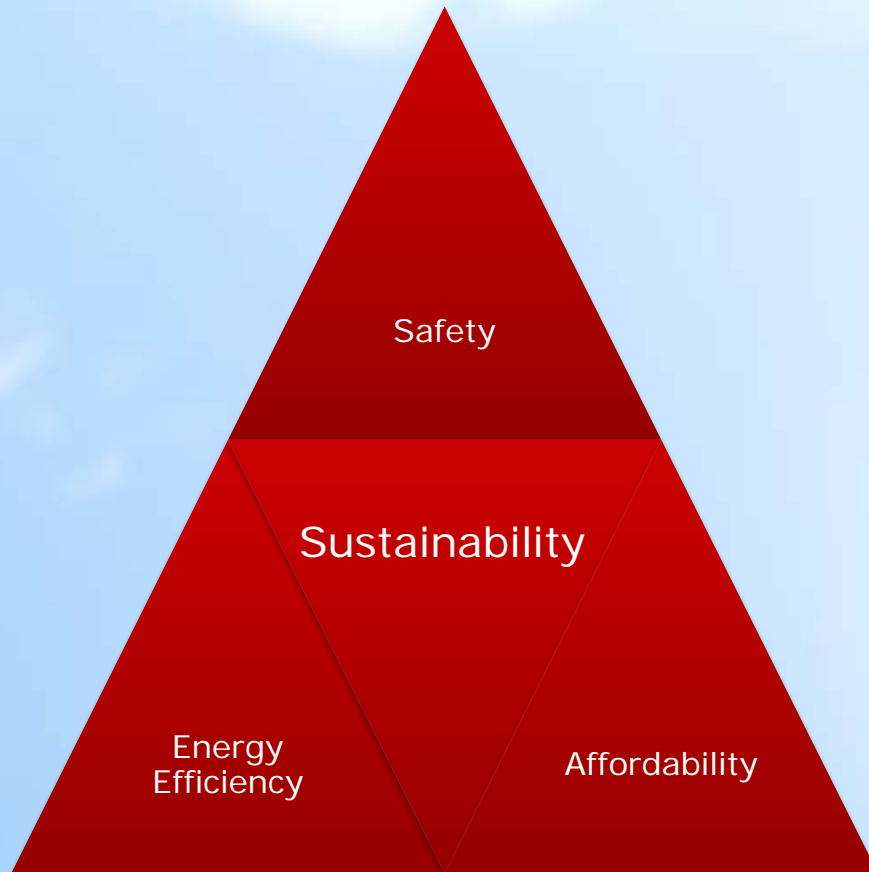
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Standards and where to apply

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How to make Ammonia plants  
become more safe and  
efficient

