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"The Latest Technology in Air Conditioning and Refrigeration"

Presentation by Marco Buoni, Vice-President of AREA

"Contractors' added value in refrigeration & air conditioning"

AREA, the Air Conditioning and Refrigeration European contractors' Association has been in existence since 1988 and currently is made up of 21 members from 18 different European countries. AREA is essentially an Association of Associations, meaning that our members are themselves trade associations. Our aim is for our membership to specifically represent contractors' interests at national level in order that we can be truly representative of the contractors' interests at European level in Brussels. Our members currently represent some 9,000 companies, a workforce of around 125,000 people and a combined turnover approaching 20 billion Euros.

Our members essentially represent the businesses responsible for the design, installation, maintenance and repair of all types of refrigeration, air conditioning and heat pump (RACHP) equipment. This includes all kinds of system designs and utilizing all refrigerants from Ammonia, CO₂, Hydrocarbons, HFCs and even the new low GWP HFOs coming through to market now.

It is important to remember that heat pumps, like all compression cycle refrigeration systems, are not a particularly new technology. AREA's members have been designing and installing heat pump systems for many, many years. My own company has been installing reverse cycle heat pumps in Scotland for nearly 20 years.

So I believe that AREA's members are uniquely placed within the RACHP market to give neutral expert advice without fear of being branded biased in favour of one or other refrigerants. And it is against this background that AREA has been developing strong position papers over the past few years on contentious subjects at the forefront of our industry: The F Gas Regulation Review; Heat Pump Minimum Competency Requirements; Low GWP Refrigerants; and Energy Efficiency. These are available via our website (<http://www.area-eur.be/>) but it is on the subject of Energy Efficiency that I would like to concentrate for a moment.

Most of the discussion at political level on the subject of refrigerants seems to be concentrated on global warming potential (GWP) of refrigerants or the unreal comparison of "synthetic versus naturals". To an engineer this should be anathema. Firstly, there is no such thing as a "natural" refrigerant available for commercial use at the moment. Certainly air and water can be used in theoretical applications and, in limited cases, in laboratories under test conditions. But for

commercial use the fact is that all refrigerants for use in RACHP systems are synthetically made by large gas manufacturers with a resultant carbon footprint and by products. To use the word “naturals” for some refrigerants only skews the argument, unfairly in many cases against the most efficient gases.

The vast range of RACHP systems and applications can not all come under a neat banner where one refrigerant suits all applications. There are so many wildly differing applications that we engineers are faced with that it would be naive to believe otherwise.

At times during the past few years I have been called an HFC apologist by those lobbyists with a hidden agenda but I say again that ASEA does not favour any one refrigerant gas over any others. What we are concerned with is making sure our clients have the most efficient systems possible. Which means having all refrigerants available to us.

The number one priority when designing a new system should always be energy efficiency. Anthropogenic global warming is a theoretical science, but energy shortage is inevitable given the demands of the modern lifestyle we in the Western world desire. We must, therefore, maximise the efficiency of the existing systems and those being designed for the near future.

This comes with ensuring these systems are only installed and maintained by professionally qualified craftsmen. They need to understand the methodology in calculating the Total Equivalent Warming Impact (or TEWI) or the Life-Cycle Climate Performance (LCCP), although the latter of these is again skewed to favour certain refrigerants so isn't my favourite methodology to use. They need to appreciate what effect the gases we use can have on the environment. They need to understand what hazards are particular to whatever heat transfer fluids they are handling: flammability, toxicity, high pressures, etc. And they need to understand the importance of properly evacuated and commissioned systems in relation to the long term reliability of the system and the energy efficiency of that system during its life cycle.

This, of course, includes making sure the system is properly and effectively maintained throughout its life cycle: keeping filters clear; regular leak checking; operational checks; etc.

And finally, they need to understand the importance of proper, responsible decommissioning at the end of the life cycle. Too many systems are not dismantled by qualified people who know what they are doing when the system comes to the end of its useful life. Too many systems are stripped out, of commercial buildings in particular, by builders' labourers who simply cut the liquid and suction pipes on a split system, thus discharging the entire charge of refrigerant – sometimes several kilograms of gas – to the atmosphere. Even if the gas used is a high pressure CO₂, a toxic gas such as ammonia, or a flammable hydrocarbon doesn't make this practice acceptable – either commercially or environmentally. And ASEA's members are best placed to advise on the correct procedures for avoiding these mistakes.

