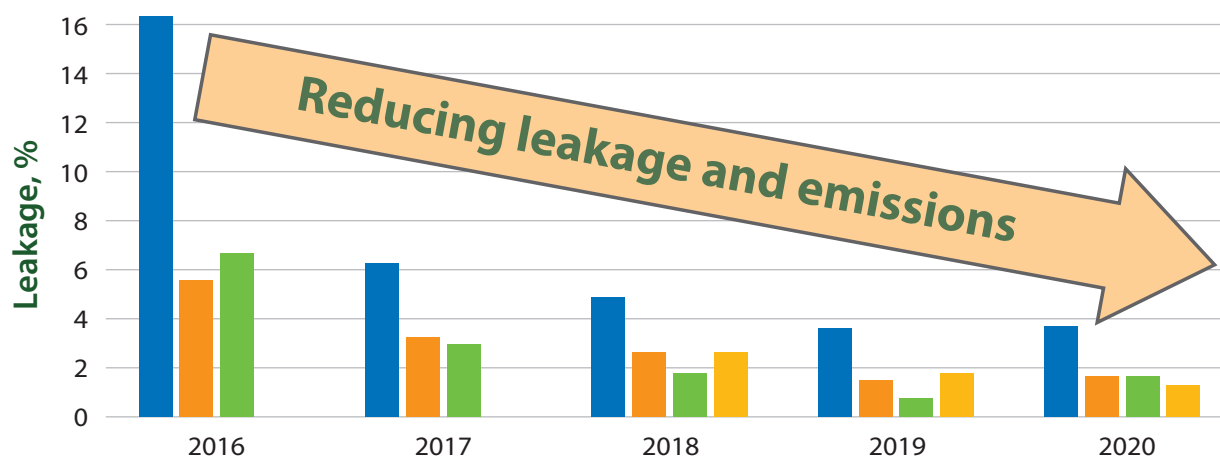


## How to set up and manage logbooks for refrigeration, air-conditioning, heat pump and other types of equipment



### Background

This technical brief reflects the Polish experience of setting up and managing logbooks for refrigeration, air-conditioning, heat pump (RACHP) and other types of equipment. It also provides examples of similar equipment databases used in other developed and developing countries.

It explains how equipment logbooks and electronic databases can facilitate a smooth

hydrochlorofluorocarbon (HCFC) phase-out and hydrofluorocarbon (HFC) phase-down. It also provides guidance on the contents and format of the equipment logbooks, and on how to set up and manage the related databases.

The Appendix describes the step-by-step approach for setting up and managing equipment logbooks and the relevant electronic databases.

### Data collection and record keeping - measures to facilitate smooth HCFC phase-out and HFC phase-down

Although production and consumption of HCFCs declined significantly in developing countries, there are still huge quantities of them contained in products and equipment, especially in RACHP equipment. Leakage of these substances into the atmosphere contributes not only to ozone layer depletion, but also to global warming since HCFCs are potent greenhouse gases.

The same applies to equipment containing HFCs with the difference that they are still widely

used – often as replacement for HCFCs – and that they do not deplete the ozone layer. HFCs contribute to global warming and are being phased down under the Kigali Amendment to the Montreal Protocol. If fully implemented by all parties, the Kigali Amendment is expected to reduce HFC emissions by 85% and avoid 0.4°C of global warming.

All policy and legislative measures that may facilitate a smooth HCFC phase-out and HFC

phase-down should be considered by the parties to the Montreal Protocol and its Kigali Amendment as part of an integrated strategy, well in advance of specific reduction targets. Apart from the mandatory import/export licensing systems for HCFCs and HFCs, there are five categories of measures<sup>1</sup> to be considered:

- Monitoring and control of trade
- Restrictions on use
- Record keeping
- Emission prevention
- Capacity building and awareness raising.

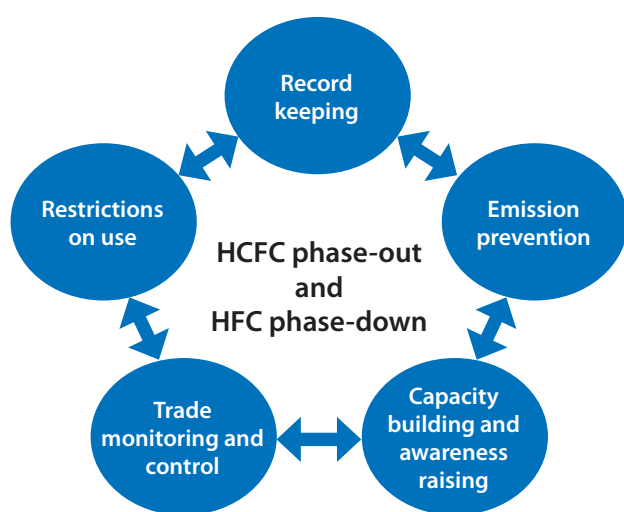


Fig. 1. Five general categories of legislative and policy measures facilitating HCFC phase-out and HFC phase-down.

One of the most effective measures to enhance the HCFC phase-out and HFC phase-down is record keeping, specifically the establishment of HCFC and HFC equipment logbooks.

Equipment logbooks can be electronic or paper-based and should contain the following data:

1. Equipment identification
2. Substances / blends contained in the equipment
3. Owner / end-user of the equipment
4. Interventions conducted on the equipment by competent / certified personnel

HCFC and HFC equipment logbooks enable data monitoring and the verification of compliance with national legislation. Countries can collect data on the existing (already installed) equipment, the installation of new equipment and the decommissioning of old equipment. Based on these data, the current demand and market trends, they can take informed decisions on the most effective legislative and policy measures such as promoting alternative technologies or banning the placing on the market or use of certain types of equipment or products.

The data on HCFCs and HFCs recovered from or charged in equipment allow the calculation of actual leakage rates. Mandatory leakage checks of certain types of equipment and within given intervals, and timely repair of detected leakages, can prevent excessive leakage. Subsequently, the amount of refrigerant used for servicing is significantly diminished. Leakage checks, repair, refrigerant recovery and recharge need to be recorded in HCFC and HFC equipment logbooks to ensure compliance and calculate leakage rates.

In addition to reducing refrigerant leakage, mandatory leakage checks and leak repairs also reduce the energy consumption. Equipment with inappropriate refrigerant charges does not operate efficiently and consumes more energy. The same applies to equipment charged with blends whose composition changes due to the leakage of the more volatile components<sup>2</sup>. Thus, these measures also contribute to saving energy and to protecting the climate.

All maintenance, servicing, leakage check, and repair work should be performed by competent and certified personnel. The equipment logbooks allow the monitoring of such operations and show whether these were performed correctly.

