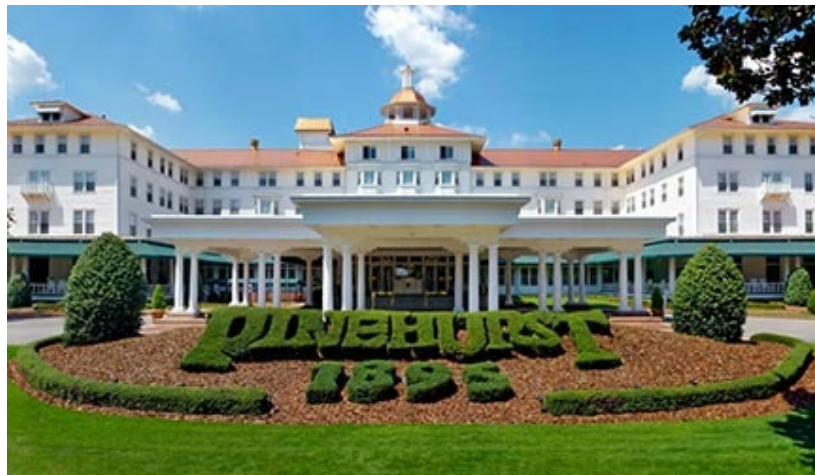




The Journal



After a century, Pinehurst Resort continues to Host America's Top Golf tournaments



Pinehurst established in 1895 - 2022

North Carolina, May 2, 2022; Touching three centuries of service, Pinehurst Resort continues to deliver exceptional meeting, event and business experiences. With 55,000 sq.ft. of indoor space and more than 2,000 beautiful acres outdoors, this legendary resort is known for its warm Southern hospitality, timeless tradition, and expert staff. Visit – and feel like a champion. Offering the best in golf, spa, tennis and Southern hospitality. The site of the 1999, 2005, 2014 and 2024 U.S. Open Championships, the 2014 U.S. Women's Open Championship and the 2008 and 2019 U.S. Amateur Championship, this Four-Diamond resort offers 9 signature golf courses.

Lodging is available at three historic hotels all located in the Village of Pinehurst: the stately Carolina, the charming Holly or the relaxing Manor. Founded in 1895, Pinehurst Resort is a quintessential destination

encompassing three historic hotels, a wealth of recreational activities, and 2,000 breathtaking North Carolina acres. Set in one of America's only National Historic Landmark Districts, Pinehurst recalls a pleasant time gone by.

Pinehurst Resort and its village were designed by famed landscape architect Fredrick Law Olmsted as a health retreat amid towering

pinetrees and mild Southern breezes. Wide verandas, afternoon tea, walking trains, and bucolic pathways meander through the quaint New England-style village, which is full of shops, galleries, and other historic and cultural attractions. Pinehurst never ceases to evolve and remain relevant to today's guests. The next iteration of Pinehurst's continued evolution begins in December with the phase one renovation of The Carolina Hotel's guest rooms and lobby, as well as the creation of an expanded outdoor seating area with fire pits situated outside the Ryder Cup Lounge.

Much of the project will be completed over the winter months and first half of 2022, while the guest rooms renovations will be done in three careful stages to ensure only a limited impact on the guest's stay. The extent of the room renovations will be finished ahead of the 2024 U.S. Open. "Pinehurst has enjoyed a period of significant enhancements updates and changes over the last decade," says Bob Dedman Jr., Pinehurst Resort's Chief Executive Officer. "This is another opportunity for us to continue to improve on the overall experience."

Since opening in 1901, The Carolina Hotel's signature copper cupola has signaled a welcome destination. That tradition continues as The Carolina's guest rooms enjoy an expansive transformation, blending the modern luxuries the traveler has come to expect with the historic charm and comfort Pinehurst is known for. The refreshed rooms will be brighter in tone and feature all new fixtures, finishes and custom-built furniture. The rooms will be reconfigured with expanded bathrooms, while lighting and soundproofing will be improved.



Oscartek as part of the new eclectic remodel

Problems of transition to alternative refrigerants

Maksim Talyzin, PhD, corresponding member of International Academy of Refrigeration

The problem of refrigerant choosing has recently become very important. European legislation requires usage of new refrigerants, which leads new equipment appearance designed to work with them.

The latest trend was the shift to low-global-warming-potential refrigerants. Directive 517/2014 describes the transition process and alternatives to the existed refrigerants. Many publications have been devoted to the search for alternatives, but the really important problem of transition has become now.

Refrigeration rack CO₂
Alternative refrigerants



First of all, we will look at the alternatives proposed for use in the coming years.

Among them, two groups can be distinguished:

1. Nature refrigerants

This group includes ammonia (R717), carbon dioxide (R744), propane (R290), isobutane (R600), propylene (R1270). These refrigerants have little or no adverse effects on global warming, but despite the effectiveness of their use, ones have some disadvantages.

2. Synthetic refrigerants

Synthetic refrigerants with reduced global warming potential. This group includes hydrofluorocarbons, hydrofluoroolefins and mixtures based on them. R32, R1234yf, R1234ze, R1233zd, R454B, R513A, R455A, R448A, R449A, R452B refrigerants and others belong to this group.

There is a restriction of usage refrigerants with global warming potential (GWP) more than 2500 (like widely used R404A and R507A) in new installations in Europe since 2020. The usage of these refrigerants in existing plants is allowed, but with an enhanced leakage control mode. So far, the situation in Russia is not relevant, but given the trends of 2021 described above, the possibility of such control should also not be excluded.

The next phase in Europe which will start from 2022 will be a ban for refrigerants with a global warming potential of 1500 and above, which include R410A and some of the proposed alternatives.

HFC consumption reduction schedule shown in Table 1.

