Opteon™

# Viracopos Airport Adopts Opteon™ XP20

## and reduces Aircraft Ground Air Conditioning emissions

Chemours™

gás eco SUSTENTABILIDADE

VIRACOPOS
Aeroportos Brasil

# Innovation & Technology

In 2022, Viracopos International Airport, located in Campinas (SP) and managed by Aeroportos Brasil Viracopos, was elected as the best airport in Brazil and the 4th best airport in the world according to the international AirHelp Score ranking. Throughout the year 2022, the airport experienced a growth of 21.86% in aircraft movements, surpassing the mark of 128,000 landings and takeoffs. This increase was in response to serving a passenger traffic of more than 11.84 million people. In addition to passenger transportation, the airport handled over 355,000 tons of cargo, including courier services.

With an increasing operational focus on sustainability, Viracopos has been assessing its greenhouse gas inventory since 2013 and since 2016, the inventory has been published in the Brazilian GHG Protocol Program through TPI – Triunfo Participações e Investimentos and is verified by a certifying organization. Additionally, Viracopos also complies with the decision of the Board of Directors of CETESB 254/2012 (GHG) and is a member of the São Paulo Environmental Chamber always seeking opportunities for reducing greenhouse gas emissions.

Keeping sustainability in mind alongside the goal of ensuring the comfort of all passengers and operational teams, Viracopos in partnership with Gás Eco and Chemours has carried out the retrofit of R-407C to Opteon™ XP20 in aircraft air-conditioning equipment.

# Goal

In parallel to the ESG practices (Environmental, Social, and Governance) adopted by Viracopos, the advancement of environmental agendas in Brazil and around the world has brought the need to ensure a sustainable and long-term operation for the airport's air conditioning systems.

In Brazil, a significant portion of the installed fleet of air conditioning systems still uses refrigerants R-22, R-407C and R-134a. As R-22 is a hydrochlorofluorocarbon (HCFC), it has ozone depletion potential, and according to the Montreal Protocol, there is a deadline for its complete prohibition.

On the other hand, R-134a and R-407C are hydrofluorocarbons (HFCs) that have a high global warming potential (GWP) and, their use will be regulated by the Kigali Amendment, an international treaty ratified by Brazil in 2022. In countries such as the United States, Canada and the European Union, the production of HCFCs is already banned and new refrigeration systems no longer use high-GWP HFCs.

The solution found by Viracopos in partnership with Gás Eco e Chemours was the adoption of Opteon™ XP20, a refrigerant based on hydrofluoroolefin (HFO), which does not degrade the ozone layer and has a low GWP making it suitable for the retrofit of R-407C in stationary aircraft pre-conditioning equipment (PCA).
**"We chose the Opteon XP20 to replace the R-407C because we seek to immediately reduce greenhouse gas emissions from our operations, in line with our sustainability and efficiency goals",** says the VCP – Bridges and Supervision team composed of Ivan Segredo, Jefferson P. Oliveira and Marcos Rosa.

### Focus on Sustainability

Opteon™ XP20 does not degrade the ozone layer and has a low GWP.

### Safety

Opteon™ XP20 is non-flammable and has an ASHRAE A1 safety classification.

# Development and Results

In addition to environmental considerations, the choice of refrigerant was made with a focus on safety, easy maintenance, and low investment cost. While other options present different degrees of flammability and/or toxicity, Opteon™ XP20 (R-449C) has an ASHRAE A1 safety classification, meaning it is non-toxic for the intended use, as well as being compatible with the same compressors, condensers, evaporators, and expansion valves already in operation with R-407C, including the use of the same synthetic polyolester (POE) lubricating oil. Therefore, there was no need to replace the equipment; only the refrigerant needed to be changed. The choice of HFO became straightforward from both an environmental and safety maintenance perspective.

The selected equipment for the retrofit was an aircraft air-conditioning unit (PCA – Pre-conditioned Air Unit) responsible for generating a flow of cooled air into commercial aircraft, ensuring a comfortable environment for passengers and flight crew during boarding or aircraft maintenance and inspection routines.

The equipment manufactured by Jirong Air Conditioning Co uses Danfoss scroll compressors and Siemens controllers to meet the cooling capacity of 150 kW and airflow of 5,100 m³/h. The previously used refrigerant, R-407C, was replaced through a simple retrofit procedure to Opteon™ XP20 (R-449C). The retrofit is considered a maintenance procedure, involving the removal of R-407C to recovery cylinders, checking the quality of the lubricating oil (and replacement if necessary), replacing oil filters following best maintenance practices, conducting leak tests, followed by vacuum procedures, charging the new refrigerant, and making final adjustments to operational parameters.

The procedure was carried out in one afternoon to ensure that good practices were applied and that the unit was not immobilized for too long. The result achivied was equipment capable of intaking external ambient air at temperatures close to 37°C and cooling it to temperatures close to 13°C for inflation in the aircraft and maintaining this linear condition for a long period. In addition, in the retrofit it was possible to reduce direct greenhouse gas emissions by 29%, since Opteon™ XP20 has GWP 29% lower than R-407C. Ensuring performance alongside with sustainability was crucial for the success of the retrofit and continuation of the project. It is important to highlight that, 100% of the recovered R-407C refrigerant was properly disposed of through the reclaiming process.

To ensure excellence and environmental compliance, the proper recovery and final disposal of R-407C during the year 2023 prevented the emission of 1,014 tons of CO2 equivalent into the atmosphere. This is equivalent to planting and cultivating 5,816 trees for 20 years.

**“The strategic partnership with Gás Eco and Chemours was crucial for the choice of the correct refrigerant, highlighting the importance of collaboration in the pursuit of sustainable solutions that prolong the lifespan of equipment",** says the team.

"Finally, proper maintenance and sustainable management of refrigerants are essential to ensure that not only direct emissions are reduced but also indirect emissions related to energy consumption go hand in hand. Currently, Viracopos has over 32 other air conditioning units to serve aircraft on the ground, which will undergo the same retrofit procedure to Opteon™ XP20."

# Gás Eco ESG division

Gás Eco Sustentabilidade is a Brazilian company with more than 20 years of experience in the market. Specialized in sustainable solutions, it serves several business units in the refrigeration segment, working on the decarbonization of companies contributing to reduce greenhouse gas (GHG) emissions and working on energy efficiency, IoT, automation and artificial intelligence to optimize processes and reduce operating costs.

# Opteon™ XP20

Opteon™ XP20 (R-449C) is a non-flammable hydrofluoroolefin (HFO) based refrigerant (ASHRAE A1), which does not degrade the ozone layer and has a low global warming potential (GWP). It has an optimal balance of properties to replace R-22 and R-407C in HVAC systems, both in commercial and industrial applications. Opteon™ XP20 is suitable for new installations and for retrofitting existing systems.


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|---|---|
| ASHRAE Classification | R-449C |
| Composition | R-125/R-134a/R-32/R-1234yf |
| Weight in % | 20/29/20/31 |
| Molecular weight | 90,3 g/mol |
| Boiling point at 1 atm (101.3 kPa) | - 44,5°C (- 48,1° F) |
| Critical Pressure | 637.8 psia (4398 kPa [abs]) |
| Critical Temperature | 84,2°C (183.5°F) |
| Liquid Density at 21.1°C (70°F) | 1119,1 kg/m³ (69,8 lb/ft³) |
| Ozone Depletion Potential (CFC-11 = 1.0) | 0 |
| Global Warming Potential AR5 | 1147 |
| ASHRAE Safety Classification | A1 |
| Temperature Glide | ~4,5 K |

# Learn more

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