# Sustainability is Key



**Safety** must never be compromised. All low GWP refrigerants are safe if used according to standards



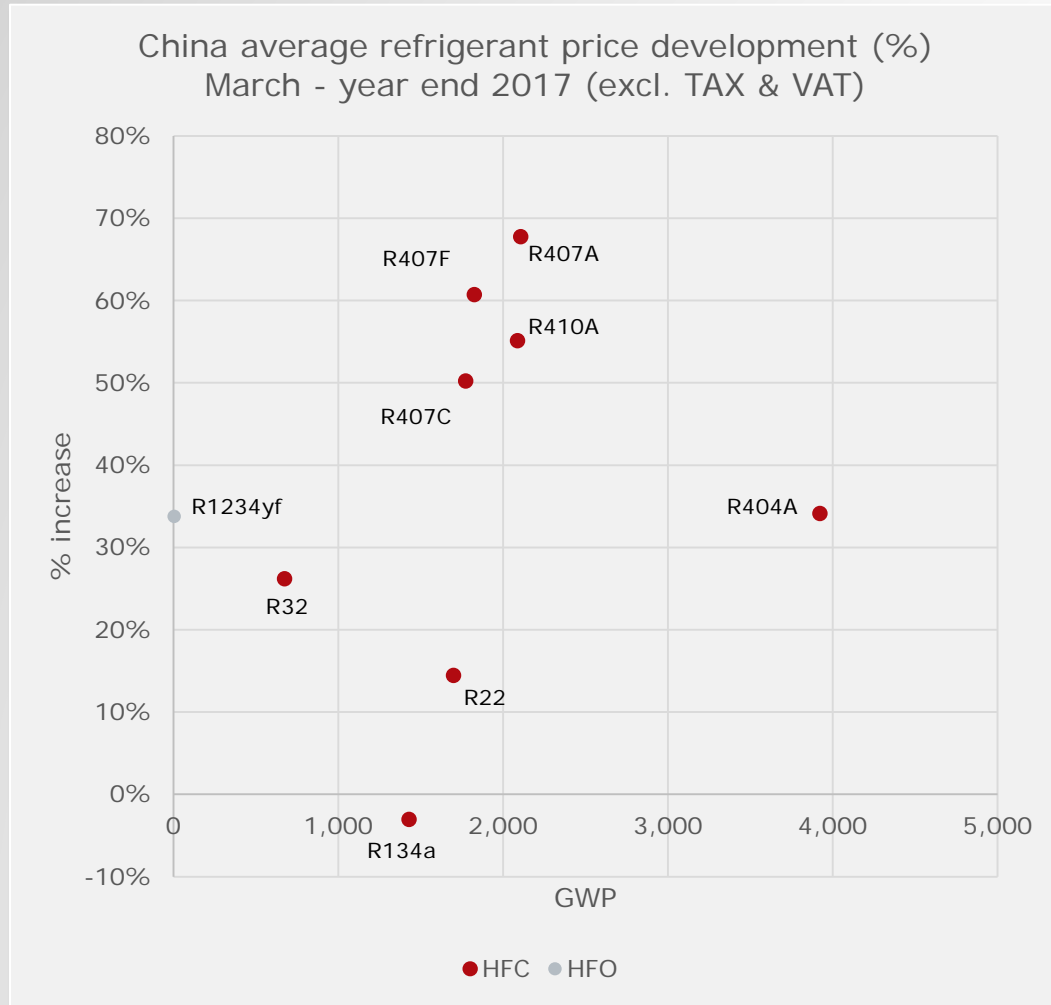
**Energy efficiency** is important to address minimized electricity consumption and reduce running cost.



**Affordability** in the market is a basic parameter to be addressed ensuring the good business case

# Refrigerant market observations

## China



Source: ChinaIOL

- All prices without tax but no special environmental taxation on HFCs in China
- Increase mainly due to increase in raw material prices (flourspat)
- R22 will be phased out – no cheap drop in substitution
- Good reason to choose natural refrigerants where possible

# Natural refrigerants in China

- **27 supermarkets** adopted CO<sub>2</sub> solutions. 23 of them are with Danfoss CO<sub>2</sub> solutions inside
- **150+ cold storage & food processing projects** adopted the CO<sub>2</sub> solutions (Industrial Refrigeration), **all** with **Danfoss CO<sub>2</sub> solutions**
- **95% of the NH<sub>3</sub> industrial refrigeration projects** in China are with Danfoss automatic control solutions inside



