WELCOME

• ENERGY CONSERVATION - ABSORPTION CHILLER

Integrating Energy & Environment Sustainable solutions for Business Improvement

Leaders in Energy conservation & Environment preservation
Leiders in Energy conservation & Environment preservation

COMPANY PROFILE

• A 40 year old value based organization
• Manufacturer of Industrial Boilers, Air Pollution Control Equipments, Absorption Chillers and Chemicals
• From $0.5 million in 1966 to $1 Billion + in 2011
• Total Manpower: 4000
• World wide network of 13 offices, 5 subsidiaries and > 100 distributors/reps
• 50,000 installations for various businesses in more than 75 countries
• World class manufacturing plants (>1 million square feet)
• Quality assured manufacturing to international codes
• Tradition of intensive R&D
• Thermax: 3rd best company to work for in India: BT Mercer Survey
• Most comprehensive range of absorption chillers
• License agreement - Babcock & Wilcox (for utility boilers)
• Technology and Manufacturing Licensing Agreement – Georgia Pacific Chemicals
• Business tempered by social responsibility
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**Boilers & Heaters**
- Large capacity power boilers
- Thermal oil / water heaters
- Package boilers
- Energy recovery systems

**Cooling & Heating**
- Exhaust & Multi-energy fired chillers
- Steam fired chillers
- Hot water fired chillers
- Direct fired chillers

**Heating**
- Steam/Hot water power plants
- Packaged solid/oil/gas fired boilers
- Fired thermic fluid heaters
- Exhaust waste heat recovery boilers

**Turnkey Power Plants**
- Solid fuel based
- Gas based combined cycle
- Waste heat recovery based
- RE based incl. Biomass, Bagasse, solar, etc.
- O&M of power plants

**Chemicals**
- Ion exchange resins
- Cooling water chemicals
- Fireside chemicals
- Polyelectrolyte

**Enviro**
- ESP & Bag filters
- Scrubbers
- Air purification
- Retrofit & Revamp

**Water and wastewater**
- Wastewater & Effluent water treatment systems
- Water recycling
- Waste management

**Solar**
- Heating
- Cooling
A STEP INTO THE PAST
1890
Ferdinand deCarre develops First Absorption Machine
VAPOUR ABSORPTION TECHNOLOGY & ITS EVALUATION EVOLUTION

1890
Ferdinand deCarre develops First Absorption Machine

1950'S
The Electrolux Refrigerator
VAPOUR ABSORPTION TECHNOLOGY & ITS EVOLUTION

1890
Ferdinand deCarre develops First Absorption Machine

1950’S
The Electrolux Refrigerator

1950-60
Commercialization of Single Effect Machine by Carrier
1970

Japan adopts technology from USA
1970

Japan adopts technology from USA
VAPOUR ABSORPTION TECHNOLOGY & ITS EVOLUTION

1970
Japan adopts technology from USA

1970-75
Innovation of Double Stage Machine from Japan
VAPOUR ABSORPTION TECHNOLOGY & ITS EVOLUTION

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1990-94
Reverse flow of technology from Japan to USA
VAPOUR ABSORPTION TECHNOLOGY & ITS EVOLUTION

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ABSORPTION - Working Principle
1. Boiling point of the water is a function of pressure. At atmospheric pressure water boils at 100 deg. C. When maintained at high vacuum, water will boil and subcool itself. The boiling point of the water at 6 mmHg (abs) is 3.7 deg. C.
2. Lithium Bromide (LiBr) has the property to absorb water due to its chemical affinity. At higher concentration and lower temperature LiBr absorbs water vapour (refrigerant vapour) very effectively.

How do the chillers work?
How do the chillers work?

3. As Lithium Bromide becomes dilute it loses its capacity to absorb water vapour. It thus needs to be reconcentrated using a heat source. Heat source may be Steam or in some cases, even Hot water.
4. The heating causes the solution to release the absorbed refrigerant in the form of vapour. This vapour is cooled in a separate chamber to become liquid Refrigerant.
How do the chillers work?
# Absorption Chiller – Vacuum Readings

<table>
<thead>
<tr>
<th>Pressure (atm.)</th>
<th>Gauge Pressure (kg/cm² G)</th>
<th>Absolute Pressure (kg/cm² G)</th>
<th>Temp. (°C)</th>
<th>Remarks</th>
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<td>10</td>
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<td>8</td>
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<td>5</td>
<td>6</td>
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<td>Driving pressure for double effect type</td>
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<td>2</td>
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<td>0.5</td>
<td>1.5</td>
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<tr>
<td>1 atm.</td>
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<td>760 mmHg</td>
<td>100</td>
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<td>525.9</td>
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Based On No of Stages

