

## A history of refrigeration

Man has packed food in snow or ice since prehistoric times, but it was the ancient Egyptians who first understood the principle of refrigeration: that when fluid evaporates from a surface, it takes heat molecules away with it.

The intermediate stage in the history of cooling foods was to add chemicals like sodium nitrate or potassium nitrate to water causing the temperature to fall. Cooling drinks came into vogue by 1600 in France. Long-necked bottles were rotated in water in which saltpeter had been dissolved.

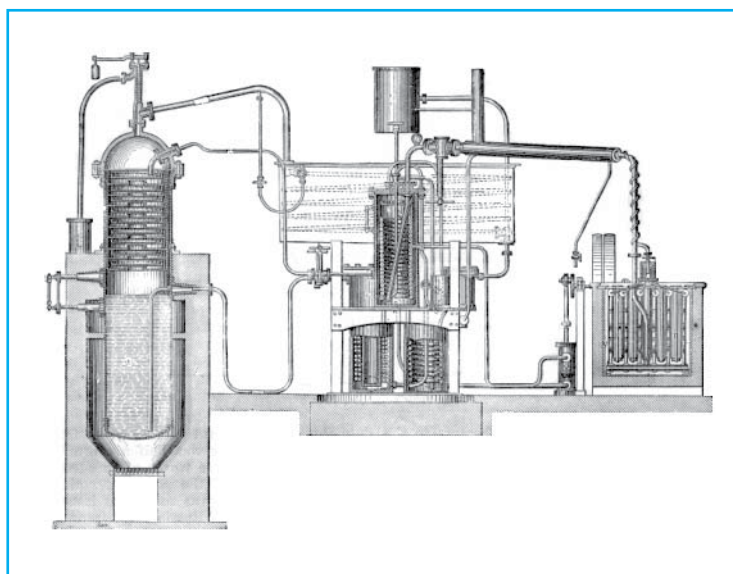
The first experiments with artificial coolants were performed by William Cullen in 1748. Cullen let ethyl boil into a partial vacuum.

In 1805, an American inventor named Oliver Evans designed the first refrigeration machine that used vapour instead of liquid. Evans never constructed his machine, but one similar to it was built by an American physician, John Gorrie. It was an air-cooling apparatus for treating yellow-fever patients. Its basic principle – that of compressing a gas, cooling it by sending it through radiating coils, and then expanding it to lower the temperature further – is the one most often used in refrigerators today.

In 1859 a French monk called Ferdinand Carré developed a more complex system. Unlike earlier compression machines, which used air as a coolant, Carré's equipment contained rapidly expanding ammonia. Ammonia liquefies at a much lower temperature than water and is thus able to absorb more heat. Vapour compression refrigeration became, and still is, the most widely used method of cooling.

In 1895 Carl von Linde set up a large-scale plant for the production of liquid air. Six years later he developed a method for separating pure liquid oxygen from liquid air that resulted in widespread industrial conversion to processes utilizing oxygen. Despite the inherent advantages, refrigeration had its problems. Refrigerants like sulfur dioxide and methyl chloride were causing people to die. Ammonia had an equally serious toxic effect if it leaked. In the 1920s a number of synthetic refrigerants called halocarbons or CFCs (chlorofluorocarbons) were developed by Frigidaire.

The best known of these substances was patented under the brand name of Freon. Chemically, Freon was created by the substitution of two chlorine and two fluorine atoms for the four hydrogen atoms in methane ( $\text{CH}_4$ ); the result, dichlorodifluoromethane ( $\text{CCl}_2\text{F}_2$ ) is odourless and is toxic only in extremely large doses.



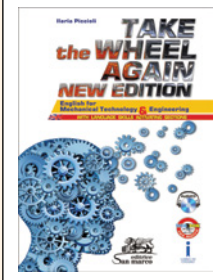
*Ferdinand Carré's equipment.*



*Ferdinand Carré*



*Carl von Linde*



## ACTIVITIES

1 Answer the following questions.

- 1 Who were the first to exploit the principles of refrigeration?
- 2 How were drinks cooled in the 17<sup>th</sup> century?
- 3 What is Freon?

2 What were the milestones in the field of refrigeration? Complete the chart.

who	what
William Cullen	He performed the first experiments with artificial coolants.