

## F-Gas Consultation Forum

### Topic B:

# Barriers to the uptake of low GWP alternatives to HFCs related to lack of training

Preliminary findings of external study carried out for DG CLIMA

September 10<sup>th</sup> 2015, Brussels

# Introduction

- skills and training related to low GWP alternatives to HFCs
  - an important aspect of achieving the HFC phase-down
  - training is crucial to the successful uptake of new refrigerants
- possible barriers :
  - lack of relevant training material / courses / practical training facilities
  - poor uptake of training in low GWP alternatives
- Topic B addresses these issues
  - provides an overview of EU legislation
  - provides an assessment of status quo of training in Member States
  - note: Topic B only applies to RACHP (unlike Topic A, which includes foams)

# Why are there barriers related to training?

- 2006 EU F-Gas Regulation specified minimum training requirements for F-Gases
  - now widely adopted in most Member States
- most low GWP alternatives have characteristics that require extra training

	Ammonia	HCs	CO <sub>2</sub>	HFOs	HFC-32
Flammability	✓	✓		✓	✓
Toxicity	✓				
High pressure			✓		

- Extra training required for:
  - Technicians doing installation, maintenance and end-of-life decommissioning
  - Engineers doing design of systems and components

## Study Activities on barriers related to training

- literature review
  - to identify relevant EU level legislation and standards and produce an overview
  - to identify training courses and training material that is already available
- Member States survey
  - to obtain information about availability and uptake of training
- discussions with training experts
- case studies
  - looking in more depth at various training initiatives
- this Consultation Forum
  - to identify any gaps in data and to test the preliminary findings
- draft report due by October 2015

# Member State Survey

- training responses from 22 Member States
  - representing 91% of EU population
  - non-responders: Belgium, Denmark, Greece, Hungary, Luxembourg, Slovakia
  
- key questions on training:
  - F-Gas training – details about compliance with requirements in 842/2006
  - low GWP alternatives: availability and uptake of training for:
    - ammonia
    - CO<sub>2</sub>
    - hydrocarbons (small hermetic)
    - hydrocarbons (larger systems)
    - HFOs and other lower flammability refrigerants

# F-Gas Training and Certification (1)

- good compliance with F-Gas Regulation
  - all responders have F-Gas training available for RACHP
  - total of 160,000 SRAC F-Gas qualified technicians in 21 countries
    - approx. 200,000 in EU, allowing for non-responders
- data from each Member State analysed by population

	F-Gas certificated		
	Technicians per 100,000	Companies per 100,000	Technicians per company
Average	40	10	4
Maximum	290	65	32
Minimum	13	3	2

- Outliers (technicians per 100,000):
  - high number: Cyprus (290), Finland (92), Netherland (80)
  - low number: Latvia (13), Malta, Portugal, Estonia (all 18); Germany (26), Czech R. (31)

## F-Gas Training and Certification (2)

- 16 out of 21 countries (76% ) have a central personnel and company register
- 16 countries have 1 to 3 certification bodies
  - Outliers: Germany 110, Spain 40, Italy 25, Netherlands 6, Cyprus 5
- Average company size is small: 4 certificated technicians per company
  - most countries have an average between 2 and 7 technicians per company
  - Outliers: Lithuania 32; Bulgaria 15; Netherlands 8

## Training for lower GWP alternatives

- training availability question (for 5 categories of low GWP alternative)
  - e.g. “*Is ammonia RACHP training available?*” Yes/No
- Number trained
  - e.g. “*Approximately how many technicians are trained to work on ammonia systems?*”
  - many responder countries could not provide data

	Number of countries “Yes”	% of countries “Yes”	Number trained* (number of responders)	% of total F-Gas personnel trained in alternatives
Ammonia	15	71%	4766 (9)	2.3%
CO <sub>2</sub>	11	52%	4400 (8)	2.2%
HC small	10	48%	1430 (7)	0.7%
HC larger	7	35%	112 (2)	0.05%
HFO	4	20%	0 (0)	0%

