

The History of Gas Refrigerators and How Propane Gas Refrigerators work

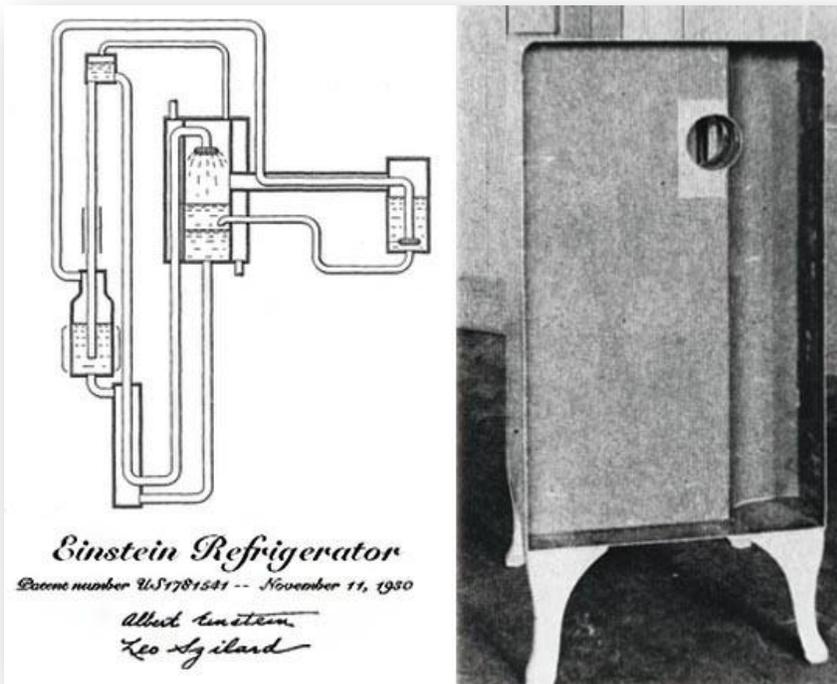
By Dynamx, Inc. – Gas-Fridge.com

What is the history of the absorption system ?

HISTORY - The ammonia refrigeration cooling system which is also known as an absorption cooling system was first discovered in 1824 by Michael Faraday who tried to liquefy gases which, among them was an ammonia gas. This experiment was used in taking ammonia vapor in a glass tube with silver chloride in it and allowing it to absorb in the silver chloride powder. He then heated the chloride - ammonia mixture and watched the ammonia liquid evaporate out of the silver chloride and become cold. This experiment later was the birth of the ammonia absorption cooling systems [HEREAFTER CALLED PROPANE REFRIGERATORS].

In 1926 Albert Einstein and a former student, Leo Szilard, embarked on a venture to develop a safer refrigerator since the electric refrigerators of the time were known to leak toxic gases through broken seals. Such an incident of a German family killed by fumes caught the attention of Einstein and sparked this project. Einstein insisted that a better refrigerator design must be possible.

Their goal was to design a device with no moving parts or mechanical motion and eliminate the wear and tear factor. They used their knowledge of thermodynamics to produce an absorption refrigerator.



This device would drive a combination of safer gases and liquids through three interconnected circuits. It required only a small gas flame as a heat source and was totally sealed and safe. Some experts estimate the sealed system could last 100 years.

Einstein and Szilard applied for and received 45 patents in 6 countries for this type of

refrigeration technology. None of their inventions ever reached customers. The introduction of the less-toxic coolant freon and better judgment kept Einstein and Szilard from continuing the project.

Dynamx, Inc
6755 N. Hwy 89, Chino Valley, Az. 86323
(928) 636-1955
Gas-Fridge.com

The History of Gas Refrigerators and How Propane Gas Refrigerators work

By Dynamx, Inc. – Gas-Fridge.com

Appliance manufacturer ElectroLux bought the patents which proved to be the end of the Einstein refrigerator.

There has been much advancement in the understanding of this type of refrigeration in our time and age. There is also not much Lp fridge history given until the early 1930's when the SERVEL propane refrigerators were developed.



1940 Servel Gas Fridge

At the time of this invention there was not much refrigeration available on the market. Therefore, this became the first most popular refrigerator which at that time was sold in large cities by the 10's of thousands for apartments, hotels, and any other application known. People had only a few other options available for refrigeration at that time.

