



**10th International IIR Conference**  
**“Ammonia and CO2 Refrigeration technologies”**  
27-29 April 2023, Ohrid, R. Macedonia  
- Information -



**Key message of the President of the Organizing Committee: F-exit**

This 10<sup>th</sup> IIR conference was organized by the Faculty of Mechanical Engineering – Skopje in cooperation with the International Institute of Refrigeration.

This event was organized successfully attended by 153 participants from 35 countries worldwide; presented 40 scientific and technical papers including five keynote lectures.

The meeting in Ohrid was opportunity also to meet and exchange experience with experts from leading companies, to talk with scientists from well known universities and research institutions.

We hope that the participation on the 10<sup>th</sup> IIR Conference Ohrid-2023 was successful and useful for engineers, researchers, manufacturers, contractors, end users etc.

**New horizons for ammonia and CO2 refrigeration are open.**

**Ammonia:** low charge systems, factory made units, dry expansion, new types of heat exchangers such as shell-and-plate and microchannel heat exchangers, electronic expansion valves, new (miscible) oils, semi-hermetic compressors, heat pumps up to 90 °C of hot water, ...

**CO2:** applications in all climate locations, innovated thermodynamic cycles, parallel compression, ejectors as expansion devices, flooded evaporators, integrated approach, efficient heat pumps, expansion of many CO2 applications including in industrial systems, ...

Because of the climate change, there is energy transition from fossil fuels to renewable energy sources. According to the IEA, the heating in the building sector and in huge part of industry will be covered with heat pumps. The refrigeration companies become heating ones. In their names, they input first word heating then cooling. Ammonia and CO2, including hydrocarbons, are excellent working fluids for heat pumps.

The future of ammonia and CO2 refrigerants has never been more prospective than today. Because of the harmful impacts of fluorinated refrigerants on the environment, our refrigeration world is changing and natural refrigerants are leading the change.

From the beginning of the Montreal Protocol until today (2023), 36 years have passed, which is one human working life. During this period, refrigeration technology experienced strong “earthquakes” and continues to do so. The following conversions are performed:

CFCs => HCFCs => HFCs => HFOs(?)

If we consider the problem of climate change as well as the issue of PFAS (forever chemicals), then synthetical refrigerants lead to new uncertainty. If we look at these conversions so far, all the chemical elements have changed, only fluorine (F) still remains.

Therefore, the key message of the author of this text is:

**F-exit**

and it means the application of natural working fluids.

One curiosity:

Prof. Gustav Lorentzen spent a part of his life in Macedonia, in the city of Bitola, 60 km far from Ohrid. As an UN expert, he was working on development of industrial refrigerating equipment in the factory "Georgi Naumov". It was in (about) 1960. See the photo of Gustav Lorentzen in Ohrid.

The conference Proceedings and separate papers can be provided from the International Institute of Refrigeration (Paris) on the website [www.iifir.org](http://www.iifir.org).

Prof. Dr. Risto Ciconkov, President of the Organizing Committee.  
5 May 2023