\* Number trained, as reported by Member State F-Gas focal point – real number probably higher

# Countries with numerical data for non-F-Gas refrigerants



	Number of technicians trained per 100,000 population			
	F-Gas	Ammonia	CO2	Hydrocarbon
Czech Republic	31	0.5	1.0	2.4
Estonia	18	5.7	0.0	0.0
Finland	92	1.8	1.8	0.4
Germany	26	2.5	3.7	1.2
Ireland	35	0.8	0.3	0.1
Italy	76	0.2	0.4	0.1
Netherlands	80	2.4	2.4	0.0
Sweden	94	0.5	4.1	0.5
UK	57	3.0	0.2	0.1
<b>Average (9 countries)</b>	<b>54</b>	<b>1.9</b>	<b>1.7</b>	<b>0.6</b>

## Encouraging comments on Member State training initiatives



- 13 Member States have some further plans to improve training provisions, e.g.:
  - **Bulgaria:** has an ongoing project to gain knowledge of the training that should be conducted related to alternative refrigerants.
  - **Estonia:** has launched a project to promote F-gas alternatives and low GWP technology in Estonia and help companies with the know how to make better choices.
  - **Finland:** training organizations have plans to improve training related to low GWP alternative refrigerants but they are waiting for the update of regulation 303/2008
  - **Netherlands:** in addition to the ammonia and carbon dioxide training facilities, a training related to hydrocarbon refrigerants is planned.
  - **Spain:** the Environment Ministry in coordination with other Ministries like Employment Ministry and Education Ministry are working to modify the official training system to the use of alternative technologies.
  - **UK:** F-gas qualifications have been updated to cover aspects of low GWP alternatives and a Safe Handling of Refrigerants publication will be updated to provide more information in low GWP area.

# EU Legislation on Training for RACHP (1)

- refrigerant handling training under F-Gas Regulation
  - an unusual approach: highly prescriptive (in terms of minimum requirements)
    - monitored by each Member State competent authority
  - cannot purchase refrigerants without proof of certification
- legislative requirements for non-F-Gas refrigerants
  - defined by relevant safety related framework Directives
- these Directives do not directly refer to refrigerants or RACHP systems
  - they are very broad in scope
  - this requires interpretation by employers of RACHP technicians / designers
- training to be identified by employer risk assessments and provided to employees
  - technicians working with flammable refrigerants must be adequately trained

## Affects training for technicians

OSH Framework Directive on safety and health at work	89/391/EEC
ATEX 137 Directive for improving the safety and health protection of workers potentially at risk from explosive atmospheres	99/92/EC

## Affects training for equipment specifiers, producers and distributors

Pressure Equipment Directive	97/23/EC recast 2014/68/EU
ATEX 95 – Explosive Atmospheres Directive	94/9/EC recast 2014/34/EU
General Product Safety Directive	2001/95/EC
Low Voltage Directive	2006/95/EC recast 2014/35/EU
Electromagnetic Compatibility Directive	2004/108/EC recast 2014/30/EU
Machinery Directive	2006/42/EC

## EU Legislation on Training for RACHP (3)

- Directive 89/391/EEC – the OSH Framework Directive
  - measures to encourage improvements in the safety and health of workers at work
  - Article 12: Training of workers
    - employer shall ensure that workers receives adequate safety and health training
    - training required “*in the event of the introduction of new work equipment or a change in equipment*”
    - training to be adapted “*to take account of new or changed risks*”
- Directive 99/92/EC – ATEX 137
  - on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres
  - places a responsibility on employers to provide appropriate training for works in relation to risks from explosive atmospheres
- hard for Member States to centrally monitor uptake of training
  - no certification requirement for non-F-Gas alternatives

- *“Refrigerating systems and heat pumps - Competence of personnel”*
  - applies to all refrigerants
- provides comprehensive framework for training requirements
  - including safety issues related to flammable and toxic refrigerants
- defines competency requirements for a range of job types e.g.
  - design, installation, general maintenance, circuit maintenance, decommissioning
- describes long list of topics that must be addressed in training e.g.
  - theoretical knowledge of cycles, practical knowledge of components
- defines different competency levels for a matrix of job types / topics
  - basic appreciation; working knowledge; fully operational; leading edge