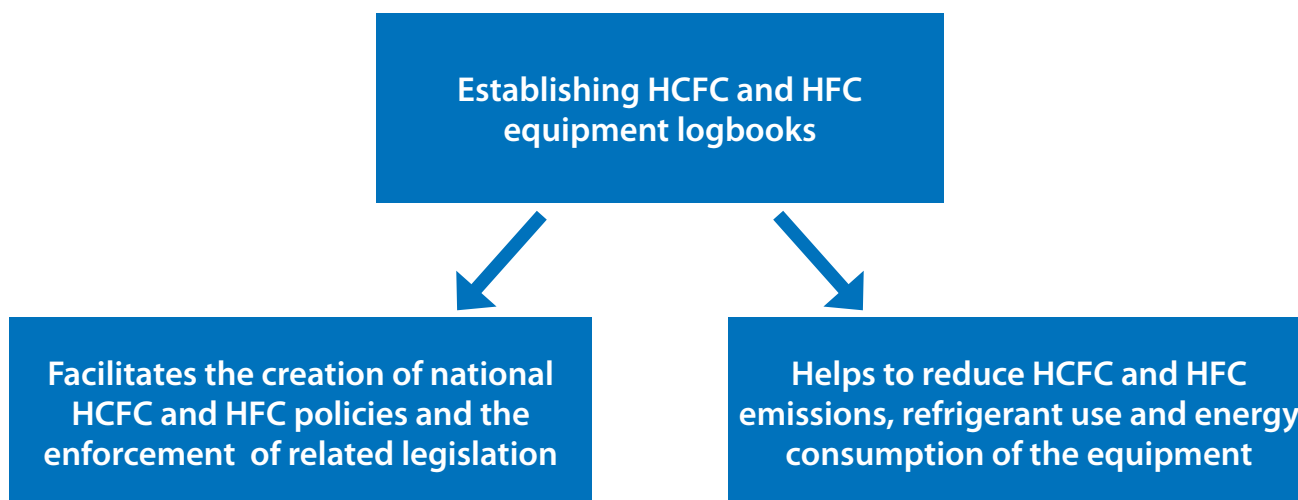


Fig. 2. How equipment logbooks facilitate a smooth HCFC phase-out and HFC phase-down

## Equipment logbooks - mandatory or voluntary?

In principle, countries might opt for mandatory or voluntary equipment logbooks. However, leaving the decision on keeping equipment logbooks to the owners or end-users of the equipment would result in different contents and formats of the logbooks. It would not allow the country's administration to obtain reliable and complete data on the substances and quantities contained in different types of equipment. It would also make it a challenge

to adopt meaningful policies and legislation. Furthermore, voluntary equipment logbooks would not allow monitoring whether leakage checks were performed by competent/ certified personnel and whether detected leakages were repaired in a timely manner. Thus, the preferable option is the adoption of mandatory equipment logbooks. The requirement of keeping logbooks and maintaining records must be included in the national HCFC / HFC legislation.

## What types of equipment and what substances should be covered by the logbooks?

About 90% of all HCFCs and HFCs produced globally are used for charging new and servicing existing RACHP equipment<sup>3</sup>. It is therefore crucial to monitor the amount of refrigerant contained in such equipment, as well as that recovered from and recharged to it.

Equipment containing alternative refrigerants such as hydrocarbons, carbon dioxide, ammonia or unsaturated HFCs (also known as HFOs) should also be considered since it would provide valuable information to policy makers on the rate of deployment of these alternatives in the country. If older refrigerants such as chlorofluorocarbons (CFCs) are still

contained in equipment operating in the country, such equipment should also be included in the equipment database.

Extending the scope of the logbooks to cover equipment containing perfluorocarbons (PFCs) would also be useful because of the extremely high global warming potential (GWP) of these chemicals. Other types of equipment which could be covered by the equipment logbooks are stationary fire protection systems and electrical switchgears.

Mandatory equipment logbooks may cover:

1. Stationary RACHP equipment. In developing countries these usually hold more than 90% of HFCs and HCFCs contained in all types of equipment.
2. Stationary fire protection systems if the country has considerable number of such equipment containing HFCs or HCFCs.
3. Mobile refrigeration systems like those on trucks or trailers. Leakage from this type of equipment is usually very high and it would be advisable to monitor them.
4. Electrical switchgears containing SF<sub>6</sub>. Although this substance is not controlled under the Montreal Protocol, it has an extremely high GWP.

