International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622
NATIONAL CONFERENCE on Developments, Advances & Trends in Engineering Sciences
(NCDATES- 09th & 10th January 2015)

RESEARCH ARTICLE OPEN ACCESS

Renewable Energy And Other Alternative Energy Sources

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ABSTRACT
Up to this point we have considered fossil-fueled heat engines that are currently in use. These devices have provided society's answers to the thermodynamic question: How can the chemical energy of fossil fuels be converted into mechanical work and motive power? Let us now turn our attention to the another great thermodynamic question: How can thermal energy be transferred from cold to warmer regions.The well-known Clausius statement of the Second Law of Thermodynamics asserts: It is impossible to construct a device that, operating in a cycle, has no effect other than the transfer of heat from a cooler to a hotter body. Thus the Clausius statement tells us that energy (heat) will not flow from cold to hot regions without outside assistance. The devices that provide this help are called refrigeration units and heat pumps. Both types of devices satisfy the Clausius requirement of external action through the application of mechanical power or natural transfers of heat (more on this later).The distinction between refrigerator and heat pump is one of purpose more than technique. The refrigeration unit transfers energy (heat) from cold to hot regions for the purpose of cooling the cold region while the heat pump does the same thing with the intent of heating the hot region. The following will focus on refrigeration and make the distinction between refrigeration and heat pumps only when it is essential to the discussion
Keyword: clausius statement, Thermodynamics asserts.

I. INTRODUCTION

Consider an insulated cold region of temperature TL as shown in Figure 8.1. Heat leakage from the surroundings to the system tends to increase the systemís temperature. In order to keep the cold region at temperature TL, the conservation of energy requires the removal of an amount of heat equal to the energy inflow. This is done by a cold region heat exchanger that has an even colderliquid flowing through it to carry away the heat. If the fluid is a saturated liquid, it will evaporate and absorb energy from the cold region in its heat of vaporization. Such a heat exchanger is called an evaporator. Thus the basic problem of refrigeration may be reduced to one of providing a mechanism to supply cool saturated liquid or a mixture of liquid and vapor, the refrigerant, to an evaporator.

II. Refrigerants

Refrigerants are specially selected substances that have certain important characteristics including good refrigeration performance, low flammability and toxicity, compatibility with compressor lubricating oils and metals, and good heat transfer characteristics. They are usually identified by a number that relates to their molecular composition.

III. Vapor-Compression Cycle Analysis

A vapor-compression cycle was shown in Figure 8.2, The work required by the refrigeration compressor, assuming adiabatic compression, is given by the First Law of Thermodynamics:

w = h1 ñ h2 [Btu/lbm | kJ/kg] (8.1)

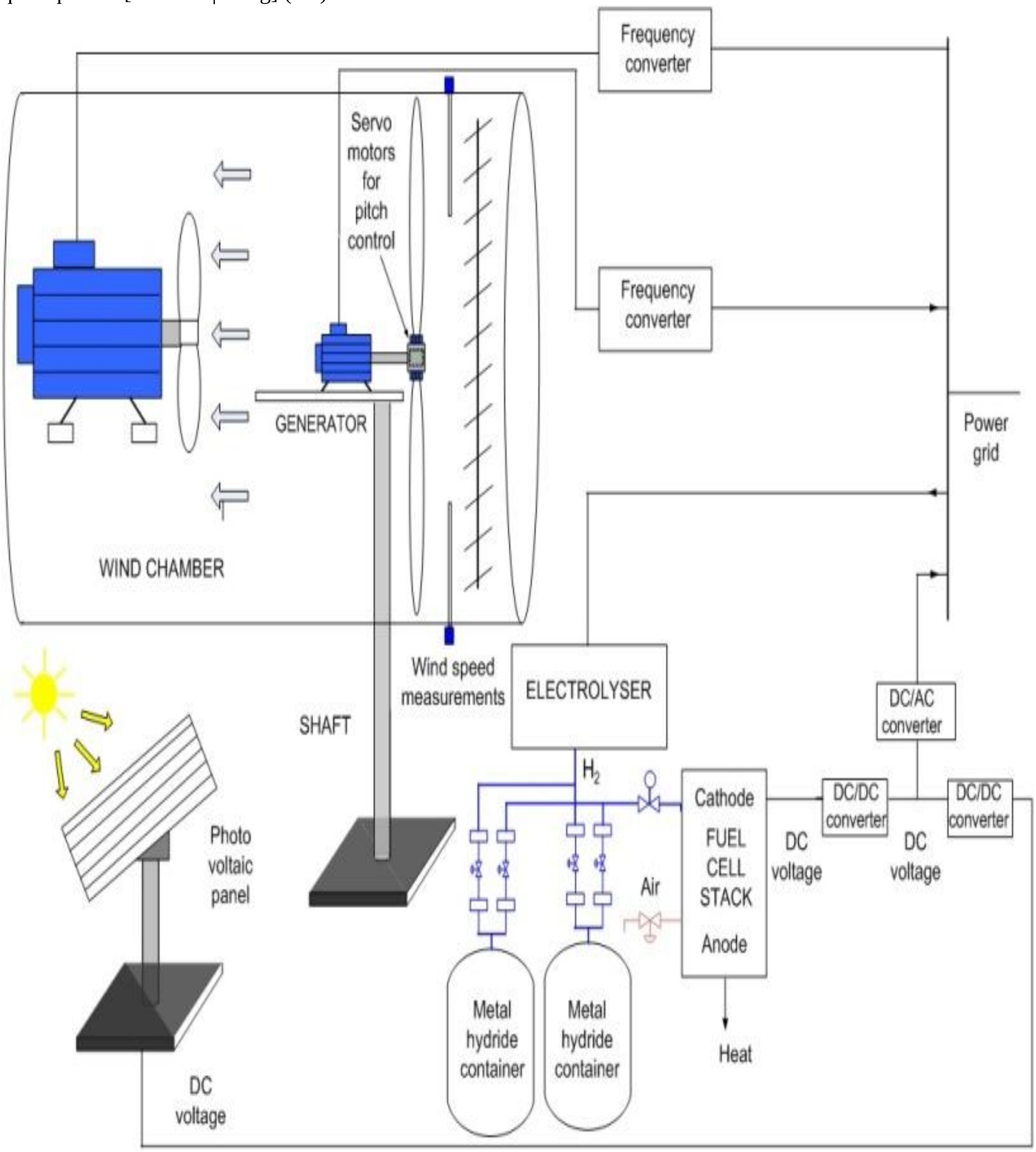
where the usual thermodynamic sign convention has been employed. The enthalpies h1 and h2 usually are related to the temperatures and pressures of the cycle through the use of charts of refrigerant thermodynamic properties such as those given in Appendix F. In the ideal vapor compression cycle, the compressor suction state 1 is assumed to be a saturated vapor. The state is determined when the evaporator temperature or pressure is given. For the ideal cycle, for which compression is isentropic, and for cycles for which the compression is determined using a compressor efficiency, state 2 may be defined from state 1 and the condensing temperature or pressure by using the chart of refrigerant thermodynamic properties. Assuming no heat exchanger pressure losses, the evaporator and condenser heat transfers are easily determined per unit mass of refrigerant by pplication of the First Law of Thermodynamics:

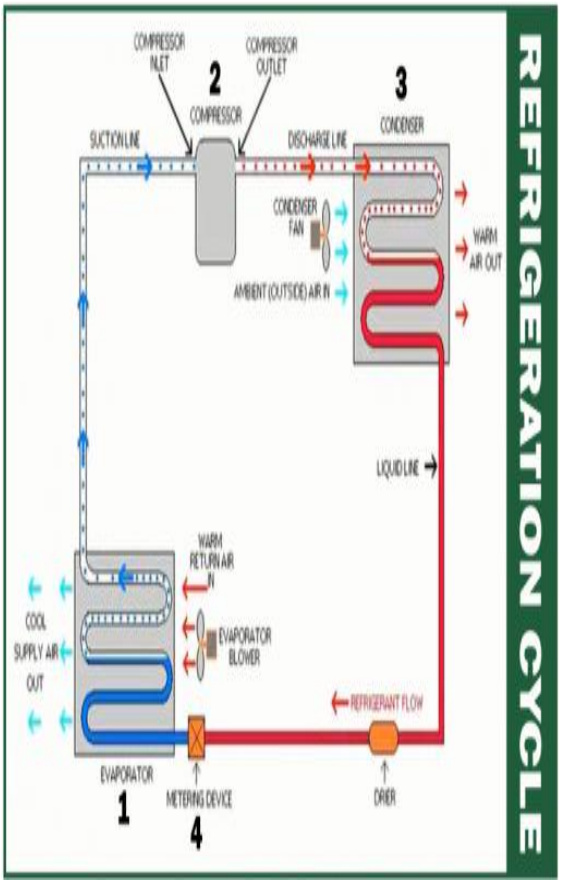
qL = h1 ñ h4 [Btu/lbm | kJ/kg] (8.2)

qH = h3 ñ h2 [Btu/lbm | kJ/kg] (8.3)

The evaporator heat transferred, qL, is commonly referred to as the refrigeration effect, RE. The product of the refrigerant mass flow rate and RE, the rate of cooling produced by the unit, is called the refrigeration capacity [Btu/hr | kW]. Applying the First Law to the refrigerant in the system as a whole, we find that the work and heat-transfer terms are related by

qL + qH = w [Btu/lbm | kJ/kg] (8.4)





where qH and w are negative for both refrigerators and heat pumps. Hence

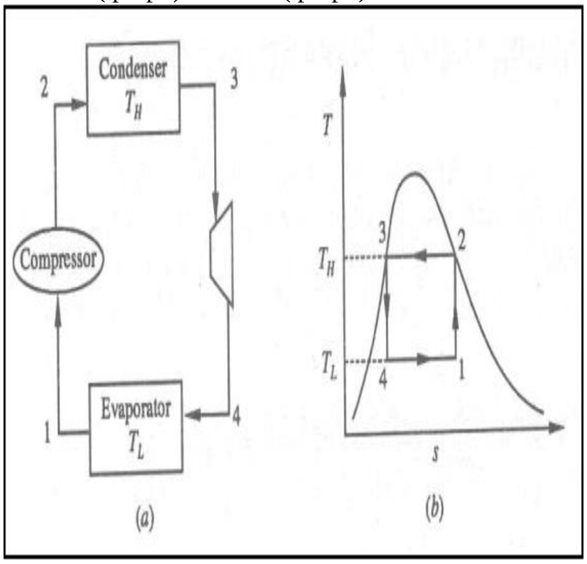
qL + |w| = |qH| [Btu/lbm | kJ/kg] (8.5)

