

**General methodology of ODS  
alternatives surveys and  
consumption, banks and servicing  
needs of ODS alternatives in Serbia**

Marin Kocov

marinkocov@yahoo.com

# **Methodology for collecting and analysing use of ODS alternatives**

(applicable for ECA countries when there is no production of ODS alternatives)

Everything that is less than 3% of the total figure should be neglected due to the limited time for collection of data.

Use the infrastructure established for the preparation and implementation of HPMP that was used to conduct the ODS surveys.

**Step 1.** Determine the consumption in manufacturing sector for the period 2012-2015 (serial production – like refrigerators, freezers, passenger cars, foams, MDIs etc.) and solitaire production of cold rooms, displays etc.

**Step 2.** Calculate the banks of refrigerants in all sectors (refrigerators, freezers, room air-conditioners, passenger cars, busses, trucks, trailers, vans)

Use statistical data – for Serbia [www.stat.gov.rs](http://www.stat.gov.rs);

[www.popis2011.stat.rs](http://www.popis2011.stat.rs)

UN trade statistics (<http://comtrade.un.org/data/> - for refrigerators, freezers, air-conditioners)

GCI\* – as a comparative tool for certain appliances in use of domestic refrigeration, mobile air-conditioning and unitary air-conditioning.

The Green Cooling Initiative (GCI) is funded by the [International Climate Initiative](#) by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and implemented by [GIZ Proklima](#).

**Step 3.** Determine the number of appliances in all sectors and estimate leakage rate for each sector;

**Step 4.** Calculate the servicing needs (“Import - Export - Consumption in manufacturing sector”);

**Step 5.** Conduct inventory for equipment charged with more than 3 kg refrigerants (even less - for R-404A – 1.3 kg, for R-410A – 2.4 kg, for R-407C – 2.8 kg – this is equivalent **to 5 tonnes of CO<sub>2</sub>**). Data obtained could be used for approximation of the use of ODS alternatives when statistical data are available (crucial to determine the banks for cold rooms, displays, central air-conditioning in commercial and residential buildings, etc.)

## **Prepare questionnaire**

Before conducting the inventory, check what is available in the statistical year book (or any other statistical information) and then focus on the inventory.

## **Step 6.**

Projection of the use of ODS alternatives up to 2030

UNEP's scenario to estimate growth of HFCs

consumption

GCI

GDP

Consult national experts/refrigeration association

Personal knowledge and experience

## Calculation the carbon dioxide equivalent of a quantity of F gas

You calculate the carbon dioxide equivalent of a quantity of F gas by multiplying the mass of the gas (in tonnes), by the gas' global warming potential (GWP).

Global warming potentials for F gases are listed in the table of F-gases (EU) Regulation No 517/2014.

	Composition	GWP
HFC-134a		1,430
R-410A	HFC-32/125 (50/50)	2,088
R-407C	HFC-32/125/134a (23/25/52)	1,774
R-404A	HFC-125/143a/134a (44/52/4)	3,922

For example the global warming potential of R-404A is 3,922.

Therefore the tonnes CO<sub>2</sub> equivalent of 10 kg of R-404A is calculated as follows:

Mass (in tonnes) of F gas multiplied by GWP of F gas  
= (10/1,000) \* 3,922 = 39.2 tonnes CO<sub>2</sub> equivalent  
CO<sub>2</sub> equivalent thresholds for common F gases used in the EU regulation

F gas	GWP	mass, in kg, equal to 5 tonnes CO <sub>2</sub> (leak check)	mass, in kg, equal to 40 tonnes CO <sub>2</sub>	mass, in kg, equal to 50 tonnes CO <sub>2</sub>	mass, in kg, equal to 500 tonnes CO <sub>2</sub>
R-404A	3,922	1.3	10.2	12.7	127
R-410A	2,088	2.4	19.2	23.9	239
R-407C	1,774	2.8	22.5	28.2	282
HFC-134a	1,430	3.5	28.0	35.0	350

## Leak checks

Operators of equipment that contains fluorinated greenhouse gases in quantities of 5 tonnes of CO<sub>2</sub> equivalent or more and not contained in foams shall ensure that the equipment is checked for leaks.

Hermetically sealed equipment that contains fluorinated greenhouse gases in quantities of less than 10 tonnes of CO<sub>2</sub> equivalent, shall not be subject to leak checks, provided the equipment is labelled as hermetically sealed.

## **LOG-BOOKS**

Log-books should be mandatory and frequency of checking for leakages should be part of the national legislation (the best tool for leakage prevention);

Each leakage of refrigerants (R-407C, R-404A, R-410A) in quantity over 10% of the total quantity installed, means change of the complete system charge. For the smaller systems it is not so essential, but for the systems with more than 30 kg of refrigerant this implication is important, refrigerant has already modified its composition and lost the basic characteristics. In addition the remaining refrigerant (90%) has to be recovered since it is practically waste and the system has to be recharged with the new refrigerant.

## **Software is needed for the log-books**

This system would facilitate future data collection of ODS alternatives and its incorporation in country programme (CP) data reports.

## **Serbia got one!**

For the survey very useful information could be obtained from the software in order to approximate the banks of refrigerants in various sectors.

## **More about the log-books**

License plate for car is very logical!

What about a chiller?