# Safety goes hand in hand with Energy Efficiency

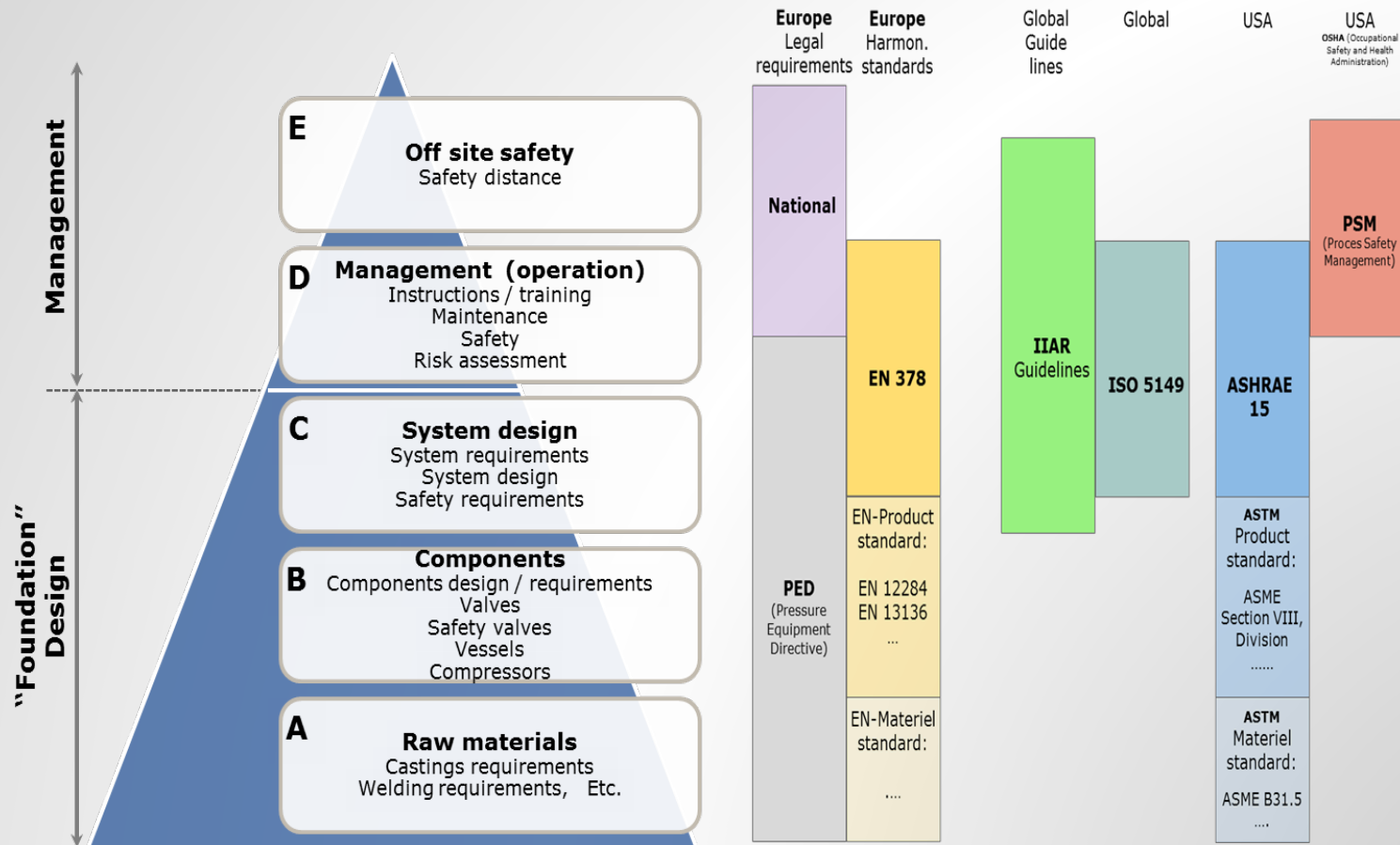
## Old systems :

- Large amount of charge
- Manually operated
- No defrost optimisation
- Maintenance gaps less visible in performance

## New systems :

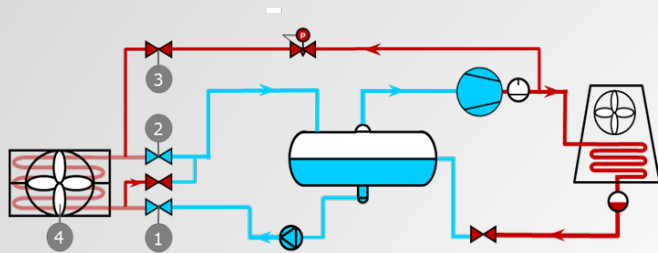
- minimised amount of charge
- Automatically operated
- Defrost optimisation
- Maintenance gaps very visible on performance