Again, there has been a lot of talk during the past two years suggesting that we should all be moving away from HFCs and pushing towards “new naturals”, with CO₂ and ammonia mentioned alongside hydrocarbons. But these aren't new refrigerants by and large. My Father's generation were working with these gases many years ago. Ironically the industry actively moved away from using them in

many applications because of safety fears that aren't even considered now it seems. When almost every aspect of our private, home and commercial lives seems to be so controlled by Health and Safety legislation it does seem strange that the very real dangers of some of these alternative refrigerants are completely disregarded. One has to ask oneself if it will take a high profile casualty before any attention is paid to this.

Certainly there is well documented evidence of domestic refrigerators exploding the doors clean off where flammable hydrocarbon gas has leaked into the refrigerated cabinet and been ignited by the thermostat clicking off during the night.

So it is clear that there are issues to deal with before we can consider fully embracing these so called "new" refrigerants.

When we do embrace them in a wider range of use we first have to make sure that there is adequate training available to all refrigeration engineers across the EU and beyond to make sure that craftsmen are fully aware of the dangers.

Training at present mainly consists of educating the craftsman in the theoretical knowledge required to understand how systems work and monitoring some form of practical demonstration of putting the theory into practice. But training doesn't generally cover the differences between refrigerants nor the specific hazards associated with many of them.

We need better training made available on a much bigger scale because we are already seeing the bad effects of too rapid a roll out of alternative refrigerant use. Large commercial refrigeration systems in supermarkets often work most efficiently when they run with CO₂. There is little dissent from this theory, albeit the efficiency only really applies in the more Northern European countries. The UK, Ireland and Scandinavia has some excellent examples of high efficiency CO₂ systems but they are not much use in Italy, Portugal or Spain.

The retail sector in the UK is trying to roll out a rapid changeover from HFC to CO₂ use because of political pressure with little or no basis in technological reasoning, and the industry simply doesn't have enough competent, fully trained field engineers to install, service and maintain them. Contractors in the UK who carry out this supermarket work have expressed real concerns that too rapid a roll out like this will inevitably result in accidents happening. We have already seen a number of high pressure pipe and fitting failures, mercifully without fatalities so far but it is only a matter of time I fear.

And aside from this large commercial market and the small domestic refrigerator market, which has almost entirely moved away from HFCs toward Hydrocarbons already in the EU, there is also a huge market in the small air conditioning industrial sub sector, domestic heat pumps and commercial multi split air conditioning sector where HFCs continue to represent the very best of options in terms of energy efficiency. Trials on small to medium duty split air conditioning systems comparing R410a with variously CO₂, ammonia, hydrocarbons and HFOs showed the HFC to be up to 60% more efficient. When RACHP systems are said to be responsible for around 40% of

buildings energy consumption already, it is completely irresponsible to consider changing this gas for one which is so much less efficient.

The clear message from ARIA is that F Gas Works. The double meaning that fluorinated gases are an effective heat transfer media and that the F Gas Regulation can work at minimising emissions of potentially damaging gases.

I say that the Regulation “can” work because at the moment there is good evidence of where it is having a real and positive effect on contractors and end users behaviour, but there is also evidence of where it could work far more effectively. ARIA has been heavily involved in collating the evidence from contracting businesses right across the EU and reporting back to the Commission via the fluorinated gases expert group during the Regulation’s review process. The most important message to filter through has been the importance of effective policing of the Regulation. Even the very best piece of legislation needs proper implementation and enforcement if it is to achieve its objective.

Member states who have fully implemented the Regulation thus far can point to the reduction in leaks from better installed and monitored systems, in line with countries that had previously enforced legislation on a national scale. A renewed emphasis on up skilling of craftsmen or even a simple enforced round of refresher training for experienced competent refrigeration engineers does have the fairly immediate effect on day to day working that achieves what the Regulation aims to achieve. The theoretical knowledge part of the necessary qualification includes such things as environmental legislation and awareness so that field technicians can be fully aware of what potential damage can be done if they don’t carry out their duties responsibly. This simple reality proves the importance of a properly trained, competent workforce. But this can only work fully if there are proper checks and balances in the market to make sure that only these competent professionals can work on the systems containing these gases.