Since then, refrigeration has greatly advanced with electric refrigerators, [12V solar DC refrigerator units](#), and propane gas refrigerators. These refrigerators are always being improved to add more efficiency and less energy with less money. Many people still resort to propane absorption refrigeration systems for a non electric appliance.

How does a propane refrigerator function?

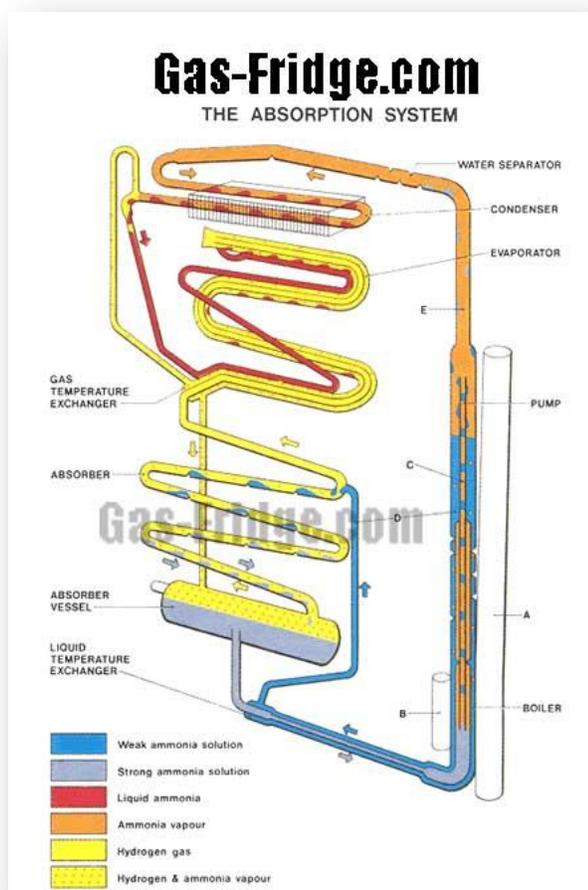
Functions - An absorption ammonia refrigerator or gas refrigerator still functions on the same basis as Micheal Faraday had started with. The mixture that these cooling systems use is a mixture of anhydrous ammonia, distilled water, and hydrogen vapor.

Here we analyze how a propane fridge functions. The ammonia and water is heated by a propane flame [which is why it is called a propane refrigerator] thus causing it to vaporize into a steam through the perk tube. The process that this steam is being perked, is similar to a coffee percolator. The inner tube [perk tube] in the boiler emits steam & water bubbles moving upward. Since the ammonia is lighter than water, the ammonia will turn into steam sooner than the water will. This ammonia steam is pushed up into a condenser by the hydrogen pressure while the water falls down into the outer tube and is pushed into the absorber tubes, which then returns to the mixing tank [absorber tank].

Dynamx, Inc
6755 N. Hwy 89, Chino Valley, Az. 86323
(928) 636-1955
Gas-Fridge.com

The History of Gas Refrigerators and How Propane Gas Refrigerators work

By Dynamx, Inc. – Gas-Fridge.com



As the ammonia steam is moving upward through the rectifier and on into the condenser tubes it again turns into a rich ammonia liquid. This rich ammonia liquid is pushed into the top of the evaporator tubing. After it is in the evaporator it meets the hydrogen gas moving up through the inner tube inside the evaporator. This hydrogen gas absorbs the rich ammonia. As the ammonia meets this hydrogen gas in the evaporator it creates a chemical reaction. This reaction evaporates the ammonia thus making it extremely cold at that point. This is what is called absorbing the heat or better stated, removing the heat from the refrigerator box. See figure 1 to locate the propane refrigerator parts.

In the mean time, the water is then being pushed backwards to the absorber coils and drops downward to the absorber tank. While this is happening, the hydrogen gas passes upward through the absorber coils and “catches” any ammonia left in the weak water that is falling downward and carries it up to the top of the evaporation system and drops it into the outer

tube of the evaporator. It then flows downward in a mist form causing it to become extremely cold. As it falls down, the rich ammonia returns to the absorber tank [mixing tank] and mixes with the weak water which allows it to continue with its cycle all over again. An ammonia absorption cooling system is a unique design invented so that a person can operate independently by using either a propane, [natural gas](#), or butane burner to heat the ammonia solution therefore creating an ammonia refrigerator. Earlier on, there were also many cooling units that used a kerosene burner to heat the solution. This type of refrigerator is still available on the market, yet is much more limited in supply.

