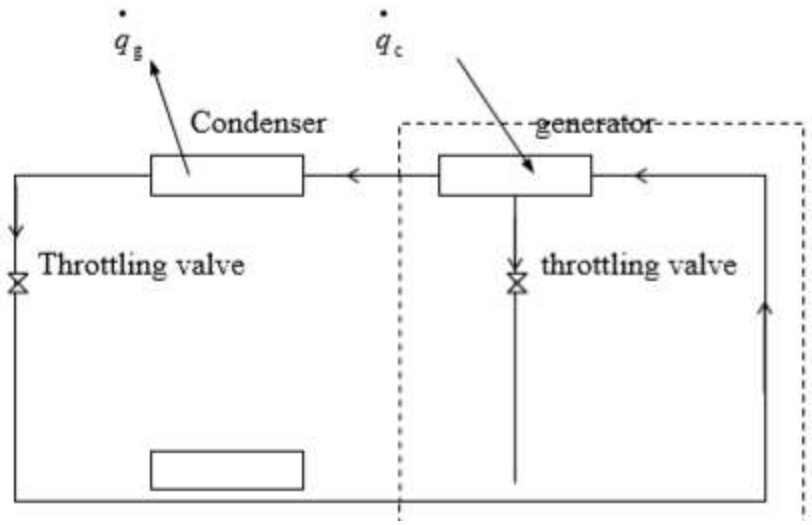
The Suddhananda Engineering and Research Centre, Bhubaneswar, has organized One-Day Faculty Development Program on "**UTILISATION OF RENEWABLE ENERGY IN ABSORPTION COOLING SYSTEM IN INDUSTRIES"** under the aegis of Department of Mechanical Engineering on 21/04/2021. Prof.Pradeep Kumar Mohapatra, Prof. Prafulla Kumar Behera, Prof. Prabhu Kalyan Mishra, Prof.Sanjita Namata are the key speaker for the FDP Program. They Emphasizes on the following challenges of conventional energy source and focused on utility of non-conventional energy.

The growing population, rising per capita energy consumption rate, and increasing atmospheric CO_2 levels set the stage for the current global energy challenges. Renewable energy can be widely applied in industrial applications. The four options primarily are: • Biomass for process heat; • Biomass for petrochemical feedstocks; • Solar thermal systems for process heat; and • Heat pumps for process heat.. The instability of fuel prices, along with calls to divest from fossil fuels, means companies that rely on heat generation have a strong incentive to switch to renewables.In combined heat and power (CHP) plants, the waste heat from biomass electricity generation can be used very effectively in industrial applications. The absorption cooling system is a heat-activated cooling system based on a solution absorption process. Systems are categorized by coupled renewable (solar) collectors, thermodynamic cycles,

and working pairs. Renewable (Solar) energy can be converted to heat energy by using solar collectors, which collect heat, and transfer it to a given fluid. The heat is then used, in general, for heating, cooling, generating electricity or drying crops. Solar collectors are divided into two main categories: flat plate collectors and concentrating collectors. A flat-plate collector is, basically, an insulated box with a single or double glass cover. Flat plate collectors are used to provide heat energy at moderate temperatures, up to about 100˚ C above ambient temperature. In a concentrating collector, an optical device is used to concentrate the incident radiation on to a small area. Concentratingcollectors are used to provide heat energy at a higher temperature compared with flat plate collectors. Two main types of concentrating collectors are used: parabolic dish collectors and parabolic trough collectors.

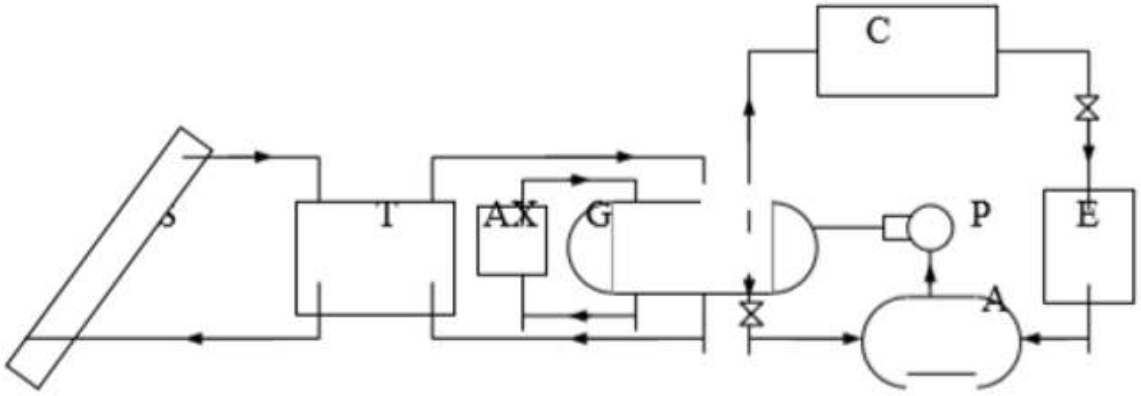


(BASIC ABSORPTION CYCLE

Absorption cooling systems use a single-effect absorption cycle operating with an H_2O/LiBr working pair and a solar flat-plate collector (FPC) or an ETC with hot water to drive these systems.Utilization of renewable (solar) energy by thermal conversion method, is of low cost, but it requires high density of solar radiation. Water is heated in a flat plate collector and stored as hot water, in a storage tank. The hot water in the storage tank is then used to heat a binary mixture in the generator. Auxiliary heating system is provided as an alternative to solar heating.

Due to heating, refrigerant is evaporated in the generator, and rises to the condenser where it is condensed to a liquid. It then enters the evaporator, where it absorbs heat from surroundings, and flows to the absorber. In the absorber, the refrigerant is absorbed by the absorbent, hence, the weak solution in the absorber, becomes strong. The strong solution is then pumped from the absorber to the generator and the cycle continues,

During the absorption process, ammonia vapor is absorbed by the weak solution, and hence the concentration of the solution increases. Continuous cooling of absorber is required during this process. When heat is applied to the generator, the pressure and temperature of the solution increase at constant concentration. When the saturation pressure is reached, ammonia starts to evaporate, the temperature of the solution continues to increase, the concentration decreases, and the pressure remains constant at the saturation pressure. Due to heat removal, the pressure and temperature decrease at constant concentration, until, ammonia vapor is returned back and be absorbed by the weak solution, in the absorber. Continuous cycles work on the principles that, whenever cooling is required, then, heat energy is supplied to the system and at the same time, absorption process is taking place in the absorber. Therefore, generator and absorber of the continuous cycle must be different components. In intermittent absorption cycles, the cycle starts with a regeneration process. When heat is added to the generator, refrigerant vapor is released from the absorbent, and is then condensed and stored as a liquid. The regeneration process continues for a period of about 4 to 6 hours during which, a certain quantity of refrigerant liquid, is collected and stored in a storage tank. The cooling occurs during the absorption process, which starts after the regeneration process has been completed. In solar absorption refrigeration systems, the heat input to the generator is obtained from solar energy by using solar collectors. Using solar energy in cooling is a very interesting application because; the available solar energy at any time is approximately proportional to the cooling loads required when solar radiation is high, the need for cooling is increased and vice-versa.



(Simple Renewable Solar Absorption Refrigeration System)

[S: solar collector, T: storage tank, Ax: auxiliary heating system, G: generator, C: condenser, E: evaporator, a: absorber, P: pump]

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