
CHILLVENTA
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Refrigeration | AC & Ventilation | Heat Pumps
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CONNECTING EXPERTS.
NÜRNBERG MESSE

Leakage monitoring and reporting in EU Member States

Webinar, 14 October, 2020

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Agenda

- Electronic leakage recording and reporting
- Examples for
  - Slovakia
  - Poland
  - Germany
- Leakage data and emission reporting

EU requirements for recording of leakage

- Containment measures set out in the EU F-gas Regulation (842/2006, 517/2014): Mandatory records to be kept by equipment operators
- Data to be recorded:

  - ✓ Quantity and type of refrigerant installed
  - ✓ Quantities of F-gases added during installation, maintenance, service or due to leakage
  - ✓ Recycling / reclaim of F-gases, if applicable, name and address of recycling / reclaim facility, certificate number
  - ✓ Quantity of F-gases recovered
  - ✓ Company which installed, serviced, maintained, repaired, decommissioned the equipment and its certificate number
  - ✓ Dates and results of leakage checks
  - ✓ In case of decommissioning: recovery and disposal of the F-gases
- Logbook can be paper-based or electronic
- Storage of the records at the operator and the service company for 5 years, unless data are stored in a database set up by the national authorities
- National rules on logbooks might apply in addition

EU reporting requirements regarding F-gases

F-gas consumption
(production, import, export, destruction & feedstock use)

All F-gases

(according to Article 19 of Regulation (EU) No 517/2014)

European Environment Agency

European Commission

HFCs only

(according to Article 7 of the Montreal Protocol; Kigali Amendment)

UN environment
United Nations Environment Programme
Ozone Secretariat

F-gas emissions
(activity data)

GHG emissions

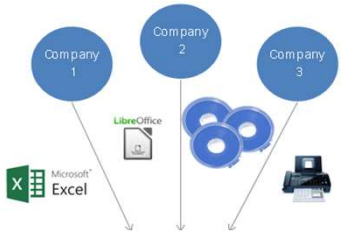
(according to Article 4 of the UNFCCC; Paris Agreement)

UNFCCC

- Submission of GHG emission inventories at national and EU level

Advantages of electronic systems

Non-electronic reporting



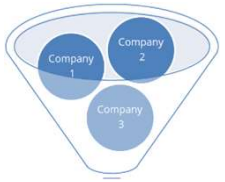
Communication

- ☒ Communication has to take place individually
- ☒ No automated communication with multiple companies

Data quality

- ☒ Data have to be manually digitalised and converted into common format
- ☒ Upon data submission, no automated data quality checks possible
- ☒ Data quality remains at low level
  - ☒ Manual data handling prone to errors

Electronic reporting



- ☑ All communication can be handled within one central system (e.g. open source)

- ☑ Data are automatically gathered in a common format
- ☑ Numerous automated data quality checks upon data submission
- ☑ Reporters can copy previous deliveries
- ☑ Possibility to link gathered data
  - ☑ E.g. reported import / export data can be compared with licensed amounts

Example Slovakia – general aspects

- Electronic system "*Leaklog*" since 2009
- Run by the Slovak Association for Cooling and Air-conditioning Technology (SZ CHKT)
- System information is available on web page **http://www.szchkt.org/?locale=en_GB**
- More than 1200 operators, over 250 service companies using "*Leaklog*"
- Mandatory under national legislation
- Data registration through service companies that are certified by SZ CHKT as "Notified Body" officially authorized by the Ministry of Environment to certify companies and organizations for the activities in this area
- Use of the data on leakage and national F-gas market for the annual emission reporting to the UNFCCC (see 2020 submission of the National Inventory Report **https://unfccc.int/documents/227921)**

Example Slovakia – data reporting

Web-based annual reporting:

- New charges and leakages by certified companies;
- F-gases imported in bulks by certified companies;
- F-gases in products by importers, exporters, producers by companies.