# The safety standards

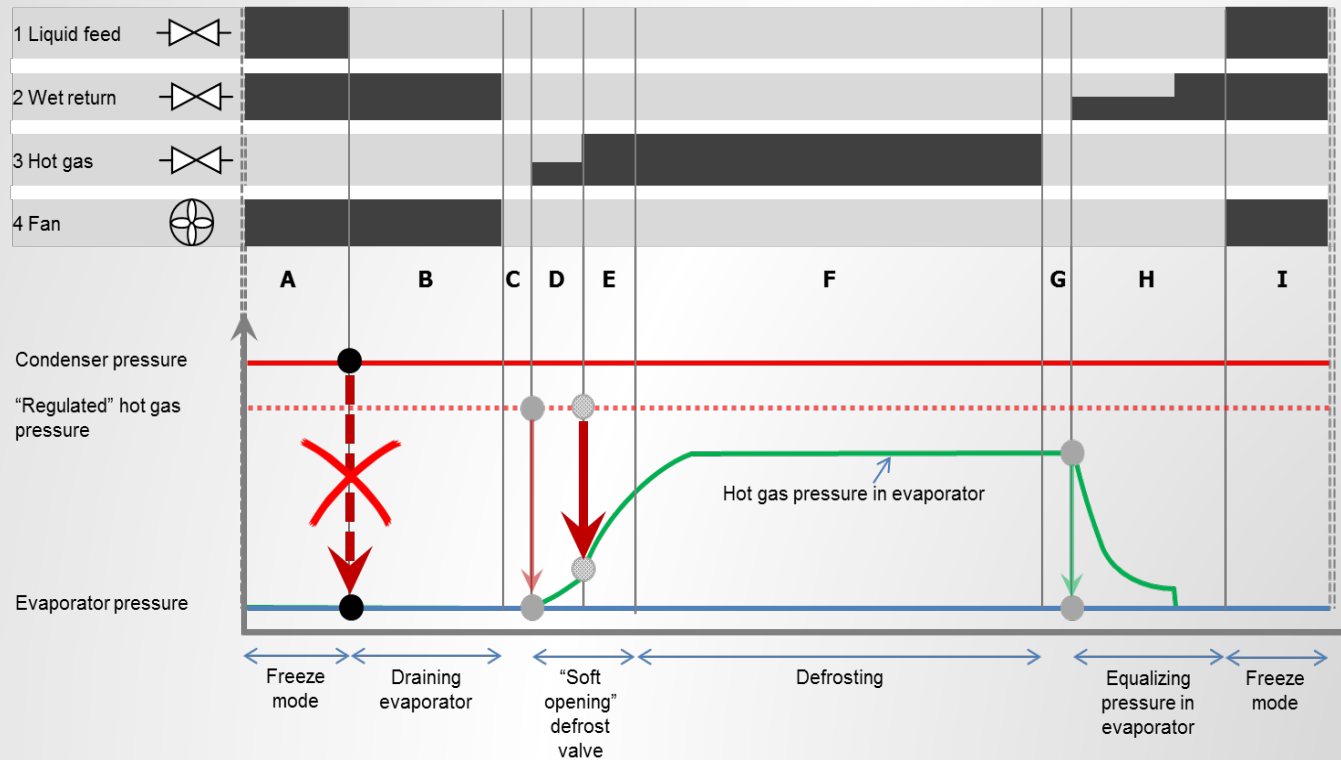




# The safe defrost cycle



## Defrost sequence

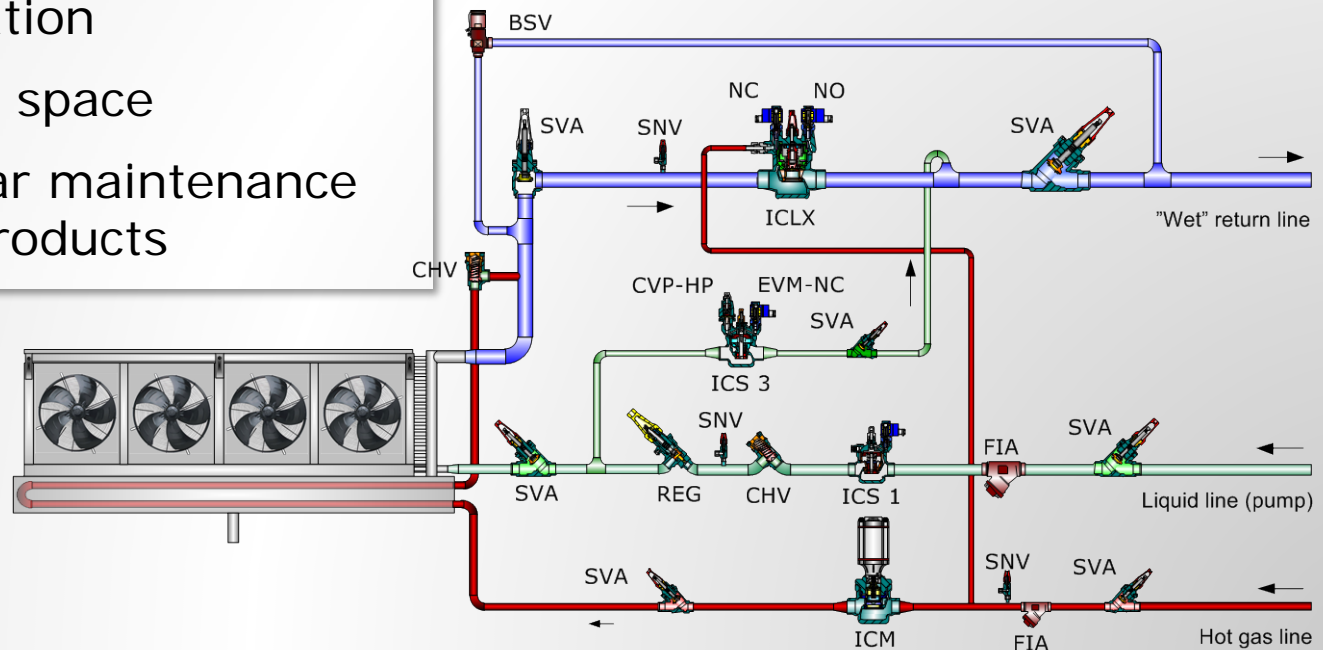




# Traditional Air cooler build up

## Hot gas defrost by pressure control

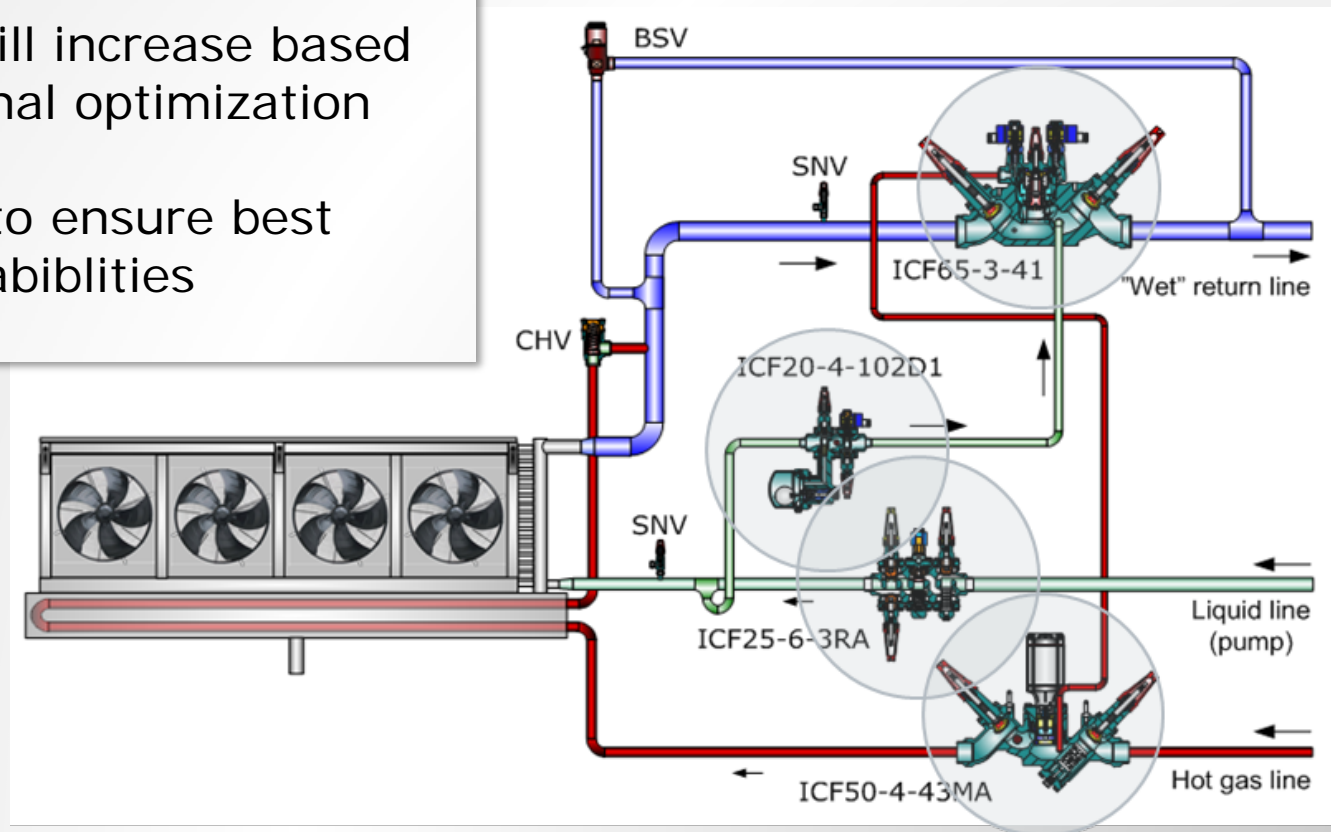
- Installation requires disassembly and re-assembly prior to welding
- Increased risks for leakages due to several weldings
- Complex insulation
- Occupies much space
- Need for regular maintenance on individual products



