

# R717 ROMANIAN REFRIGERATION REVIEW

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**Abstract:** *The paper presents a study of the Romanian line up to the environment, refrigeration and air-conditioning EU legislation with the recommendation of using R717 as ecological refrigerant alternative.*

**Key words:** *environment, refrigeration and air-conditioning EU legislation*

## 1. Introduction

In the last years, the refrigeration, air conditioning and heat pump Romanian industry made important technical progress and complied with the Montreal and Kyoto Protocols See: [1, 2, 3, 8].

The activity of the AGFR (Romanian General Association of Refrigeration) was a complex one, in the fields of education, research and production, having tight bounds to other associations in Romania and the Patronage for Refrigeration and Air-Conditioning of Romania (PFACR).

An important activity in research, at both national as at international scale, is also to be underlined, the contribution of young members, such as those involved in Master and PhD programs at the Faculty of Building Services within the Technical University of Civil Engineering in Bucharest, being worthwhile mentioning.

## 2. Ammonia as Ecological Refrigerant Alternative

Ammonia is often used in areas where it can be stored easily, but its toxicity and security are limiting it to be used in some refrigeration applications.

In the last years in Romania the commercial, industrial and domestic refrigeration fields were developed: pork

slaughterhouses, storage rooms, logistic parks, warehouses, farms, beer factories, poultry slaughterhouses, soft drinks factories, dairy factories, wine factories, ice rink, supermarkets etc. Each industrial refrigeration plant was made in one/two compression stage, cascade with conventional equipment as: evaporators, pumps, heat exchangers, evaporative condensers, tanks, vessels for high pressure and low pressure, stainless steel tubes, valves and automatic systems and worked with R 134a, R744 and R 717 (NH<sub>3</sub>) See: [4,5,6,8].

Some examples of such objectives working with R 717 (NH<sub>3</sub>) are: Ianca SLAUGHTERHOUSE, AGRISOL Scaieni Prahova, Keller LOGISTIC Brasov, AVICOLA Brasov, TRANSAVIA, WAREHOUSE Tulcea, SCANDIA Sibiu, MEGAIMAGE Stefanesti Ilfov, PARMAFOOD Bucuresti; AVICOLA Buzau and many others.

For industrial refrigeration systems, these objectives were built 50% with European support.

## 3. Romania, an Ammonia Traditional User

Making analyze on Romanian market during the last five years it can be concluded that the most important field

where applications with ammonia were made, was the food industry.

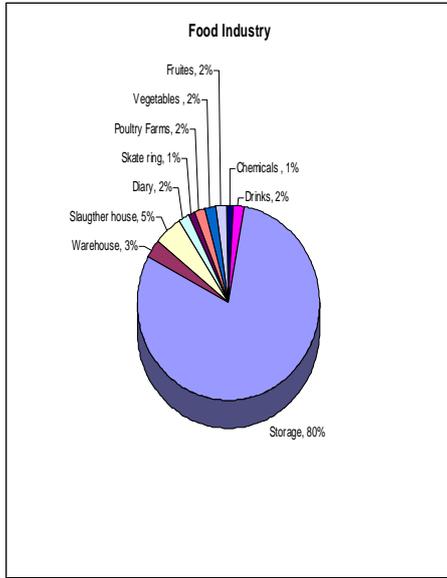


Fig. 1 Ammonia industrial refrigeration in Romania in last five years

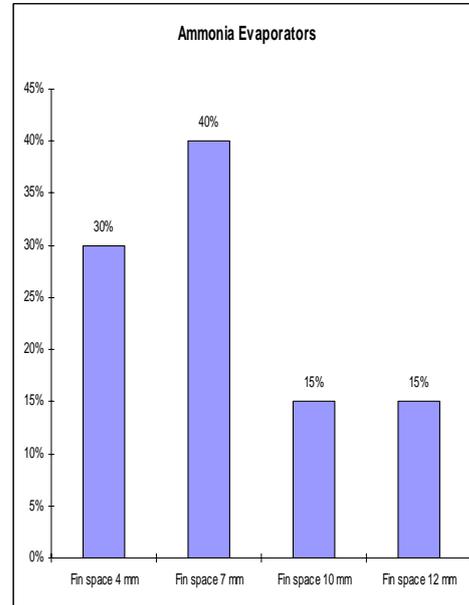


Fig. 3 Evaporators used in Romanian ammonia refrigeration plants in the last four years