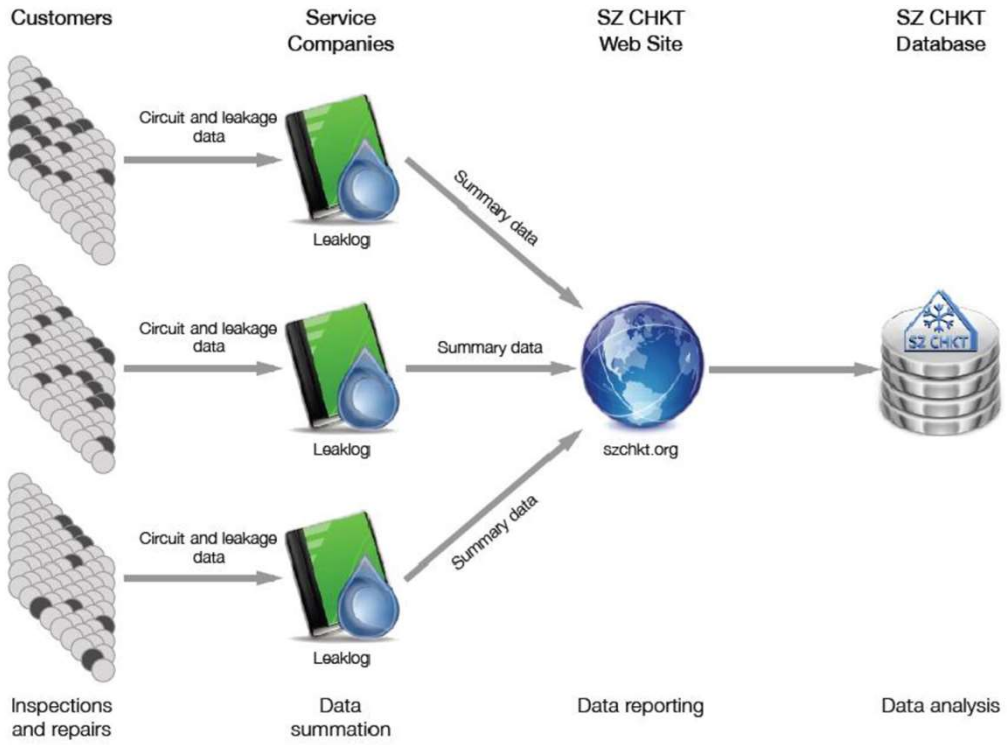


Figure 1: Data flow from customers using Leaklog to the information system of SZ CHKT at www.szchkt.org, where the data is automatically processed

Example Slovakia – Data assessment 2017 (I)

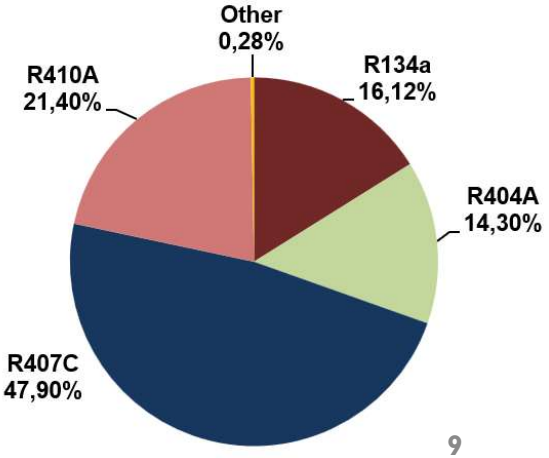
Sample:

- **Ca. 8000 refrigeration circuits in different applications** (total charge is ca. 200 tonnes of refrigerants, i.e. ca. 20 % of the country's refrigerant bank)
- Data entered by 55 service companies
- **Average charge:** 22.6 kg
- **Refrigerant use by applications:**
  - Commercial Ref: 19.2 %
  - Stationary AC: 23.9 %
  - Heat pumps: 2.2 %
  - Industrial Ref: 54.4 %

Table 1. Ratio of refrigerant amount in different categories of usage to total charge

Refrigerant	Category of usage – ratio of refrigerant amount on total refrigerants charges									
	All refrigerants		Commercial cooling		Air Conditioning		Heat pumps		Industr. cooling	
	kg	%	kg	%	kg	%	kg	%	kg	%
All	181252	100	34793	19.2	43313	23.9	4030	2.2	98654	54.4
R134a	29217	100	9619	32.9	4018	13.8	960	3.3	10190	34.9
R404A	26029	100	8213	31.6		0.0		0.0	13794	53.0
R407C	86953	100	10198	11.7	12805	14.7	360	0.4	63292	72.8
R410A	38957	100	5492	14.1	24842	63.8	2348	6.0	6228	16.0