Single Effect

Concentration Gain takes place in single stage - Only One Generator
Single Effect Steam Driven Series Flow Cycle

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Down Valve
Absorbent Pump
Refr Blow Pump
ProChill Series Flow Cycle
Single Effect Steam Driven
Condenser
Chilled Water Outlet 70°C
Chilled Water Inlet 12°C
Refrigent Pump
Absorbent Pump
Steams Control Valve

ALL FIGURES ARE INDICATIVE
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Based On No of Stages

Double Effect

Concentration Gain takes place in Two stages - Two Generators, High Temperature & Low Temperature
ABSORPTION HEAT PUMP

SCHEMATIC CYCLE DIAGRAM OF HEAT PUMP
CATEGORIES-ABSORPTION CHILLER

- SINGLE EFFECT
  - Low temperature hot water chiller (75-120 ºC)
  - Medium temperature hot water chiller (115-150 ºC)
  - Low pressure steam fired chiller (0.6-3.5 bar)

- DOUBLE EFFECT
  - High pressure steam fired chiller (4-10 bar)
  - Direct fired chiller (gas, diesel, kerosene etc)
  - High temperature hot water chiller (155-185 ºC)
  - Exhaust gas fired absorption chiller
ADVANTAGES OF ABSORPTION COOLING SYSTEMS
IT IS VERY ECONOMICAL TO USE LOW COST HEAT SOURCE LIKE

Steam
Hot Water
Natural Gas
Oil

To Run These Machines
NO DEPENDENCE ON ELECTRICITY...

Freedom From H. T. Power.

Transformer Becomes Redundant

Reduction in Electrical Accessories Such as Cabling, E B Deposit, MCC Etc.

DG Back-up is Considerably Reduced
VAPOUR ABSORPTION MACHINE DOES NOT USE BIG COMPRESSOR OR MOTOR FOR ITS OPERATING CYCLE.

NO WEAR & TEAR

LESS DOWN TIME
NO DYNAMIC LOADING.

FLEXIBILITY OF INSTALLATION

ROOFTOP INSTALLATION

SAVING OF FLOOR SPACE

FOR COMMERCIAL USE.

SILENT OPERATION
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NEGLIGIBLE MAINTENANCE

NO MOVING PARTS

NO REFRIGERANT LEAK

NO TOP-UP REQUIREMENT

NEGLIGIBLE MAINTENANCE
ENVIRONMENTAL SCENARIO

Rising concern over use of CFCs/HCFCs

Planned phase out of the CFC/HCFC based refrigerants

No proper substitute found

Costly  
Scarce

Reduced Efficiency

Higher global warming potential

Growing concerns over GLOBAL WARMING
EFFECTS OF OZONE LAYER DEPLETION

HUMAN
Cataracts, Accelerated Ageing, Wrinkling & Skin cancers.
Reduced immune response leading to susceptibility to infectious diseases

MARINE LIFE
Effect on growth of phytoplankton, the mainstay of the ocean food chain

PLANTS
Interference with photo synthesis leading to lower crop yields
USES WATER AS REFRIGERANT

Zero Ozone Depleting Potential

No Future Conversion Cost
LESS GLOBAL WARMING POTENTIAL

No Global Warming Potential

Reduces Green House Gas Emissions By 50 %
APPLICATION - ABSORPTION CHILLER
COMFORT & PROCESS COOLING

ABSORPTION CHILLERS CAN BE USED IN COMFORT AND PROCESS COOLING LIKE OTHER VAPOR COMPRESSION CHILLERS ARE USED.
ABSORPTION CHILLERS CAN BE USED WITHOUT ANY ANCILLARY EQUIPMENTS WHERE HIGH RANGE OF TEMPERATURE AND HIGHER DELTA “T” REQUIRED. For eg. 35°C TO 20°C.
ENERGY CONSERVATIVE APPLICATIONS WHERE MOST OF THE LOW PRESSURE BLEED STEAM/ QUENCH(HOT) WATER WASTE HEAT CAN BE RECOVERED TO ENHANCE THE PRODUCT OUTPUT
COGENERATION / TRIGENERATION

Tri-generation

Cooling … (New concept)
Temperature of Inlet Air is maintained at 15°C

Heat from Hot Exhaust Gas is recovered & Steam is generated in HRSG in Open Cycle Power Plant

Heat is recovered from other source in closed cycle power plant

Steam or Hot water

Waste Heat from Process OR other Heat Source

Recovered waste heat input

Scheme of inlet cooling with VAM for Gas Turbine

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Improving Your Business is Our Business
Q&A