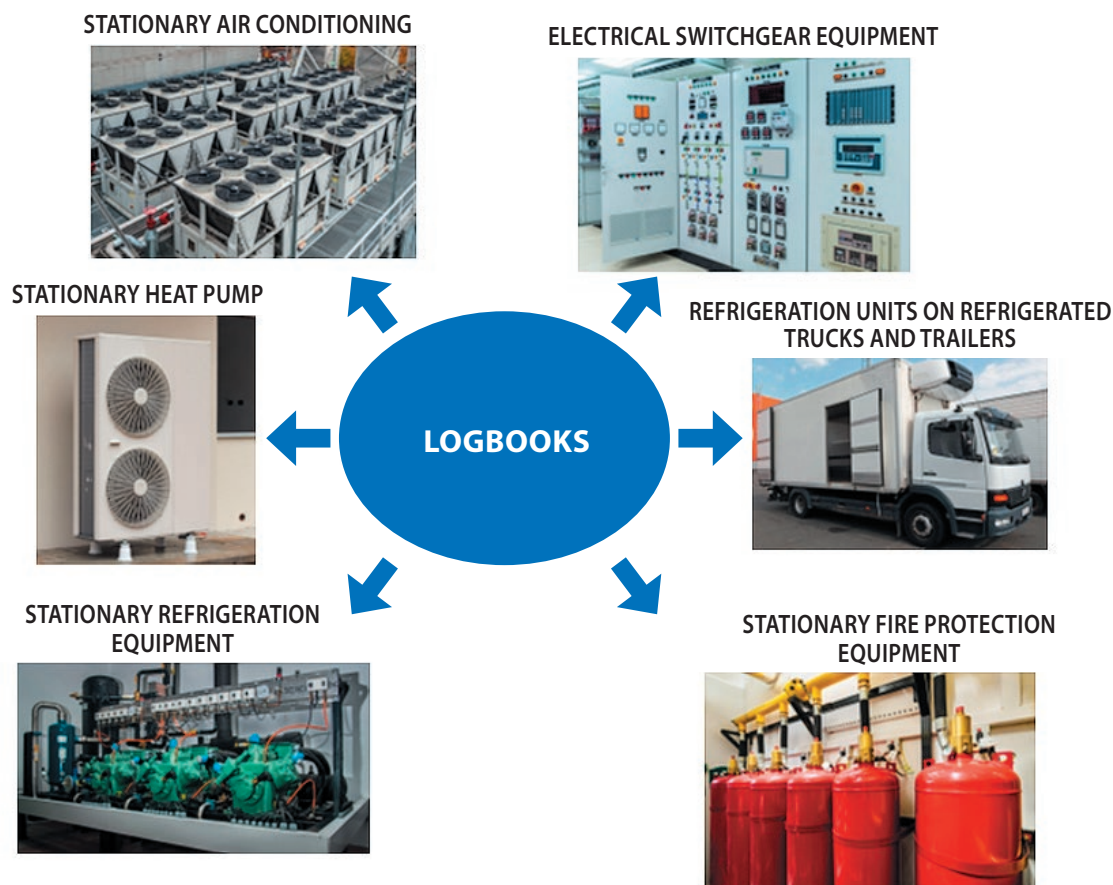


Fig. 3. The most used equipment that should be covered by the logbooks.

## Who should keep the equipment logbooks?

The most practical approach is that equipment owners or end users - usually called "equipment operators" - keep the equipment logbooks and record all maintenance, servicing, leakage checking, and repair work performed on the equipment.

An alternative approach would be for the servicing companies to maintain the logbooks. However, they might change several times

during the equipment's lifetime, and this would create an additional administrative burden for the administrator of the equipment logbooks database when dealing with such changes.

Usually, "equipment operators" are legal entities, but private persons who are owners or end users of equipment can also be required to keep logbooks and to record interventions done on their equipment.

It might also be useful to monitor the supply chain and to also make it mandatory for manufacturers and wholesalers of equipment to maintain an inventory of equipment sold. This would provide

an additional level of monitoring ensuring that all newly produced or sold equipment will also be registered in the equipment database.

## What kind of data should be included in the equipment logbook?

Contents of equipment logbooks	
Data on equipment	Name, model, serial number, date of manufacturing, whether a leakage detection system is installed, equipment location (address)
Data on substances / blends	HFCs, HCFCs, possibly also CFCs, alternatives and SF <sub>6</sub>
Minimum equipment charge requiring mandatory logbooks	Stationary equipment e.g., 5 tons of CO <sub>2</sub> -eq. for HFCs or 3 kg for HCFCs/CFCs <sup>4</sup> Mobile equipment e.g., the same as stationary or even lower limits (1 ton of CO <sub>2</sub> -eq. to cover also smaller equipment due to high leakage rates of mobile equipment)
Data on the logbook keepers or "equipment operators"	Name, address, contact details of persons keeping the logbooks and recording data (name, surname, email address, telephone)
Records of interventions	Leakage check, installation, maintenance, servicing, repair including repair of detected leaks, decommissioning, recovery, installation of leakage detection system, leakage detection system check, etc.

## Nationwide electronic database – the recommended option for equipment logbooks keeping

Electronic record keeping is increasingly becoming common practice. The advantages of electronic equipment logbooks compared with paper-based approaches include:

- Less space to store collected data - instead of storing the data in physical logbooks, they are stored in an electronic database.
- Access from anywhere in the world – electronic documentation of HCFC and HFC equipment allows for quick access to it from any place with an Internet connection.
- Reduced risk of mistakes and more efficient work – manually entering data in physical logbooks can take significant time, whereas the same information can be entered with a few clicks on a computer, phone or tablet.

It also reduces the risk of mistakes as the saved data are easier to read in the system and automatic checks for consistency or correct data format can be conducted by the system.

- Automatic email or SMS notifications – keeping electronic records allows for periodic reminders to be sent to equipment operators to carry out the mandatory leakage checks of equipment or repairs, etc.
- "On the spot" system-generated reports and statistics. These are important for regulatory bodies to verify the enforcement of certain regulations or to monitor the implementation of national policies on HCFC and HFC equipment.

- Cost savings – despite the initial costs of creating the electronic database and user interface, the long-term savings from operating an electronic system are more important as administrative costs will decrease. Managing the paperwork manually will require significant human resources and will result in significant administrative costs.

Electronic logbooks depend on technology and require the creation of the database programme and user-interface, maintenance of the system, access to a computer, phone or tablet, and internet connection. Overall, there are many advantages of electronic systems and it is recommended that the equipment logbooks are kept in a nationwide electronic database.

## Who should manage the nationwide electronic database of equipment logbooks?

An electronic database of equipment logbooks that covers the whole territory of the country may be called “National Register of Equipment Operators” or “Central Register of Equipment Operators” and would normally be administered by a competent authority or designated institution.

The responsible authority or institution must designate officers who will oversee database management and communication with the external users. A database administrator should also be designated. These officers must closely collaborate with the IT staff of the organization.

In order to ensure data confidentiality, it is essential that the designated database

managers sign confidentiality statements prior to being granted access to the database. In Poland, for example, the Ministry of Climate and Environment issued a legal act in 2015, pursuant to which the electronic database of the logbooks of equipment containing CFCs, HCFC, fluorinated greenhouse gases (F-gases) and SF<sub>6</sub> has been established. Based on that legislation, keeping equipment logbooks has become mandatory from January 2016. The creation, management, development, and maintenance of the “Central Register of Operators” are the responsibility of the Ozone Layer and Climate Protection Unit located in the Łukasiewicz Research Network - Industrial Chemistry Institute. The designated officers of that institute provide these services as well as technical support for the database users.

## The Polish “Central Register of Operators” – an example of an electronic database of equipment logbooks

The Polish Central Register of Operators (CRO) is accessible through the website [www.cro.ichp.pl](http://www.cro.ichp.pl). In order to facilitate the use of the electronic database, Ozone Layer and Climate Protection Unit has created a webpage providing public information for database users (Fig. 4). This includes answers to frequently asked questions, tips on how to use the database as well as explanation of the relevant legislation.

Equipment operators are required to register and to create their accounts in the database (1 in Fig. 5). The account must include the

data of the equipment operator and an account administrator, who will normally take care of the data entry. The operator can change the account administrator at any time, e.g., in case of changes in the company (2 in Fig. 5). Logging in to the account requires entering the username / email address and password (3 in Fig. 5). For additional security, it is recommended to include the “password reminder” function (4 in Fig. 5) and the “I’m not a robot” or Captcha security measures (5 in Fig. 5). If users have any technical problems, they can contact the system administrator (6 in Fig. 5).