Refrigerant split:



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Example Slovakia – Data assessment 2017 (II)

- Recorded leakage (refill):
  - Highest leak rates in commercial refrigeration (7.1 %)
  - High rates for R404A and R410A
  - R134a (lowest working pressure) shows lowest leakage rates

Publication:

Tomlein et al 2019:
Evaluation of refrigerant leakage ratios based on electronic logging and reporting system

(International Conference of Refrigeration 2019; DOI: 10.18462/iir.icr.2019.0148)

Table 2. Refrigerant amounts in equipment by category of usage with average weighted leakages until 1/1/2018

Refrigerant	Category of usage – average weighted leakage									
	All refrigerants		Commercial cooling		Air Conditioning		Heat pumps		Industrial cooling	
	kg	%	kg	%	kg	%	kg	%	kg	%
All	181252	4.2	34793	7.1	43313	2.5	4030	7.7	98654	3.6
R134a	29217	3	9619	3.5	4018	0.4	960	3.1	10190	3.5
R404A	26029	11.5	8213	11.5					13794	11.5
R407C	86953	2.5	10198	8.6	12805	3.1			63292	1.2
R410A	38957	4.3	5492	5.7	24842	3.3	2348	4.7	6228	7

Example Poland – general aspects

- In operation since 2016
- Mandatory under national legislation
- Web-based reporting, communication via email
- Covers not only refrigeration and air conditioning applications but all F-gas sectors subject to containment measures:

  Electrical switchgear containing SF6

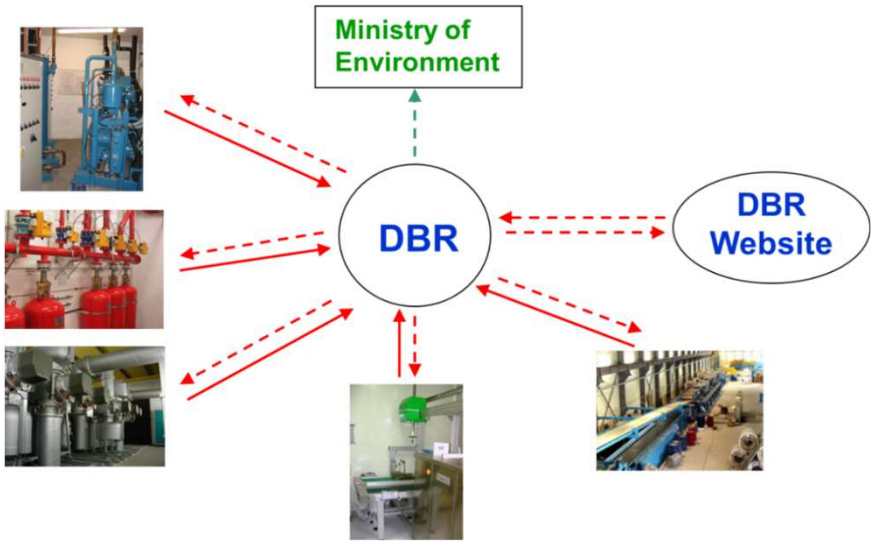
  Fire protection equipment
- If the equipment is replaced with equipment using alternative technologies, including those where flammable or slightly flammable refrigerants are applied, such replacement is also recorded.

Example Poland – general aspects

Comprehensive electronic system consisting of two databases

1) Database of Business Reports (DBR)

- For annual F-gas reporting on imports and exports (from/to Poland), use, recovering, recycling, reclamation or destruction
- Also covers ODS
- Reporting is carried out in parallel to the EU reporting obligation (DBR <> BDR) once a year
- Full overview of Polish market