At the moment there is only provision in the Regulation for making sure that companies working in the RACHP sector are registered and certificated. But in an industry with a liquid workforce such as ours, this is not good enough. RACHP craftsmen often change employers on a fairly frequent basis either because they can get better salaries elsewhere or because their employer is less busy. If a company has obtained certification and then let go of, or lost, their workforce, what incentive is there for that company to only employ fully qualified technicians if there is little or no policing of the Regulations? Particularly during times such as these when the general trend is downward in terms of the level of work available. Few contracting companies are in a position to expand their workforce right now, or to invest on a large scale in refresher training for existing technicians, when they don’t even know if there will be work for those technicians in a few months time. So what we need to do is set up and enforce an operative register of those craftsmen who are fully qualified to run alongside the company register to make sure that companies continue to only employ competent craftsmen and that end users only employ properly competent field technicians on their sites.

The registers for competent craftsmen and companies should also be made publicly available on the internet so that end users can easily check that the people turning up on their premises are qualified to work on their systems.

However, AREA does not believe that this measure alone will make the Regulation work as intended. And there are two main reasons why this is the case:

- A general lack of awareness at end user level that they have a legal responsibility to ensure the systems they are responsible for have to be worked on only by certified personnel;
- The availability of small split air conditioning systems and domestic heat pumps to non-certified companies and personnel which contain the entire refrigerant charge necessary for putting the equipment to work.

There is a simple solution to this problem that will help the Regulation as a whole work as intended.

First we need to remember that there is a legal requirement for all RACHP systems, regardless of the amount of refrigerant in them, to only be installed and serviced by properly qualified and certificated personnel. There is no lower limit below which anybody can do this. Some member states implementation processes seem to have confused the installation, servicing and repair work with that of the requirement for leakage checking. There is a lower limit of 3kgs refrigerant charge, below which there is no legal requirement to carry out an annual leak check on the systems. But this limit clearly only applies to leakage checking. So we need to raise awareness that there is a legal requirement for all RACHP systems to be worked on only by properly competent craftsmen.

Because of a general lack of effective policing of the Regulation in many countries, there have been numerous cases of small split air conditioning systems being supplied to non competent people. They are sold complete with pre flared copper tubing and the installation instructions explain in layman's terms how to install the system but worryingly advise the installer to purge the pipes of air rather than use a vacuum pump to properly dehydrate the entire system. This is not only illegal (deliberate venting to atmosphere) but very bad installation practice as it leads to rapid corrosion within the system and component failure. These systems being freely sold to non qualified people frequently leads to loss of refrigerant and potential environmental damage.

AREA have suggested putting restrictions on the sales network to make sure that only certified people and companies can actually take delivery of the systems for installation. But we were met with complaints that we would be interfering with the manufacturers supply chain. We have suggested that the onus of responsibility be changed from the customer to the supplier as it is easier to check compliance. And finally we have suggested that there is a total ban on pre charging the systems. There are good technical and environmental reasons for this suggestion.

By supplying systems without the refrigerant already charged in them it doesn't matter who buys the product or carries out the basic installation. Non qualified people could, in principle, buy the systems themselves, drill the holes through walls and physically connect the pipes, thereby limiting the installation cost to them, the end user. What they cannot do is put the system to work. For this they would need a properly qualified refrigeration craftsman. One must assume that a properly qualified craftsman, having had the refresher training, would not charge the system without first checking the leak tightness as required by law. They would then properly evacuate the system to make sure there is no moisture content to cause oxidisation or corrosion. They would then only charge the amount necessary to make the system work efficiently. Therefore, if there was some catastrophic failure of a component, the minimum amount of refrigerant would be lost to atmosphere.

The solution is simple: make sure that only competent people install the systems either by restricting the sales route of systems or by controlling the sale of refrigerant including that which comes pre charged.

These simple solutions will help AREA's member contractors to help the Commission make the F Gas Regulation work.

Thank you.