Consider some features of natural refrigerants usage Ammonia (R717)

One of the oldest refrigerants has the highest efficiency, but is toxic, at a certain concentration it can form explosion and fire hazardous mixtures, aggressively interacts with some materials. Refrigeration plants using ammonia are subject to mandatory control by public authorities. Despite the negative properties, there is a system for training specialists to work with this refrigerant, as well as proven regulatory documentation.

CO₂ (R744)

Along with ammonia, it is also one of the first refrigerants, widely used until the spread of freons. Negative properties include high working pressure, a negative effect on the human body, and if ammonia leakage is easily noticed by the characteristic smell, the leakage of the CO₂ is almost no noticeable using the

Table 1. Schedule of HFC reduction

	Group I	Group II	Group III	Group IV
Freeze	–	–	2024 (100%)	2028 (100%)
Stage 1	2019 – till 90%	2020 – till 95%	2029 – till 90%	2032 – till 90%
Stage 2	2024 – till 60%	2025 – till 65%	2035 – till 70%	2037 – till 80%
Stage 3	2029 – till 30%	2029 – till 30%	2040 – till 50%	2042 – till 70%
Stage 4	2034 – till 20%	2034 – till 20%	–	–
Stage 5	2036 – till 15%	2036 – till 15%	2045 – till 20%	2047 – till 15%
Counties	Parties not operating under Article 5 of the Montreal Protocol, with the exception of Group II	Belarus, Russia, Kazakhstan, Tajikistan, Uzbekistan	Parties to Article 5 of the Montreal Protocol with the exception of Group IV	India, Pakistan, Iran, Iraq, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, UAE
Basic level	Average HFC consumption for 2011-2013 + 15% of HCFC baseline	Average HFC consumption for 2011-2013 + 25% of HCFC baseline	Average HFC consumption for 2020-2022 + 65% of HCFC baseline	Average HFC consumption for 2024-2026 + 65% of HCFC baseline

the sensory organs. Working with CO₂ requires training in industrial safety, but since R744 belongs to the same group as the widely used freons, this aspect is not given sufficient attention.

Propane (R290) The application efficiency and properties are close to the well-known R22 refrigerant. It is flammable, there are norms for minimum charge.

Isobutane (R600) The field of application is limited to domestic systems with small refrigerant charge, so such negative properties as flammability are not very relevant.

Propylene (R1270) It is similar to propane in terms of both positive and negative properties. It is also should pay attention to such a refrigerant as dimethyl ether and mixtures based on it, the research of which has been widely carried out in our country, especially for use in transport refrigeration plants.

Refrigeration compressors Synthetic refrigerants also have positive and negative application features The most popular hydrofluorocarbon R32, like most pure hydrofluoroolefins, is little toxic, partly flammable.

Synthetic refrigerants are odorless and heavier than air, which does not allow detecting leakage by the senses and when they enter the respiratory tract, oxygen displacement begins, which can lead to sad consequences.

Hydrofluorocarbons with a reduced global warming potential have properties similar to the widely used refrigerants R404A and R507A.

What should be pay attention to when choosing an alternative refrigerant?

First of all, it is worth dividing the task to replace refrigerant in existing equipment and to produce new equipment intended for use with new refrigerants.

In the first case the important points are:

The same or similar refrigeration capacity when using existing components, which includes refrigerant parameters such as latent heat of steam generation at a given temperature, volumetric capacity, condensation heat, etc.

Compatibility with materials

Safety measures that allow to use an existing or close technical solution

In the second case, first of all, attention should be paid to the near future, for example, the usage of the above refrigerants R448A and R449A is not advisable, since in the near future they will be also prohibited to use.

Which refrigerants should be considered as alternatives?

First of all, the proposed alternatives either require increased safety measures (flammability, high pressure, toxicity) or lead to problems during the operation of the plant.

Separately, mixed refrigerants should be considered. If there are fewer problems when using azeotropes (R513A), then when using zeotropes (R450A), many problems arise, both in operation and in the design of new installations (restrictions when used flooded evaporators).

The usage of natural refrigerants such as ammonia, CO₂, propane requires a review of the system design approach, both in terms of safety and efficiency.

For example, the usage of a basic transcritical cycle with a refrigerant R744 (CO₂) with the "standard" design parameters does not allow to get similar efficiency compared to traditionally used refrigerants R404A and R507A.

The usage of additional measures (parallel compression, ejector, recovery systems, algorithms of "floating" condensation pressure, etc.) allows to significantly increase efficiency, but require other approaches in the design of refrigeration plants.

The use of propane as refrigerant for commercial refrigeration plants is limited by the allowable refrigerant charge, which causes manufacturers to design a system with several independent circuits and with increased temperature differences in heat exchangers, which leads to a decrease in the efficiency of the refrigeration plant.

Also, for the above mentioned (R717, R744, R290) refrigerants, it is required to follow increased safety measures, which requires additional training of personnel, and, most importantly, integral compliance with operating rules.

The problems with the usage of unsaturated hydrocarbons, hydrofluoroolefins and mixtures based on them are the high cost and "partial flammability" with a lower negative impact on the environment compared to hydrofluorocarbons.

In summary, attention should be paid to more widely usage of natural refrigerants and mixtures based on them. Because of there are a very few possibilities for ban them, the cost of this refrigerants is low, effectiveness is high at certain design. An important fact is that these substances are produced directly in the Russian Federation, which will significantly reduce dependence from import.

Negative factors in the use of natural refrigerants are safety problems and new approaches to the design of plants. However, these problems can also be positive from the point of view of the technical development of refrigeration equipment.



512 South Airport Blvd., South San Francisco, CA 94080

Tel: 855.885.2400 | 650.342.2400 | Fax: 650.342.7400 | www.oscartek.com