Example Poland – general aspects

Comprehensive electronic system consisting of two databases

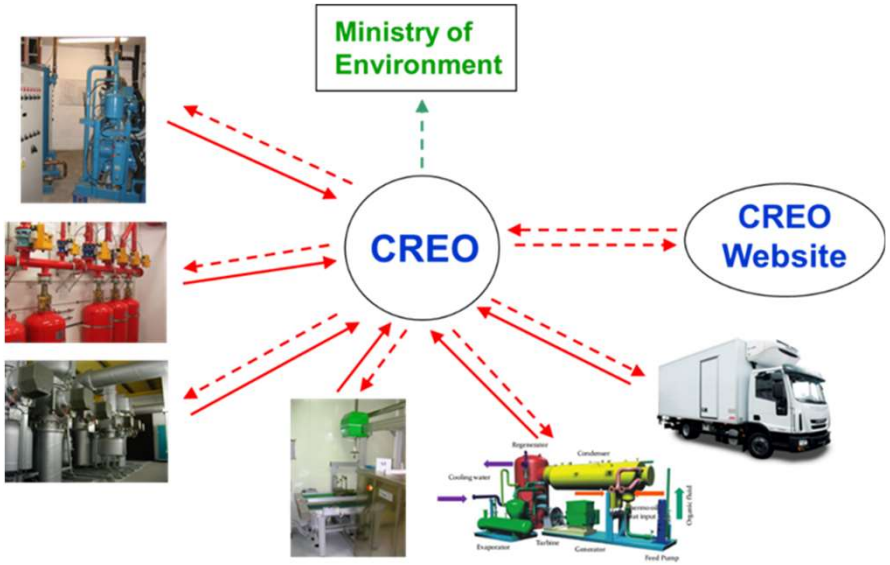
2) Central Registry of Equipment Operators (CREO)

Equipment database

For operators to register their ODS or F-gas containing equipment

Electronic „logbooks“ of equipment (information on operator, equipment manager, type of equipment, substance used, activities performed etc.)

Live recording of data entries



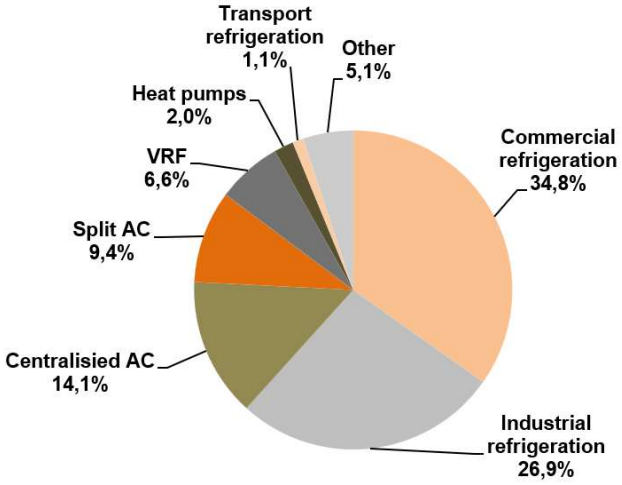
Example Germany – general aspects

- **"VDKF LEC":** Electronic recording system established and run by a national refrigeration association since 2005 (Verband Deutscher Kälte-Klima-Fachbetriebe (VDKF))
- Use of this system is not mandatory under national legislation
- Data coverage (May 2019):
  - ~ 1 000 service companies
  - ~ 45 000 operators
  - ~ 200 000 cooling circuits
- Total charge is 2 520 tonnes of refrigerant

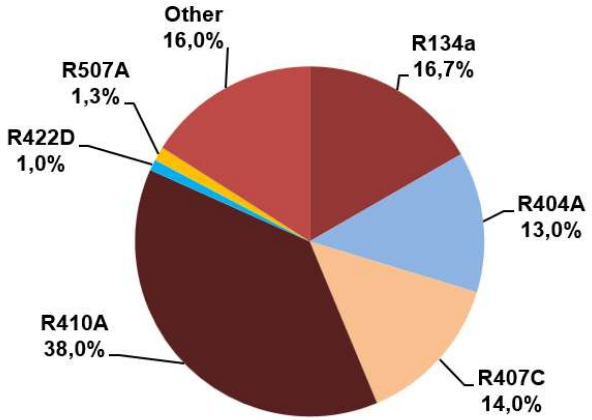
Example Germany – Data assessment (I)

- **Period:** 2014-2018 (as of May 2019)
- 36 % of recorded cooling circuits contain less than 5 t CO_2 eq (leak checks not mandatory), 52 % contain 5-50 t CO_2 eq (leak checks every 12 months required)

