

REFRIGERATION USING SOLAR ENERGY

Rising energy costs are generating new interest in thermal energy based refrigeration systems. These can compete with electrical energy based refrigeration systems if the source of heat energy is waste heat or solar energy.

Chillers for industrial use based on absorption refrigeration are commercialized now. In India M/S Thermax manufactures and markets lithium bromide/ water system, based absorption refrigeration machines for industrial and institutional use.

These systems are relevant to India because:

1. Ambient temperatures are high through out the year in most parts of the country. Higher ambient temperatures mean more energy is consumed in refrigeration
2. Solar insolation is high in most parts of the country. This implies that we have more energy at our disposal.
3. There is huge potential demand for refrigeration in rural areas, which are best suited for solar energy based refrigeration systems

Proposal:

Solar energy based refrigeration is an idea whose time has come. The economics are moving into positive zone. Companies who get into this line can expect to reap the benefits in next five years time.

Product mix:

Absorption refrigeration systems based on solar energy for ice plants	5000 TR
Absorption refrigeration systems based on solar energy for cold stores	10000 TR
Adsorption refrigeration systems based on solar energy for rural cold stores	5000 TR

Market:

The market potential is enormous. The challenge is to make the systems economic and affordable.

Technology:

Absorption refrigeration: In this system solar energy is used to drive out the volatile component from a solution and build up the pressure. Examples are water vapour from lithium bromide water solution or ammonia from aqueous ammonia solution. The vapour is then condensed (rejecting heat). This is done with either water-cooling or air-cooling. The condensed liquid is then expanded to absorb heat from the space where refrigeration is needed. The vapours are once again absorbed in the solution. The cycle is continuously repeated. Sub zero temperatures can be reached by absorption refrigeration systems. Ice can be made.

Adsorption refrigeration: In this system solar energy is used to drive out the volatile component from a solid adsorber and build up the pressure. Examples are water vapour and silica gel adsorbent or ammonia and activated carbon adsorbent. The vapour is then condensed (rejecting heat). This is done with either water-cooling or air-cooling. The condensed liquid is then expanded to absorb heat from the space where refrigeration is needed. The vapours are once again adsorbed by the adsorbent. The cycle is continuously repeated. These systems are suited for cooling applications.

These are old concepts and adequate published data is available on many variants. Commercial systems are working where waste heat is available. Like wise generating hot water or steam using solar energy is a proven technology. The challenge is combining these two technologies into an economically viable system.

Manufacturing process:

The main activity is design and engineering. A good engineering design team with formal qualifications and experience in the refrigeration industry is needed. Manufacturing activity consists of fabricating different components like absorbers, heat exchangers. These along with necessary bought out items are assembled as compact units and sold are installed at clients site as per requirements.

Plant and Machinery:

The manufacturing plant require is general fabrication work shop machinery used for fabricating chemical plant and machinery

Raw materials:

Stain less steel and mild steel sheets of different thickness, pipes and tubes are the main raw materials. Pumps, valves are the main bought out items

Utilities:

Power is the main utility

Project cost:

Invest of Rs. 5 crores may be required to manufacture the systems given under product mix

Turnover and profitability:

Annual sales of Rs. 20 crores with 20 % margin can be expected

Suggested location:

Around Hyderabad

Entrepreneur profile:

This proposal is best suited for existing chemical machinery fabricators, who are willing to face the challenge of commercializing a promising concept

APITCO's consultancy:

1. Technology tie – up
2. Finding low cost funds and venture capital