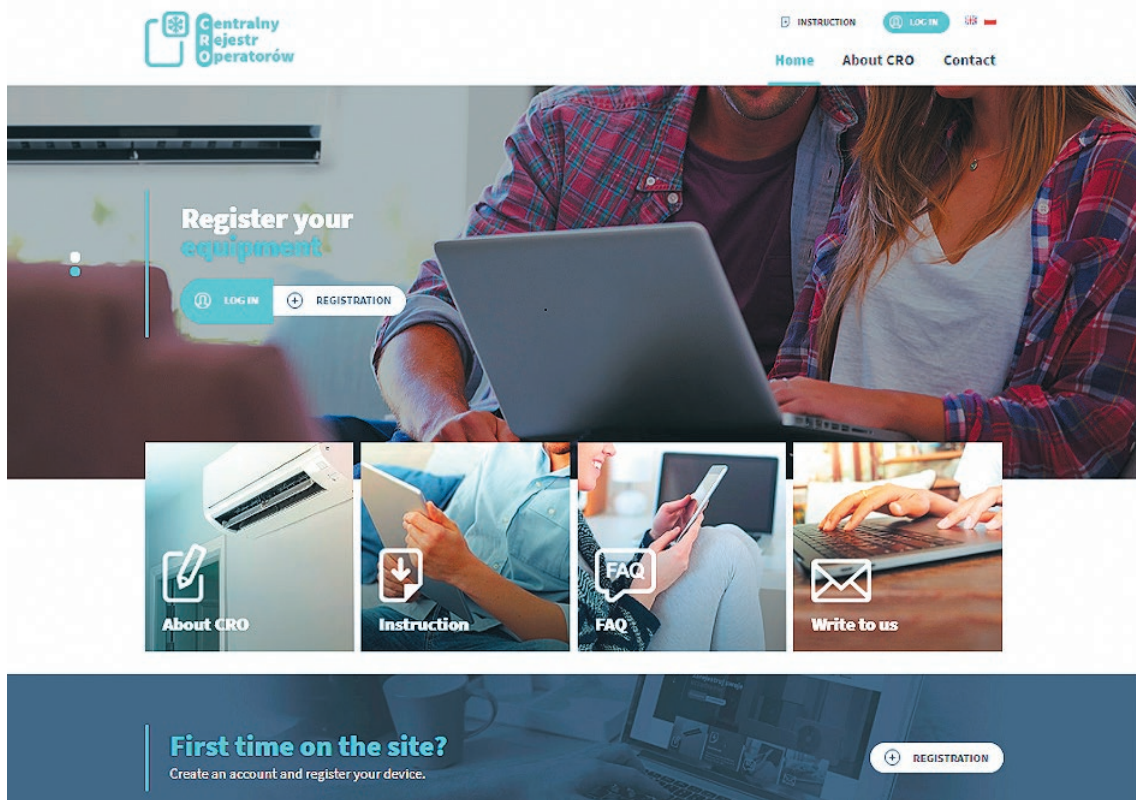


Fig. 4. Central Register of Operators – public information page.

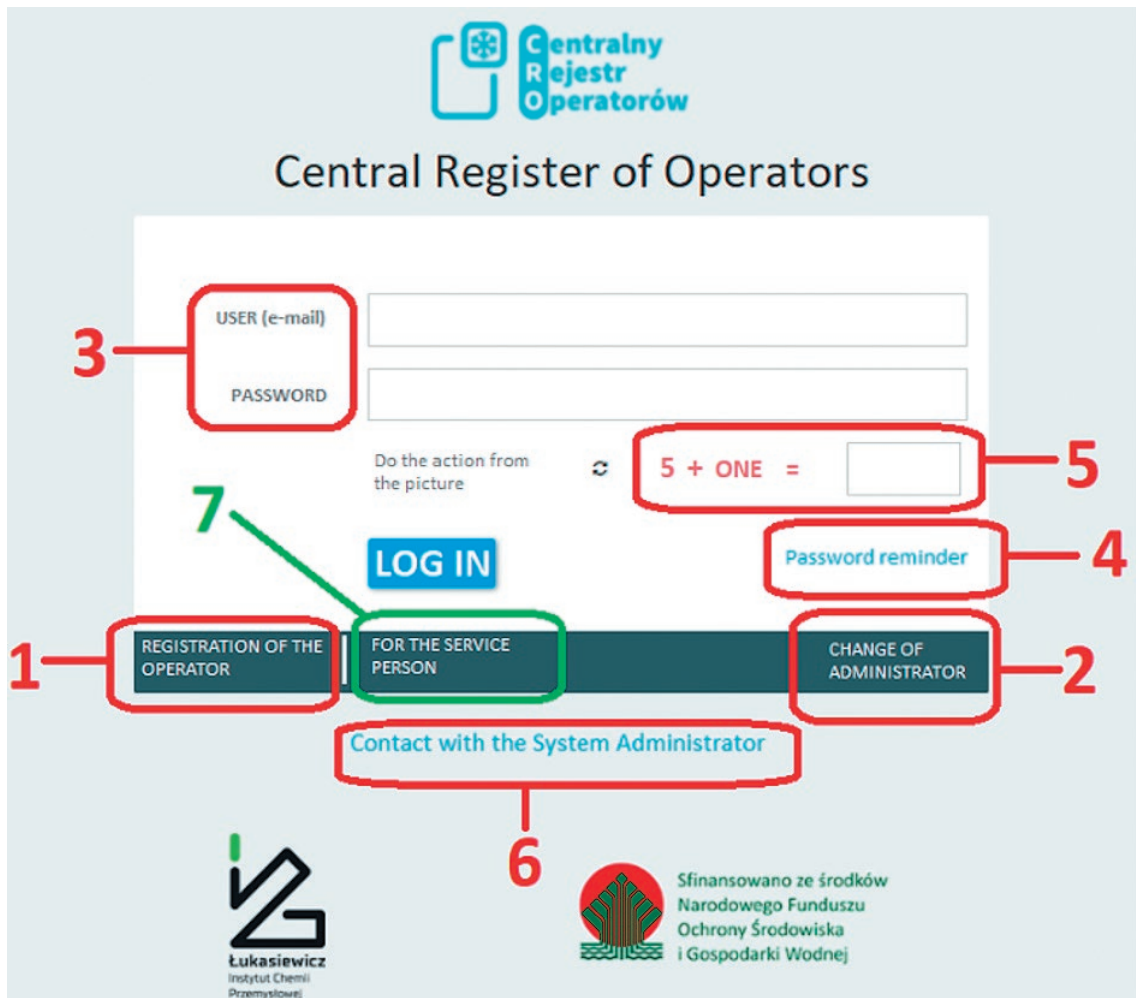


Fig. 5. Central Register of Operators - login page for users.