# Safety and efficiency improvements

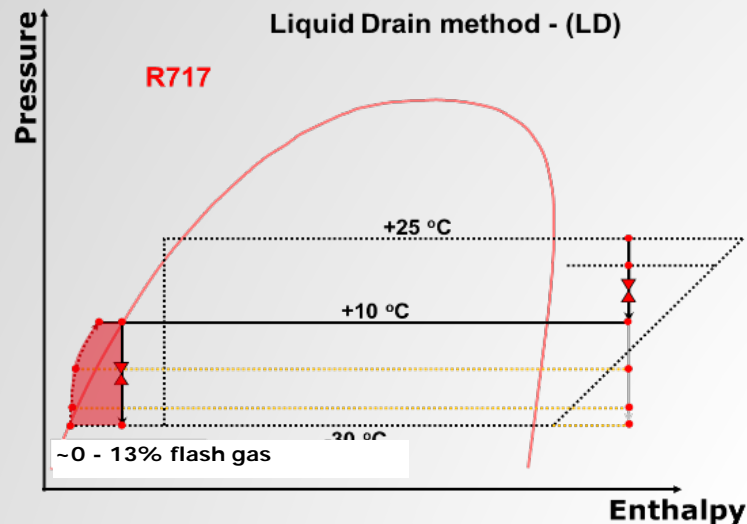
## Hot gas defrost by liquid drain

- Safety can be ensured using electronic valves and controls
- Efficiency will increase based on operational optimization
- Innovation to ensure best defrost capabilities

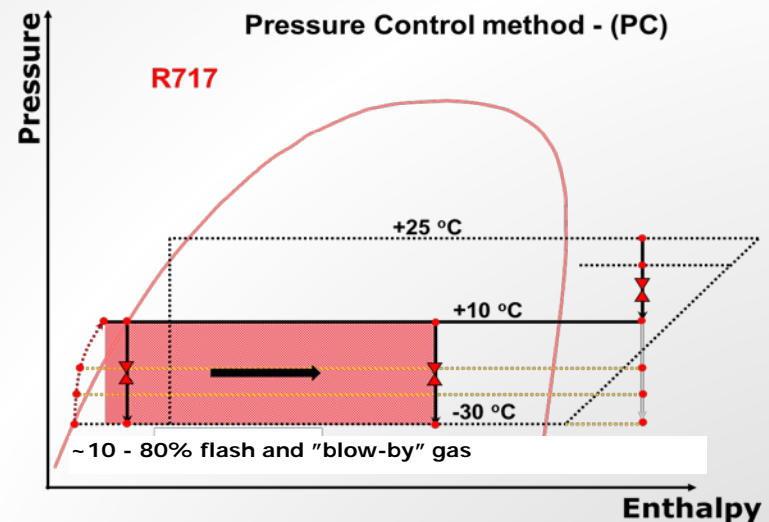


# Energy savings

## Liquid drain versus pressure control



- The drain device is activated on the **presence of liquid**, irrespective to the pressure in the evaporator
- The drain quality is **100% liquid**.



- The drain valve opens based on the **set-pressure** (*defrost pressure*).
- The drain quality is **uncontrolled**, and dependent on:
  - Capacity of hotgas solenoid valve.
  - Amount of gas that is possible to condense in the evaporator.
  - Capacity of drain valve.
  - Pressure drop in pipes and evaporator

# Sum up



## Key messages

Refrigerants transition continues its journey and prices on F gases increase.

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The refrigerant transition implies increased usage of natural refrigerants like ammonia and CO<sub>2</sub>.

Ammonia installations can be improved to become very safe and even more energy efficient

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Methods to make ammonia the preferred future choice

- Reduction of charge sizes
  - New operational methods to ensure safe defrosting and increase energy efficiency
  - Better design of components
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Targetted training and roadshows can be a way to accelerate the skills development

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Many thanks for your attention



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