How do propane refrigerators compare?

Compare - When doing propane fridge comparisons, in times past, the [SERVEL built in the 1930's -1950's](#) lasted for generations due to the fact that their design was made with the intent to last a long time. In later times, the refrigeration units have become more streamline with less heavy duty materials for lighter weight and still have quality performance. An average propane gas refrigerator today will last approx. 15 yrs. By that time the box will be looking quite tattered under normal use.

Dynamx, Inc
6755 N. Hwy 89, Chino Valley, Az. 86323
(928) 636-1955
Gas-Fridge.com

The History of Gas Refrigerators and How Propane Gas Refrigerators work

By Dynamx, Inc. – Gas-Fridge.com

The older style SERVELS were much heavier in weight than the newer style ammonia cooling systems are. These older units weighed as much as 400- 500 lbs. The newer refrigerators weight anywhere from 150-275 lbs. This again is due to lighter materials and higher quality workmanship. There is also a larger amount of selection available on the market to choose from today compared to 50 years ago.



Consul or Danby Gas Refrigerator

When SERVEL in Evansville, IN sold out the business to ELECTROLUX, ELECTROLUX then sold it to DOMETIC Corp. in Sweden. The SERVEL name was still being used by DOMETIC until 2005. This refrigerator is now called a DOMETIC refrigerator which is still being produced by DOMETIC.

Some of the newer propane refrigerators for backwoods and off the grid living that are on the market today are ; [EZ-FREEZE](#), [DIAMOND](#), DOMETIC, [CONSUL](#), and [DANBY](#). These are all ammonia absorption systems that run off of either, propane, natural gas, or butane burners. The DOMETIC refrigerator is the only one that is still available with kerosene. The CONSUL and DANBY refrigerators are manufactured in BRAZIL S.A. Both made by the same company. The DIAMOND and EZ-FREEZE refrigerators are manufactured in the USA. by

separate independent companies.

As was mentioned before, an average absorption cooling unit today runs for 10-15 years. The cause of this difference in length of performance compared to the older style SERVELS is based on 1 primary thing. When SERVEL built those huge old refrigerators, the materials used on the cooling units was so much heavier and thicker, thus adding all the extra weight, that they hardly



EZ Freeze Propane Fridge

ever rusted out. The evaporator also was galvanized to prevent rusting. Rusting is a primary cause for leakage in the cooling units itself.

There are brands that in times of hard, heavy use that an ammonia absorption refrigerator will block up in the boiler section [perk tube] in 5-10 years. When this happens, the refrigerator can be recharged again. This is done by first removing the ammonia solution and then removing the blockage in the perk tube. When the unit is repaired and welded together, the unit is recharged again with new solution. This is only true with some

brands, whereas other brands have a much higher life expectancy of 25 years plus.

How efficient is a propane refrigerator?

Dynamx, Inc
6755 N. Hwy 89, Chino Valley, Az. 86323
(928) 636-1955
Gas-Fridge.com

The History of Gas Refrigerators and How Propane Gas Refrigerators work

By Dynamx, Inc. – Gas-Fridge.com

EFFICIENCY - The gas consumption on a “modern day” gas refrigerator is less than half the amount than an older SERVEL is due to the designing of this cooling system. An average amount of propane used in the older SERVELS was 3-4 lbs. a day. This is approx. ¾ gal. of propane a day. The average amount that the newer style propane refrigerators use is 1 – 1 ½ lbs. a day, an approx. amount in volume @ gal. is 1/3 gal. per day.

The amount of improvements that have been made in the newer style refrigerators [built from the mid 1970's - today] by improved performance in gas usage is credited wholly to the improved engineering on absorption cooling systems and burner designs. [Click here](#) to read more about the burner.

What is the best venting practices?

VENTING - The older SERVELS with their larger burners have been noted to burn much more dirty than the modern day refrigerators do. Since the modern-day propane refrigerators use only ½ the amount of fuel to operate, they are also noted to burn much cleaner. These unburned gas fumes are what they call carbon monoxide [CO] gas. When too much of this gas is emitted into a room, it will create CO poisoning if this level of CO is too high.

Are some gas refrigerators dangerous?