Equation (8.5) is written here with absolute values to show that the sum of the compressor work and the heat from the low-temperature source is the energy transferred by the condenser to the high-temperature region. This may be seen graphically by addition of the enthalpy increments representing Equations (8.1) to (8.3) in the pressure-enthalpy diagram shown in Figure 8.8. The pñh diagram is applied often in refrigeration work because of its ease of use in dealing with enthalpy differences and constant-pressure processes.**ompressors**

While most small- and medium-capacity refrigeration systems use hermetically sealed, electricmotor-driven compressor units or open (externally powered) reciprocating compressors, centrifugal compressors are frequently found in large units for cooling buildings and for industrial applications. The reciprocating compressor has much in common geometrically with a simple two-stroke reciprocating engine with intake and exhaust valves. As in that case, the compressor clearance volume Vc is the volume at top center, and the piston sweeps out the displacement volume, as indicated in Figure 8.9. The processes 1-2-3-4-1 on the idealized pressure-volume diagram represent the following1ñ2 Both valves are closed. Compression of the maximum cylinder volume V1 = Vc + Vd of refrigerant vapor through the pressure ratio p2/p1 to a volume V2. 2ñ3 Exhaust valve is open. Discharge of refrigerant through the exhaust valve at condenser pressure p3 until only the clearance volume V3 = Vc remains when the piston is at top center. 3ñ4 Both valves are closed. Expansion of the clearance gas with both valves closed from V3 to V4. Note that the inlet valve cannot open until the cylinder pressure drops to p4 = p1 without discharging refrigerant back into the evaporator. 4ñ1 Intake valve is open. Refrigerant is drawn from the evaporator into the cylinder at constant pressure p1 through an intake valve by the motion of piston. Refrigerant in the amount V1 ñ V4 is processed per cycle.

Assuming polytropic compression and expansion processes with the same exponent k:

V4 = V3(p3/p4)1/ k = Vc(p2/p1)1/ k



IV. Absorption Refrigeration

Example 8.3 shows that vapor compression refrigeration requires a significant supply of work from an electric motor or other source of mechanical power. Absorption refrigeration is an alternate approach to cooling that is largely thermally driven and requires little external work. This form of refrigeration is growing in importance as energy conservation considerations demand closer scrutiny of the disposition of heat rejection from thermal processes. Absorption refrigeration provides a constructive means of utilizing waste heat or heat from inexpensive sources at a temperature of a few hundred degrees, as well as directly from fossil fuels. The eventual abolition of the use of CFCs may also boost absorption refrigeration technology. This system relies on the fact that certain refrigerant vapors may be dissolved in liquids called absorbents.

For instance, water vapor is a refrigerant that tends to dissolve in liquid lithium bromide, an absorbent. Just as when they condense, vapors release heat when they go into solution.

V. CONCLUSION

This heat must be removed from the system in order to maintain a constant temperature. Thus, cooling causes vapor to be absorbed in absorbents, just as cooling causes vapor to condense. On the other hand, heating tends to drive vapor out of solution just as it turns liquid to vapor. This solution phenomenon and the fact that pumping liquid requires a relatively small amount of work compared with that required to compress a gas are the secrets of absorption refrigeration. Consider the schematic diagram in Figure 8.14, which shows a basic absorption refrigeration unit. The condenser / throttling valve / evaporator subsystem is essentially the same as in the vapor compression system diagram of Figure 8.2. The major difference is the replacement of the compressor with a different form of pressurization system. This system consists primarily of an absorber at the pressure of the evaporator, a vapor generator at the pressure of the condenser, and a solution pump. A second throttling valve maintains the pressure difference between the absorber and the generator.

References

[1] Parsons, Robert A. (Ed.), ASHRAE Handbook of Fundamentals. Atlanta: American Society of Heating, Refrigerating, and Air-Conditioning Engineers, 1989, p. 16.3.
[2] McQuiston, Faye C. and Parker, Jerald D., Heating Ventilating, and Air Conditioning, 3rd ed. Wiley, New York, N.Y., 1988.
[3] Stoecker, W. F. and Jones, J. W., Refrigeration and Air Conditioning, 2nd ed. McGraw-Hill, New York, N.Y., 1982.
[4] Threlkeld, James L., Thermal Environmental Engineering, 2nd ed. Prentice-Hall, Inc., Engelwood Cliffs, N.J., 1970.
[5] Jennings, Burgess H., The Thermal Environment ñ Conditioning and Control, Harper and Row, 1978.