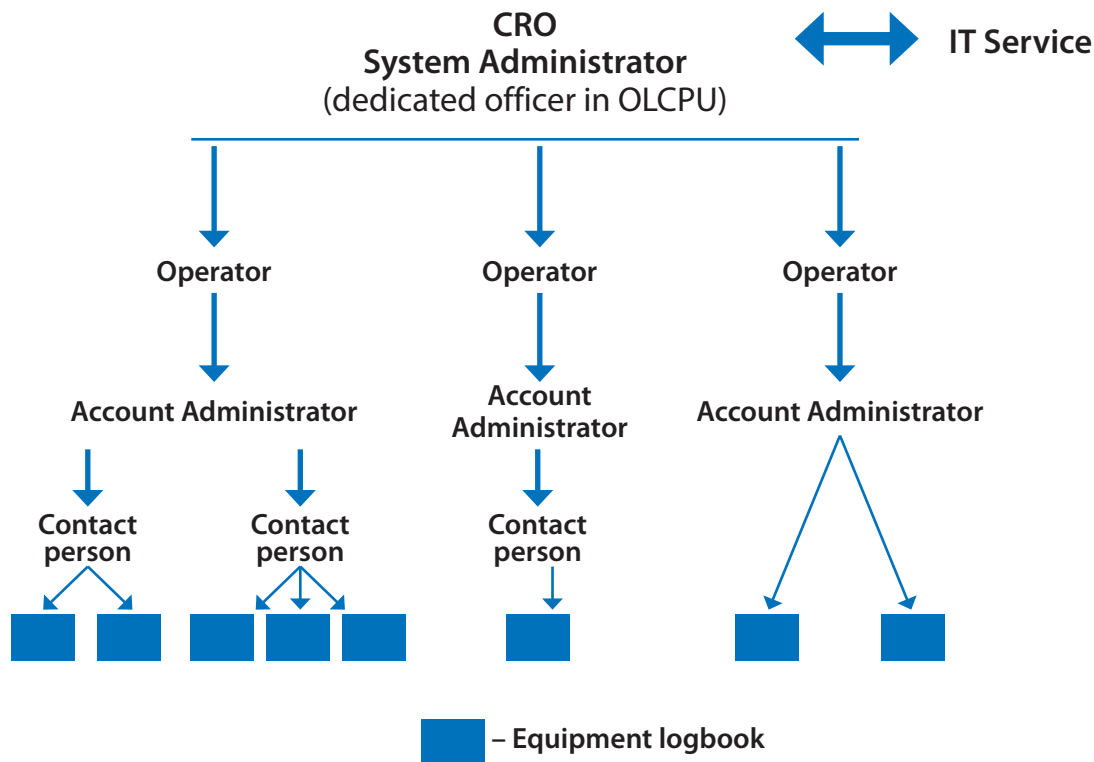


Fig. 6. Central Register of Operators - administration scheme.

Certified service technicians can submit their certificate numbers to the Central Register of Operators (7 in Fig. 5)<sup>5</sup>. They will receive notifications if their certificate numbers are illegally used. Recording the certificate numbers of the technician and the company in the equipment logbooks is required whenever an intervention on the equipment is conducted.

Equipment operators with many equipment logbooks can designate additional “contact persons” and grant them the necessary rights to assist the account administrator with the data entry. The designation of additional “contract persons” is not mandatory. The Central Register of Operators scheme is shown in Fig. 6.

Account administrators or contact persons are responsible for setting up equipment logbooks in the Central Register of Operators, and for entering, maintaining, and updating data on the interventions performed on the equipment. The account administrator is designated by the operator and may designate contact persons on

behalf of the operator. The following data are contained in each logbook:

- 1) Date of logbook creation
- 2) Contact data of logbook creator
- 3) Contact data of the account administrator (mandatory) and contact persons (optional)
- 4) Equipment data
  - a. Type of substance or mixture - Central Register of Operators system is only for controlled ozone depleting substances (ODS) and F-gases.
  - b. Quantity of substance or mixture contained in the equipment - for controlled ODS the minimum amount is 3 kg or 6 kg if the equipment is hermetically sealed. For F-gases the minimum is 5 CO<sub>2</sub>-eq.t. or 10 CO<sub>2</sub>-eq.t. if the equipment is hermetically sealed.
  - c. Leak detection system installed (YES or NO)
  - d. Equipment category – to be selected from 9 categories in a list: 1 – stationary refrigeration equipment; 2 – stationary air



conditioning equipment; 3 – stationary heat pump; 4 – electrical switchgear; 5 – equipment containing solvents; 6 – refrigerated unit on truck or trailer (mass > 3,5 t); 7 – organic Rankine cycle<sup>6</sup>; 8 – a system used to extinguish a fire; or 9 – a system used to provide an inert atmosphere in a specific closed space, where leakage of flammable substances may occur.-

- e. Equipment sub-category (industrial, commercial, domestic and other e.g., office, hospital, school, house)
  - f. Equipment name
  - g. Equipment model
  - h. Equipment serial number
  - i. Equipment manufacturing date (if available)
- 5) Equipment operator data (name, address, Taxpayer's number)
  - 6) Date of adding the entry on activity
  - 7) Name of person who made the entry
  - 8) Start date and completion date of intervention performed on the equipment
  - 9) Type of intervention to be selected from the list: leak test and its result: tight / leaky and the reason for leakage, installation, maintenance or servicing, repair, repair of leaks, recovery, decommissioning, installation of leak detection system, leak detection system control.
  - 10) Quantity of controlled ODS or F-gas "recovered" and "added" (in "added" indicate whether it was virgin or used substance; and if used who conducted the reclamation or recycling)
  - 11) Contact data of company which conducted the intervention (name, address, certificate number)
  - 12) Contact data on technician who conducted the intervention (name, certificate number).

The equipment logbook format in the Central Register of Operators is presented in Fig. 7.

In accordance with Polish legislation, the following deadlines apply:

- Equipment logbooks for new equipment must be created in the database within 15 working days from the date of "installation"<sup>7</sup> i.e., when equipment charging was completed or from the date of delivery of equipment that does not require "installation" e.g., hermetically sealed equipment.
- Data on service interventions performed, as specified in item 9 above, must be entered into the database within 15 working days from the date of completion of the service.