SERVEL RECALL - The older SERVELS built in the 1930's – 1950's were noted to emit up to 1500 parts per million [PPM] of CO gas fumes at the exhaust vent. If this would be emitted into a room 10'-20', it would emit approx. 300-400 PPM of CO into the building [this amount varies depending on the size of the room]. This amount of CO is in a danger zone for exposure. It is highly recommended to vent an older SERVEL because of this high level of CO emission. This is due mostly because of the the design of the burner setup. The older SERVELS are not legal to operate in CANADA and are discouraged to be used by the USA. The government of United States has set up a system to reclaim these SERVEL refrigerators by paying the owner \$100 + disposal costs just to get them off of the market. Many people loved the longevity of these refrigerators that have been used for 70 some years and find it hard to part with these units and therefore, creating more hazard for themselves. This is why the government wants to omit these refrigerators. Any older style SERVEL refrigerators that are still in use today can be disposed by calling, SERVEL ACTION COMMITTEE at 1-800-782-7431.

Any propane refrigerator built in the 1980's until current are much cleaner to operate. On the average, these refrigerators will omit 20-30 PPM of CO at the exhaust vent tube, which omits approx. .001 PPM of CO in a room. The allowable amount of PPM of CO permitted in a living area is 50 PPM . At this amount of CO in any given area , no one should ever need to worry about CO poisoning with a modern day propane refrigerator. A propane refrigerator does not generally need to be vented to the outside.

Dynamx, Inc
6755 N. Hwy 89, Chino Valley, Az. 86323
(928) 636-1955
Gas-Fridge.com

The History of Gas Refrigerators and How Propane Gas Refrigerators work

By Dynamx, Inc. – Gas-Fridge.com

If a homeowner is to box in his propane refrigerator in a kitchen with cabinets built over the top of the refrigerator and around the sides, it is always important to put a vent in the floor towards the back of the refrigerator and on the top of the refrigerator for ventilation so that heat can escape from the cooling system. If this is not done, a refrigerator will overheat, thus causing it to lose efficiency in cooling.

What are the advantages of propane refrigerators?



ADVANTAGES - A propane refrigerator is an efficient way of cooling food when one is living off the grid. There are many propane fridge advantages. Since there are no moving parts on a propane refrigerator, this then means that there are no parts to wear out. With the propane price at \$1.859 a gal., a refrigerator will cost approx. \$0.60 a day to operate in warmer climates. In cooler climates such as in northern CANADA, higher altitudes, etc., a refrigerator will operate at approx. \$0.45 a day. With this amount of propane gas usage a person should be able to get 20 days of use with only a 20# propane cylinder. This sure beats using a cooler and ice packs to carry to your cabin every time you get there.

The initial cost to purchase a propane gas refrigerator is quite a bit higher than an electric refrigerator but cheaper than a 12VDC refrigerator. But to compare an electric refrigerator with a propane refrigerator is not comparing apples with apples. An electric and 12VDC refrigerator runs with Freon and a compressor pump. A propane powered refrigerator operates with a propane gas flame to heat the ammonia and distilled water using hydrogen gas to circulate steam vapor and liquid ammonia to cool it down. No electric lines or inverters and generators to power the refrigerator. All propane gas refrigerators are hooked up with a 3/8" copper or flexible gas line to feed the gas.

If I were to purchase a refrigerator whether electric, 12VDC, or propane, which would I choose?

PURCHASING - Most people may think that it depends on what the application would be. This being true, I personally use a propane powered refrigerator at our house. And if I were asked why, I would say that in order to live in a house off the grid, I still believe it would be the most cost effective to operate a

Dynamx, Inc
6755 N. Hwy 89, Chino Valley, Az. 86323
(928) 636-1955
Gas-Fridge.com

The History of Gas Refrigerators and How Propane Gas Refrigerators work

By Dynamx, Inc. – Gas-Fridge.com

propane refrigerator in the long run. This is based on the amount of maintenance to operate vs. a 12VDC refrigerator. Since there are no moving parts on a propane refrigerator there is hardly any maintenance to use this type of refrigeration unit. Generally speaking, a gas refrigerator usually needs to be cleaned only twice a year by cleaning the burner area and flue tube. No compressor unit to go bad . No batteries to charge. No batteries to replace. No batteries to maintenance.

Some propane suppliers and specialty off-grid appliance dealers offer propane gas refrigerators for sale such as Gas-Fridge.com



Modern EZ Freeze Propane Refrigerator



Modern Absorption System