## Is legislative framework sufficient for training?

- there are clear mandatory training requirements for F-Gases
- there are also mandatory requirements for non-F-Gases, but less prescriptive
  - relevant Directives already exist and require safe handling to be prioritised
- the EN standard on RACHP competence provides detailed training guidelines
  - used in conjunction with Directives there is a comprehensive framework available
- this framework is sufficient to:
  - define suitable training courses for non-F-Gas refrigerants
  - create a mandatory requirement for such training
- the key issues are to ensure:
  - **that sufficient training courses are available in or close to all Member States**
  - **that sufficient engineers are trained**

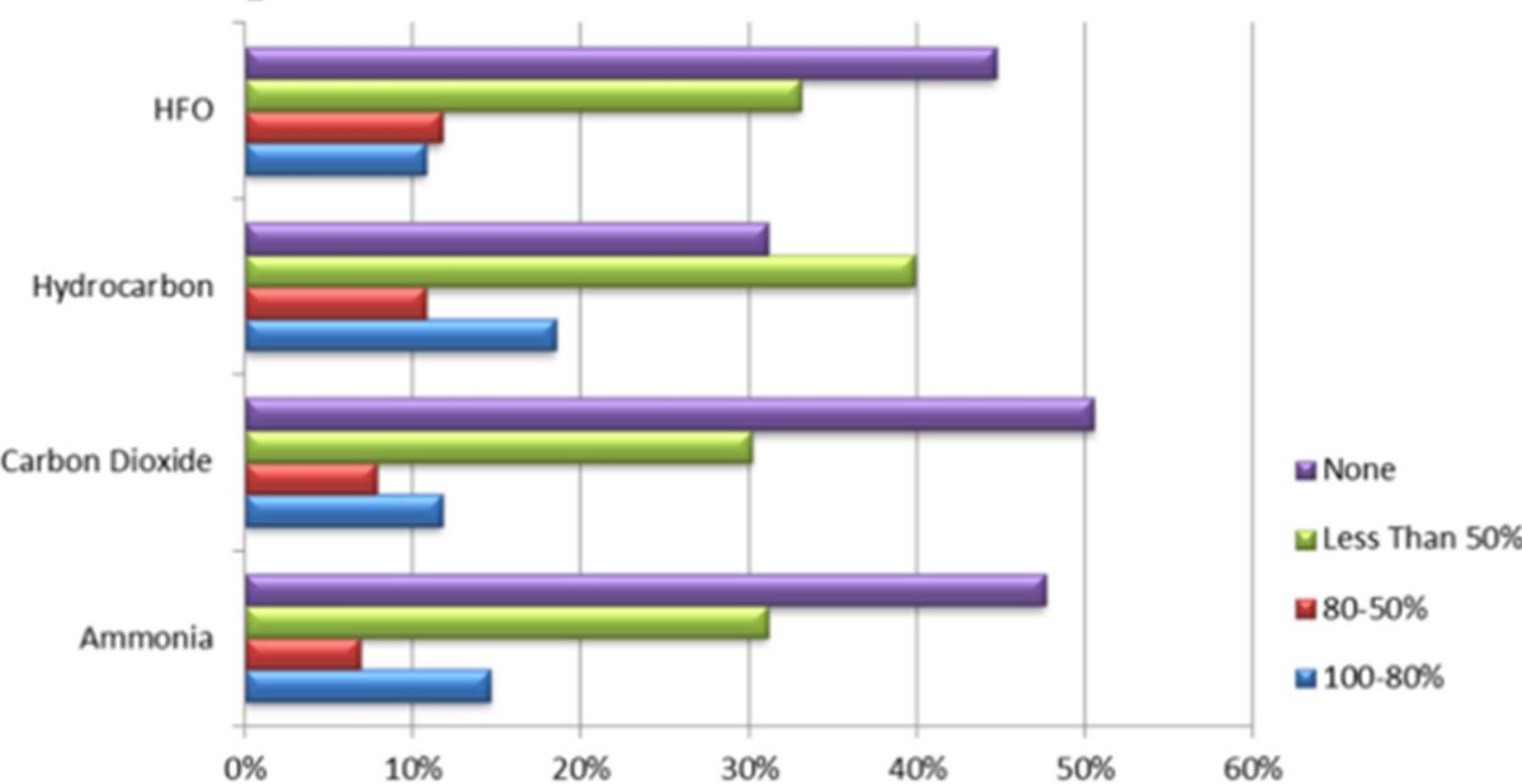
## Case Study 1: REAL Alternatives

- REAL Alternatives is a significant new initiative related to RACHP training
  - specifically targeting the new low GWP alternatives
- a multi-country initiative with significant inputs from 5 Member States
  - Belgium, Germany, Italy, Poland, UK
- REAL Alternatives training material will provide an excellent basis to support training needs across whole EU
  - much of the material is freely available
  - already available in several languages
- more details on the available material from Marco Buoni in next presentation

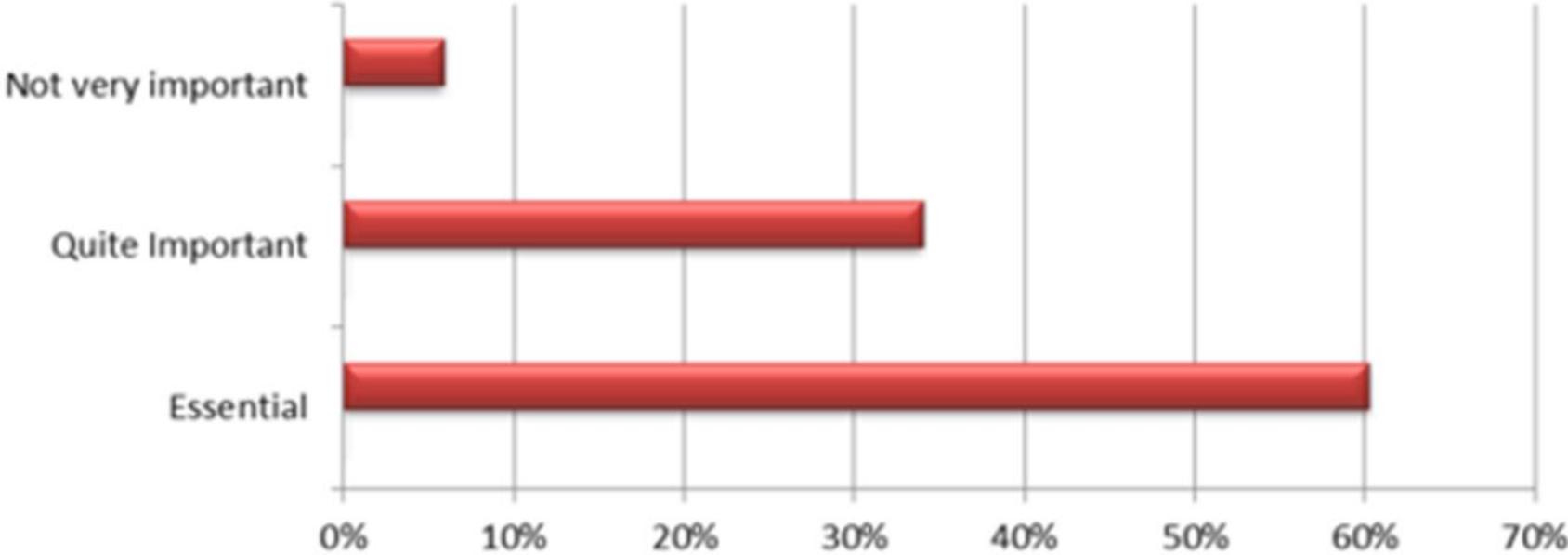
## REAL Alternatives background research