The equipment logbooks are displayed in an overview table called "Logbooks Equipment" (Fig. 8) which has a filter and search function. For example, the user can search for devices that contain R-410A refrigerant or check the amount of CO<sub>2</sub>-eq.t. in the equipment. The Central Register of Operators automatically converts from kg to CO<sub>2</sub>-eq.t. using the Montreal Protocol agreed global warming potentials (GWP). Detailed data on the service interventions performed are shown when clicking on the "OPEN" buttons.

The Ozone Layer and Climate Protection Unit sends notifications through the system informing account administrators and contact persons on regulatory changes and new functionalities. Thus, they are aware of latest developments.

The system calculates and reminds account administrators and contact persons of deadlines for:

- leak checking
- leak repair in case leaks have been detected and reported
- leak checking once appliances have been repaired.

Equipment logbook										
Date of logbook creation (DD/MM/YYYY)										
Name of person who created the logbook										
Name of account Administrator										
E-mail and phone number of the account Administrator										
Name of contact person										
E-mail and phone number of the contact person										
Equipment data					Equipment Operator data					
ASHRAE number of the controlled substance or F-gas contained in equipment					Name					
Quantity of controlled substance or F-gas in equipment, kg					Address					
Quantity of F-gas contained in equipment, tons of CO <sub>2</sub> eq										
Is the leakage detection system installed?			YES	NO						
Address of equipment location					Taxpayer's number					
Equipment category										
Equipment sub-category										
Equipment name										
Equipment model										
Equipment serial number										
Equipment production date (DD/MM/YYYY)										
History of activities										
1. Date (DD/MM/YYYY) (inserted by the system)					Name of person who made a note on activity					
2. Date (DD/MM/YYYY) (inserted by the system)					Name of person who made a note on activity					
No.	Date activity started	Date activity ended	Type of activity	Quantity controlled substance or F-gas, kg		Company which conducted the activity			Technician who conducted the activity	
				Recovered	Added	Name	Address	Certificate No	Name	Certificate No
1.										
2.										

Fig. 7. The equipment logbook format of the Central Register of Operators.

**LOGBOOKS EQUIPMENT**

**FILTERS**

To view detailed data in the card - click the "OPEN" button

Operator	Contact Person	Administrator	Type of substance or mixture	Equipment name	Equipment serial number	Date of logbook creation	Address of equipment location	Equipment category	Equipment sub-category	Quantity of controlled substance or F-gas in equipment, kg	Quantity of F-gas contained in equipment, tons of CO <sub>2</sub> eq	Status	Edition
INDUSTRIAL...	James Ka...	Megan Miam...	R-407C	MCQUAY - ce...	20485204 00...	07/07/2021 2...	Wysogotowe	2 - Air Condit...	Industrial	9.5	17	ACTIVE	OPEN
SHOPPING MA...	Margaret I...	Peter Ticho...	R-410A	Rooftop	am103438	07/07/2021 2...	Ostróda	2 - Air Condit...	Commercial	8.1	17	ACTIVE	OPEN
COMPANY	James Bond	Abbey Cal...	R-410A	MCQUAY - ce...	am103438	07/07/2021 2...	Ostróda	2 - Air Condit...	Commercial	6.2	13	ACTIVE	OPEN
COMPANY	James Bond	Emily Teag...	R-410A	Rooftop	am103438	07/07/2021 2...	Ostróda	2 - Air Condit...	Commercial	6.2	13	ACTIVE	OPEN
SCHOOL...	Mark Tayl...	Cameron D...	R-410A	MCQUAY - ce...	am103424	07/07/2021 2...	Radom	2 - Air Condit...	Commercial	7.1	15	ACTIVE	OPEN
COMPANY	Emma Kni...	William Co...	R-410A	Emerson mag...	am103424	07/07/2021 2...	Radom	2 - Air Condit...	Commercial	7.1	15	ACTIVE	OPEN
FARM	Kyle Klár...	Michael Ja...	R-410A	MCQUAY - ce...	am103424	07/07/2021 2...	Radom	2 - Air Condit...	Commercial	3.3	7	CLOSED	OPEN
COMPANY	Dorothy J...	Ryan Stev...	HFC-134a	Emerson mag...	17HZ16722 M	08/07/2021 0...	Brzesko	1 - Refrigerat...	Other	5.0	7	ACTIVE	OPEN
BRADLEY CO...	Tiffany Hi...	Bradley Co...	HFC-134a	EMERSON ma...	21BZ42168 M	08/07/2021 0...	Brzesko	1 - Refrigerat...	Domestic	5.5	8	ACTIVE	OPEN

Fig. 8. Overview table showing the equipment logbooks in Central Register of Operators.

The Central Register of Operators also allows generating reports with aggregated data from the logbooks, including data on the substance / mixture, type of equipment, refrigerant charge, refrigerant amount recovered or charged, number of operators, equipment location, etc. Based on the data from these reports, leakage rates can be calculated. Equipment operators have access to similar reports for their own equipment.

By the first half of 2021, more than 44,000 operators / account administrators and 15,000 contact persons<sup>8</sup> were registered in the system. The electronic database now covers more than 430,000 logbooks of equipment containing 15,800 tons of HFCs, 70 tons of HCFCs, 0.3 tons of CFCs, 0.7 tons of PFCs and 89 tons of SF<sub>6</sub>.

## Reduction of leakages – expected main benefit of establishing the electronic database of equipment logbooks (based on Poland’s experience)

The close monitoring of the mandatory leak checks and leak repairs through the Central Register of Operators resulted in a significant drop in the annual leakage rate of F-gases (mainly HFCs) from RACHP equipment from 12% in 2016 to 3% in 2019 and 2020<sup>9</sup> (Fig. 9). This

avoided emissions of about 6,000 tons of HFCs or 15 million CO<sub>2</sub>-eq.t. and reduced the demand for servicing. Similar drops in leakage rates were also observed for equipment containing HCFCs or CFCs.