Car mechanic – on every 10,000 km we (me) regularly change the oil, oil-filter, air-filter, pollen- filter

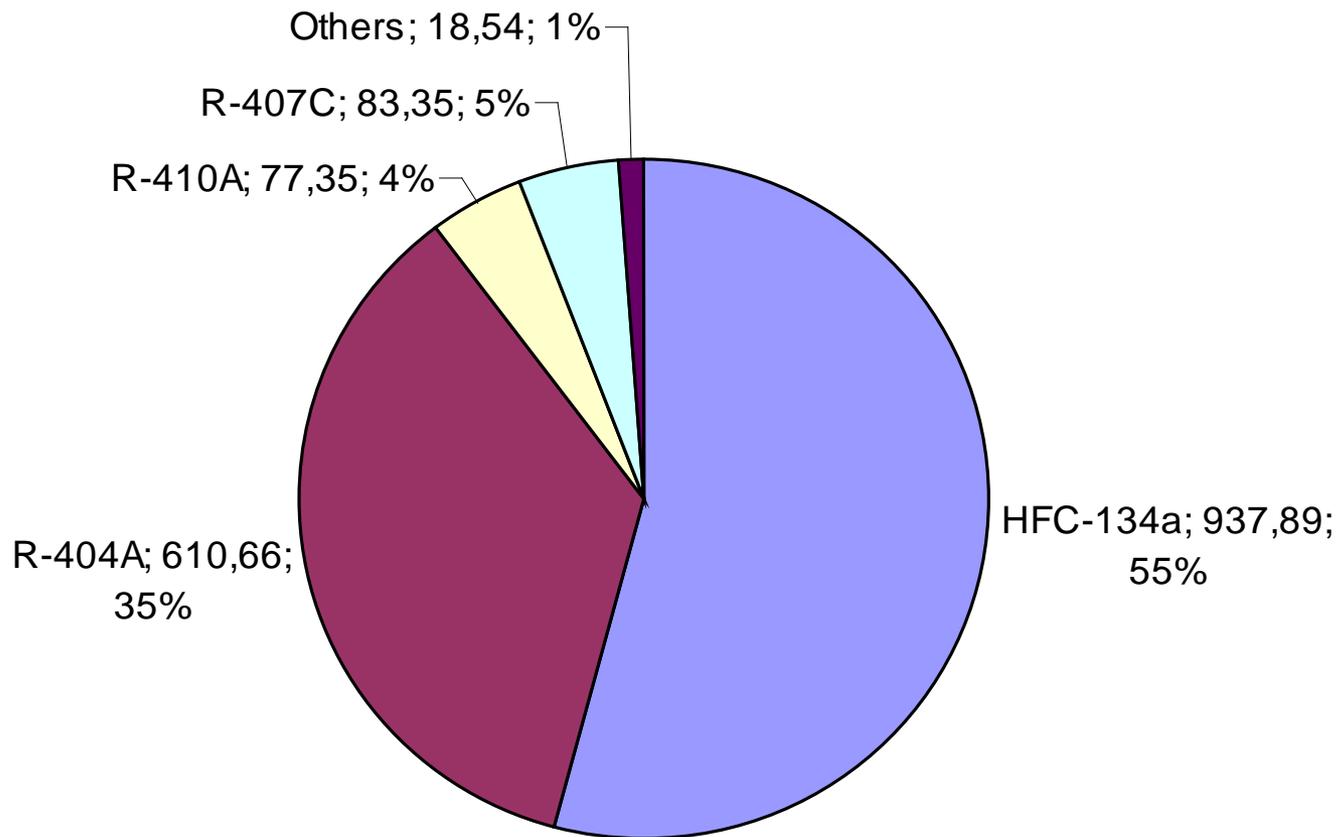
What about a chiller?

Price of a chiller vs. price of a car?

We (me) usually go to see a dentist or a doctor when we (me) have a tooth-ache or when we (me) are sick;

**Prevention!!**

# Consumption of ODS alternatives in the period 2012-2015 (in MT and %)



# Analysis of the inventory

Survey (inventory) of 741 pieces of equipment that contains more than 3 kg refrigerants was conducted at the time of the submission of the report.

<b>Refrigerant</b>	<b>Number of units</b>	<b>Total refrigerant charge (kg)</b>
<b>HCFC-22</b>	<b>23</b>	<b>782,7</b>
<b>HFC-134a</b>	<b>54</b>	<b>12.013,8</b>
<b>R-227</b>	<b>9</b>	<b>67,5</b>
<b>R-404A</b>	<b>365</b>	<b>19.313,8</b>
<b>R-407C</b>	<b>153</b>	<b>4.185,2</b>
<b>R-410A</b>	<b>127</b>	<b>2.956,6</b>
<b>Unknown</b>	<b>10</b>	<b>1.255,0</b>
<b>Grand Total</b>	<b>741</b>	<b>37.554,4</b>

# Calculating banks and servicing needs

**(Refrigerators, Freezers, Room air-conditioners,  
Passenger cars, Busses, Trucks, Vans, Trailers)**

Number of appliances per household

Statistical data

Average charge per appliance

Refrigerants

Leakage rate

# Banks and servicing needs (in MT) – Summary

2015	HFC-134a		R-404A	
	Bank	Servicing needs	Bank	Servicing needs
	1.463,17	248,72	838,12	83,81
	R-410A		R-407C	
	257,29	13,78	57,67	5,77
	HCFC-22		Allowed as per MYA	
	956,12	47,81	114,52	

# Conclusions

The main uses of refrigerants are in mobile air-conditioning followed by room air-conditioners.

Largest bank is in passenger cars - 1,064 MT of HFC-134a and the servicing needs are 213 MT.

For room ACs the bank is 956 MT of HCFC-22 (servicing needs-48 MT) + 238 MT of R-410A (servicing needs-12 MT).

The bank of R-404A is 838 MT (servicing needs-84 MT).