- R-A training material based on detailed “needs research” carried out in 2014
- survey of key stakeholders (including mainly contractors and trainers)
  - 105 responders
- Key conclusions (**in 2014**):
  - there is a general lack of preparedness for low GWP refrigerants including ammonia, CO<sub>2</sub> HCs and HFOs
  - a mix of e-learning and external training provision (blended learning) is required
  - it is essential that individuals are tested on completion of their training

# R-A Survey: What % of your workforce is trained



# R-A Survey: Is testing / certification important



## Case Study 2: French Training Assessment

- comprehensive study on training needs
  - carried out by Association Francaise du Froid in 2014
- survey of numerous stakeholders
  - professional associations, end users, installers and equipment suppliers
- study assessed ammonia, CO<sub>2</sub> and hydrocarbons
- some ammonia training in France, but not enough available for CO<sub>2</sub> and HCs
- clear conclusions about lack of practical training
  - only 1 training centre with facilities for HCs and 2 for CO<sub>2</sub>
  - plus specialised training by some equipment manufacturers
- recommendations in this study
  - to extend training at existing facilities to include low GWP alternatives

## Case Study 3: AREA Low GWP Refrigerants Training Guidance

- guidance on minimum requirements for contractors' training & certification
  - latest version published by AREA in November 2014
- defines competence requirements for RACHP contractors using low GWP refrigerants
  - aligned with EN 13313
- provides comprehensive training framework and suggested course structures
  - separate sections for ammonia, CO<sub>2</sub> and HCs
  - also refers to HFOs
- provides list of training centres
  - coverage: 14 Member States      number of training centres listed: 90
  - for each centre
    - details of refrigerants covered in courses
    - whether practical and/or theoretical
    - centre contact details
    - around 30% only offer theoretical training

## Countries listed in AREA training guidelines

Country	Number of Facilities Listed	
Belgium	1	Theoretical and practical
Denmark	3	Theoretical and practical
Finland	2	
France	31	Over half only have theoretical
Germany	9	Theoretical and practical
Ireland	3	
Italy	17	Theoretical and practical
Netherlands	1	Theoretical and practical
Norway	2	
Poland	3	
Slovakia	2	
Spain	8	Theoretical only
Sweden	3	Theoretical and practical
UK	6	Theoretical and practical

# What needs to be done to improve training (1) ?

- interim conclusions based on:
  - literature search, survey responses, review of training legislation / standards and expert comments
- legislation and standards
  - little change required
  - framework for training requirements seems adequate
- training materials for e-learning and theoretical parts of training courses
  - good materials and course agendas already available
  - can be improved as knowledge-base develops (e.g. when EN 378 revision agreed)
  - hence, some incremental development required
- training facilities for practical training and assessment
  - **changes required**
  - insufficient training centres with practical capability in most Member States
  - requires investment in RACHP hardware to support practical aspects of courses

## What needs to be done to improve training (2) ?

- uptake of training
  - **changes required**
  - more technicians and designers need to take appropriate training courses
- geographic availability of training
  - **changes required**
  - more widespread availability of trainers required in some EU countries
- appropriate roles for:
  - authorities
  - associations of service personnel
  - associations of equipment producers
  - companies selling alternative equipment
- or, should we just let the market decide (demand driven) ?

# Concluding Comments on Training

- comprehensive information on training collected in study
  - via Member States survey
  - from excellent “training needs research” carried out in recent studies
- data from this study supports other research
  - there is a significant training gap – lots more training required
  - the legislative framework seems sufficient
  - the training material for theoretical training is already very good
  - the number of facilities for practical training is not sufficient
- the need for training is driven by the rate of uptake of new technologies
  - we are at the beginning of a significant shift from high to low GWP fluids
  - increased number of trained technicians needs to match uptake of low GWP fluids
- the training barrier may be easier to address than the standards barrier
  - changing standards and legislation can take many years
  - training providers can more quickly fill the training gaps
  - but investment costs for trainers and training centres may be a constraint