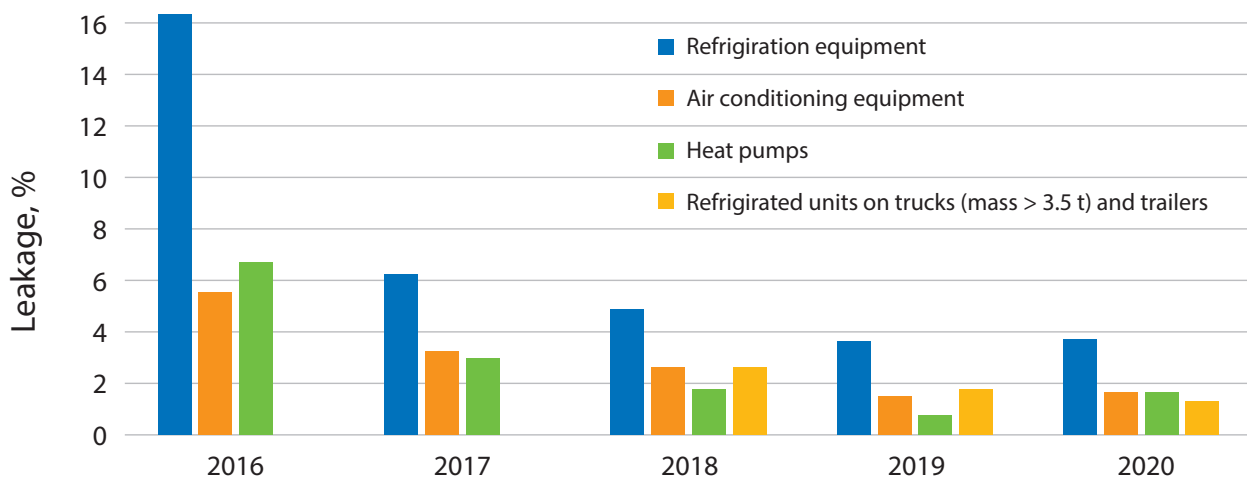


Fig. 9. Annual average leakage rates of F-gases from RACHP equipment containing 5t CO<sub>2</sub>-eq. or more<sup>10</sup> (%) in the period 2016-2020<sup>11</sup>.

## Examples from other countries

### NORTH MACEDONIA

[www.ozoneunit.mk](http://www.ozoneunit.mk)

As part of the national refrigerant and equipment management system, the database covers equipment containing 3 kg or more of refrigerant. The procedure for registering and labeling the equipment is as follows:

1. Equipment owners officially request documentation from the Ministry of Environment and Physical Planning, specifying the number of pieces of equipment to be labelled.
2. The National Ozone Unit (NOU) of the Ministry reviews the request and provides the documentation to be completed by certified technicians.

3. The documentation required for the equipment registration includes:

- Evidence list
- Evidence booklet
- Label with unique evidence number
- Label containing technical details
- Photos of the equipment
- Photos of equipment labels
- Scanned evidence list

The database is maintained by the NOU and can only be accessed by NOU staff. It is constantly improved and new features are developed to better visualize the data and to easily provide an overview of the current situation.

### **SLOVAK REPUBLIC**

<https://szchkt.org>, <https://leaklog.org>

“Leaklog” is the name of the national leakage control system for F-gases. It records leakage rates, type of refrigerant and refrigerant charge for different types of equipment and shows historical trends. The data are entered via Leaklog into the information system of the Slovak Association for Cooling and AC Technology (SZ CHKT). Leaklog does not release any confidential customer information. The monitoring system was launched in 2008 and has been widely adopted by local service companies. It replaced the previous paper-based system.

### **ITALY**

<https://bancadati.fgas.it>, [www.fgas.it](http://www.fgas.it)

The national “Fluorinated Gas Database) covers F-gases. Only certified technicians are authorized to enter data into the database. All operations are logged and stored for inspection and future interventions. Certified technicians and companies are obliged to report data on installation, leakage checks, maintenance, repair and disassembly, interventions on fixed refrigeration and air conditioning equipment, heat pumps and refrigerated chambers of

trucks and semi-trailers, on stationary fire-fighting equipment and electrical switches. Operators can download a certificate containing all information regarding their own equipment.

The F-gas database links together the following information and allows the checking for consistency and compliance with relevant legislation:

- Logbook is compiled online in the database and linked to the operator and the equipment, and independent from the maintenance company
- Equipment interventions should be recorded in the database regardless of whether they were scheduled or ad-hoc.
- Sales of refrigerant should be recorded in the database and sold only by certified companies and technicians listed in the database
- Sales of non-hermetically-sealed equipment should be recorded in the database (e.g., splits systems)
- Technicians and companies: List of certified technicians and companies is public and can be searched by name, province, fiscal code.
- Refrigerant emissions, purchase and import can be easily cross checked.

### **ESTONIA**

<https://foka.envir.ee>

The national “FOCA registry” covers stationary ODS and F-gas equipment (RACHP, firefighting equipment and SF<sub>6</sub> switchgear). It is both a registry and an electronic logbook in which leak controls, service operations and decommissioning are recorded. Mandatory registration applies to equipment with 3 or more kg of ODS or with 5 or more CO<sub>2</sub>-eq.t. (with certain exemptions for hermetically-sealed equipment and SF<sub>6</sub> switchgear).

Upon registration, the equipment owners, persons authorized by the owners or service

companies enter equipment data into the database e.g., the type of equipment, location / address, geographical coordinates, and whether it is charged with virgin, recycled or reclaimed substance. They shall also pick electronically a service company from the national database of ODS and F-gas certified companies. The FOKA registry is exchanging data with several other national databases using a secure Internet-based data exchange platform.

The service companies can enter data on leak checks and any other type of service interventions e.g., results of leak checks and relevant comments, pressure tests with nitrogen, checks and repairs of the automatic leak detection system, decommissioning of equipment, etc.

The surveillance function allows spotting missed leak checks, and automatic notifications are sent to the equipment owners and service companies if leak checks are not done in time. Decommissioning of equipment and the recovery of refrigerant is also traceable.

The registered pieces of equipment can be filtered using risk factors or other search criteria. Environmental inspectors have access to the system and can use it independently. Data needed for the compilation of national greenhouse gas inventories are also included such as the year of equipment installation, the amount of refrigerant recharged, the number of new installations, or the amount of refrigerant recovered from decommissioned equipment. These queries and filters are very practical for surveillance.

The FOKA registry is similar to the Polish CRO system with minor differences. For example, in Estonia each piece of equipment must have a QR code<sup>12</sup> that is used for identification of the equipment on the spot. The composition

data in the database is defined in the national legislation.

## **TURKEY**

<https://ecbs.cevre.gov.tr/KullaniciIslemleri/Giris>

The national equipment logbook database is similar to the Polish one. It applies to operators of the following types of equipment containing F-gases:

- stationary refrigeration equipment
- stationary air-conditioning equipment
- stationary heat pumps
- stationary fire protection equipment
- refrigeration units of refrigerated trucks and trailers
- electrical switchgear
- organic Rankine cycles.

It is administered by the Turkish Ministry of Environment and Urbanization (MoEU). Users log in to that database through the Integrated Environmental Information System (ECBS) installed on the Ministry website.

## **BAHRAIN**

The national RAC equipment database was established in 2018 and covers ODS and F-gases. It applies to all types of equipment used in air conditioning and refrigeration, except those in vehicles. The RAC equipment is recorded by registered servicing companies. The database contains information like the company commercial registry number, equipment brand name, equipment model number (indoor/ outdoor), refrigerant type, weight of refrigerant (or refrigerant charge) and cooling capacity.