Refrigerant use by applications



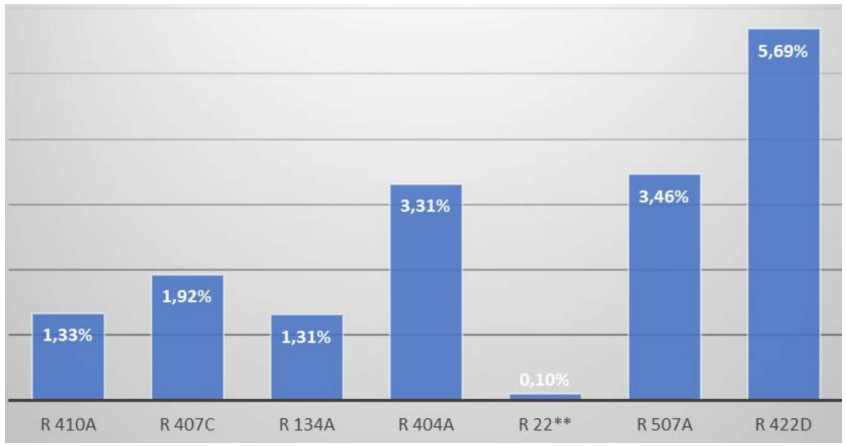
Refrigerant split

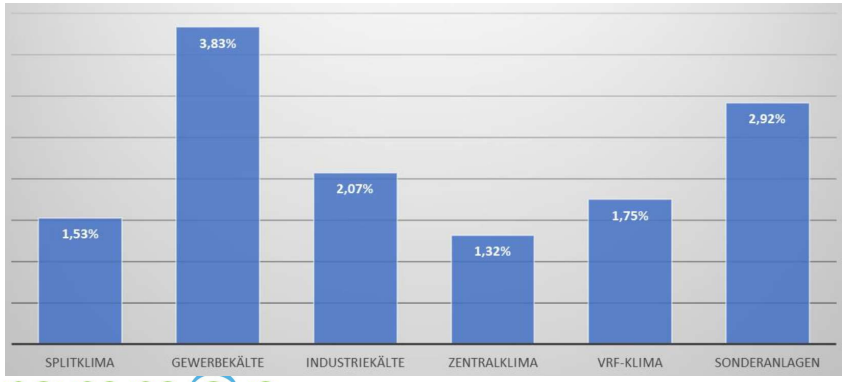


- Highest charges in industrial (24.14 kg) and commercial refrigeration (19.68 kg)

Example Germany – Data assessment (II)

- **Period:** 2014-2018 (as of May 2019)
- Average leak rates for all recorded refrigerant circuits (incl. < 3kg/ 5 t CO2 eq): 2-3 %
- By **refrigerants:**
  - R404A 3.31 %,
  - R507A 3.46 %
  - R134a 1.31%
  - R410A 1.33%
- By **application:**





Example Germany – Data assessment (III)

- **Period:** 2014-2018 (as of May 2019)
- Refrigerant refill and environmental impact:
- Largest impact of high GWP refrigerant: R404A → 57.7%

Refrigerant	Average refill quantities	GWP	CO_2 eq	Share environmental impact
R410A	5,5 t	2 088	11 484 t	9.4 %
R407C	9,3 t	1 744	16 219 t	13.3 %
R134a	7 t	1 430	10 010 t	8.2 %
R507A	1,9 t	3 985	7 572 t	6.2 %
R404A	18 t	3 922	70 596 t	57.7 %
R422D	2,3 t	2 729	6 277	5.1 %
R22**	0,1 t	1 810	181 t	0.1 %
Totals	**44,1 t**		**122 339 t**	**100 %**

Leakage data and emission reporting

- Collection of emissions data from reporting systems is encouraged by the EU F-gas Regulation (Article 20)
- Refrigerant losses during operation of equipment are (partly) reflected in the refrigerant refill
- Approximation for estimates of annual operation emissions from refrigeration, AC and heat pumps
- Databases of leakage data provide insight into large datasets which allow to generate or cross-check data for the annual F-gas emission reporting to the UNFCCC
- Monitoring and reporting of F-gas emissions is mandatory for EU countries for the implementation of the Paris Agreement

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Thank you very much for your attention!

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