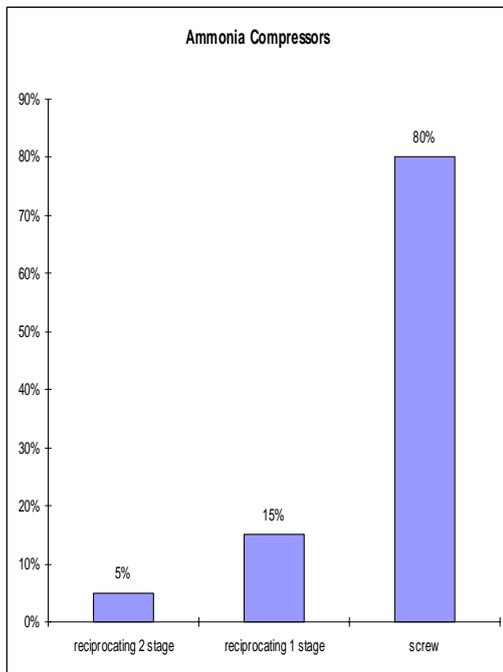


Fig 2 Compressors used in Romanian ammonia refrigeration plants in the last five years

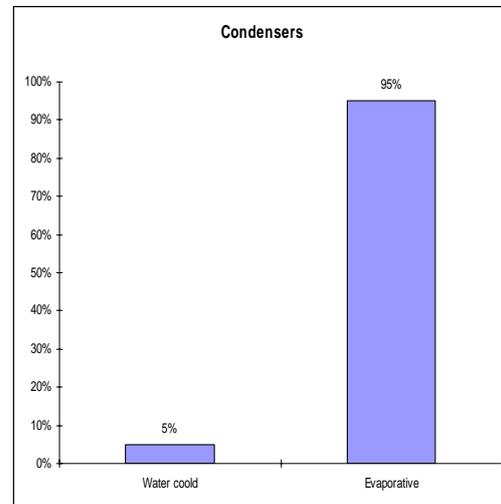


Fig. 4 Condensers used in Romanian ammonia refrigeration plants in the last five years

Figures 1, 2, 3 and 4 present a general view of the ammonia industrial refrigeration sector and the most important types of compressors, condensers,

evaporators, used in Romanian ammonia refrigeration plants See: [8, 9, 10].

It must be taken into consideration some data about recovered ammonia See: [11]

Whenever it is required to remove ammonia, from a system it shall be carried out by suitably qualified and experienced staff or refrigeration contractor, working to a written procedure.

Ammonia should be recovered into a recovery cylinder or road tanker dedicated for ammonia.

Containers provided for the supply of new ammonia shall not be employed as containers for used ammonia without the prior written consent of their owners since this may lead to contamination of the containers.

When ammonia is transferred from a system as liquid, the container shall display a warning that the ammonia may contain contaminants.

When ammonia is transferred from a system, it should be understood that the originating ammonia circuit would retain contaminants (oil, water, and particulate matter). Care should be taken in the disposal of these contaminants.

Where refrigerant is decanted from the system into cylinders care shall be taken to ensure that the weight of refrigerant transferred does not exceed the safe limit for each cylinder.

If ammonia is to be transferred to another system without being fully reclaimed, the owner/operator/user shall be notified in writing of the possibility of cross-contamination.

Recovered ammonia shall be returned to the original supplier or to a similar organization for disposed of as hazardous waste through an organisation licensed for the disposal of hazardous waste. Water into which ammonia has been absorbed shall be dealt with as waste for safe disposal.

For transport and storage purposes the suitable containers shall be appropriately labeled.

Ammonia containers shall not be stored where temperatures can exceed 45°C and should not be stored in a machinery room.

### 3. Conclusions

According to the instructions of the Ordinance of the Environment Waters and Forests Ministry, the AGFR certifies operators (companies and personnel).

The strategy regarding refrigerants according with EU Regulations show (Fig.5) that will be a reduction of 79% in next 15<sup>th</sup> years.

In this way the most ecological refrigerants are natural fluids as ammonia, water, air, HC and CO<sub>2</sub>.

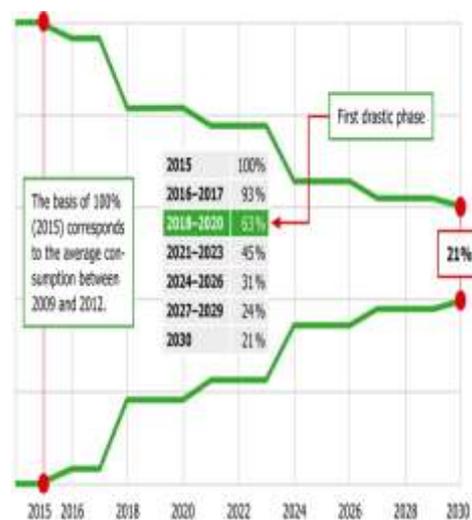


Fig. 5 F-Gas phase-out

After a global analysis of the Romanian Refrigeration situation it could be said that our country remains a traditional ammonia user.

Making an analyzes on the Romanian market during the last years it can be concluded that the most important field where ammonia applications were

used, was the food industry See: [4, 5,6,7,8,9,10].

Demonstrating a strong commitment to protect the environment through the use of natural refrigerants and most advanced refrigeration solutions, Romania decided to use green technology for CO<sub>2</sub> cascade and trans critic new commercial applications.

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