Bahrain is currently extending its database to allow the record-keeping of equipment interventions such as repair, maintenance, replacement, servicing, installation or decommission.

## Conclusions and recommendations

Mandatory logbooks and electronic databases for ODS and HFC equipment have multiple benefits:

- easy monitoring of ODS and HFC data
- direct control of the ODS and HFC markets
- effective enforcement of ODS and HFC related legislation
- perhaps most importantly, a significant reduction of ODS and HFC emissions.

So far, mainly European countries have established mandatory logbooks and electronic databases for ODS and HFC equipment. Some countries in other regions like Chile are planning the adoption of similar logbooks / databases. Many more countries could significantly reduce their leakage rates and emissions, and thus their consumption of controlled substances by introducing similar systems.

This technical brief aims to share the lessons learned from the operation of mandatory equipment logbooks/databases and to encourage countries to adopt similar record-keeping systems. It should start

with development of the necessary national regulations and the designation of a specialized unit to create and administer the database, e.g., the Ozone Layer and Climate Protection Unit in Poland, the Supreme Council for Environment – National Ozone Unit in Bahrain, or the Ministry of Environment and Urbanization in Turkey. Interested countries should consider the appropriate logbook structure (see Fig. 7 as example) and system functionalities to facilitate database management, e.g., mandatory leakage check notifications, automatic GWP calculation, national information pages, and industry manuals, etc.

It is useful to consult relevant stakeholders and to agree on a national action plan describing activities to be carried out, the implementation schedule, and the responsible authorities. The recommended steps for establishing equipment logbooks and electronic databases are listed in the Appendix.

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**Author:** Ms. Patrycja Goworek (Industrial Chemistry Institute Poland)

**Internal review:** Mr. Jim Curlin, Ms. Anne Fenner, Mr. Ruperto DeJesus, Mr. Halvart Koeppen (UNEP Law Division OzonAction)

**External review:** Mr. Janusz Kozakiewicz (Industrial Chemistry Institute Poland)

**Country case studies:** Ms. Anne Fenner, Montreal Protocol experts / focal points from Bahrain, Estonia, Italy, North Macedonia, Turkey, and Slovak Republic

**Page layout:** Mr. Vardan Dallakyan (Armenia)

## Appendix

### Step-by-step approach for setting up and managing equipment logbooks and the relevant electronic databases

1. Consult relevant stakeholders including Government bodies, RAC associations, equipment owners, operators, end users, certified technicians, and service companies, etc.
2. Agree on the type of equipment, type of refrigerants / chemicals and charge size to be covered by the logbooks, e.g., stationary RACHP equipment containing at least 3kg of ODS or at least 5 CO<sub>2</sub>-eq.t. of HFCs (including mixtures).
3. Decide on the equipment operators responsible for keeping the logbooks and recording equipment interventions, e.g, owners, end users or certified service technicians.
4. Identify the logbook contents and format.
5. Decide on the establishment of a nationwide electronic database of equipment logbooks and designate the authority/institution that will be administering that database.
6. Adopt the necessary legislation covering all relevant aspects, to make keeping the logbooks and recording equipment interventions mandatory starting from a given date.
7. Draft the concept and terms of reference for a software company to develop the electronic database and user interface.
8. Ensure the protection of personnel data, safety features, password protection and recovery, access rights, etc.
9. Draft user instructions and launch the electronic database where the equipment operators will be registered and where the equipment logbooks will be kept.
10. Inform relevant stakeholders, disseminate user instruction, and provide training as appropriate.
11. Designate officers who will manage the database.
12. Collect feedback on the operation and user-friendliness of the database and its user interface, ensure the continued maintenance of the database and envisage improvements.

## Endnotes

- 1 Descriptions of all measures can be found in the publication => [www.unep.org/ozonaction/resources/publication/legislative-and-policy-options-control-hydrofluorocarbons](http://www.unep.org/ozonaction/resources/publication/legislative-and-policy-options-control-hydrofluorocarbons)
- 2 All blends containing HFCs which ASHRAE designation starts from 4 (e.g. R-410A or R-404A) may change composition in equipment due to emission of the most volatile components.
- 3 [www.greenpeace.org/usa/wp-content/uploads/legacy/Global/usa/binaries/2009/4/hfc-fact-sheet.pdf](http://www.greenpeace.org/usa/wp-content/uploads/legacy/Global/usa/binaries/2009/4/hfc-fact-sheet.pdf)
- 4 The EU defined 5 CO<sub>2</sub> eq. tons as the lower limit for HFC and 3 kg as the lower limit for HCFC.
- 5 Certified technicians do not have direct access to Central Register of Operators, but may register in a separate registry in order to receive e-mail messages from the system anytime their certificate number is recorded in the logbook by the operator. This option prevents from unauthorized use of technicians' certificate numbers by the equipment operators.
- 6 Organic Rankine cycle is a special kind of refrigerant-related cycle applied usually in energy power stations utilizing the energy from hot water in hot springs ([https://en.wikipedia.org/wiki/Organic\\_Rankine\\_cycle](https://en.wikipedia.org/wiki/Organic_Rankine_cycle))
- 7 In accordance with Art. 2 (20) of Regulation 517/2014 'installation' means joining two or more pieces of equipment or circuits containing or designed to contain fluorinated greenhouse gases, with a view to assembling a system in the location where it will be operated, that entails joining together gas carrying conductors of a system to complete a circuit irrespective of the need to charge the system after assembly.
- 8 Number of account administrators = number of operators. One operator can only have one account administrator but many contacts person
- 9 The results are presented in the article "Mandatory leakage checking of refrigeration, air conditioning and heat pump equipment – did it reduce F-gas emissions ?" - BDS and CRO data analysis" Chłodnictwo&Klimatyzacja Magazine, issue 10/2020.
- 10 In Poland, there are only a few tons of HCFCs in equipment at present, so the authors did not calculate the leakage checks from that equipment. Generally, the leakage rate will be the same for HFCs and HCFCs – will depend on the equipment type and model and, on its maintenance, (timely leakage checking and timely leakage repairs and proper servicing).
- 11 Refrigeration aggregates on trucks and trailers were added to CRO in 2018 because of the extension of certification requirements to cover technicians servicing that kind of equipment
- 12 A QR code (abbreviated from Quick Response code) is a type of matrix barcode ([https://en.wikipedia.org/wiki/QR\\_code](https://en.wikipedia.org/wiki/QR_code)).