

THERMAL TECHNOLOGY ELIMINATES RISKY REFRIGERANTS AND REDUCES ELECTRICAL CONSUMPTION BY 99%

- ODS ,GWP are main concerns for HVAC and Refrigeration 'across the board' due to pressurized refrigerants used in processes
- Electrical power consumption is a compound concern for indirect carbon emissions and primary resource depletion

TO REDUCE OR TO ELIMINATE? THAT IS THE QUESTION

- Replacement refrigerants reduce the ODS / GWP risk. Retrofits and complete equipment changes are the path to introduce new pressurized refrigerants.
- Reduced risk does nothing to change the emission potential since all pressurized refrigerants can escape into the atmosphere due to human error or mechanical failures and accidents.

POWER HUNGRY?

- Electrical power consumption remains comparatively high even when retrofits or equipment changes show improved efficiency.
- HVAC/Refrigeration accounts for the major percentage of energy consumption in buildings operating in warm climates.
- Pressurized refrigerants can't be eliminated as long as compression cycle technology is employed.

HOW TO ELIMINATE?

- Desiccant materials as mediums convert thermal changes into chemical changes and vice versa without employing pressurization of a refrigerant.
- Electrical power consumption is reduced by at least half since no high torque or speed from motors is involved in the process when desiccant technology is utilized.
- Heat exchangers and air handlers require no major design changes in desiccant systems.

THERMAL TECHNOLOGY APPLICATIONS

1. DESSICANT DEHUMIDIFIERS (SOLID AND BINARY FLUID): for drying and purifying air.
2. ABSORPTION SYSTEMS (BINARY FLUID): for cooling down to 50 C.
3. ADSORPTION (SOLID SILICA AND SILICA GEL): for cooling down to 38 C.

Desiccant systems use the manipulation of thermal dynamics and chemically variable materials to remove heat and moisture from the air.

DESSICANT DEHUMIDIFICATION

- Reduces humidity to 40% RH without changing the air temperature in the closed space. The process shifts the water vapor to the ambient air outside the space. Analogous to a sponge drying water from a vessel.
- System eliminates the need for compression cycle refrigeration to control environments for equipment or manufacturing processes.
- System can eliminate the need for air-conditioning in high people traffic closed spaces such as shopping areas due to the ability to reduce humidity while properly ventilating the space with outside fresh air.
- Used as an add-on to existing HVAC can reduce the thermal load by at least 40%. HVAC maintenance reduced, HVAC can be downsized, electrical power consumption reduced.

HOW DESSICANT DEHUMIDIFICATION WORKS

- A heat source dries the desiccant medium outside the space and the system introduces the dry desiccant to air flow in the space thus removing the moisture from the space
- The cycle is repeated to continuously dry the medium and the space air flow.
- Heat source can be solar or any low level heat source including flame, ground heat harnessing or other alternatives.
- Electrical power for fans can be solar PV or other alternative such as wind, hydro, fuel cells, waste heat etc. etc.

ABSORPTION COOLING

- Uses high level heat such as steam or waste heat from industrial process to produce cold water
- No pressurized refrigerants used
- A binary fluid is circulated at low pressure to soak heat into the fluid which is then cooled by water and chemically regenerated and recombined by heat then cooled again to renew the cycle
- Produces chilled water, these systems are ideal for cooling where high level heat is available continuously.
- This is an industrial process which needs to be monitored and controlled frequently.
- Maintenance is continuous but the 'free' heat source of wasted industrial heat makes the system very viable.

ADSORPTION COOLING

- Uses low level heat source (80-180 C) and vacuum source to produce cold water
- No moving parts. No maintenance requirement. Hermetically sealed under vacuum continuously. Zero environmental risk.
- External vacuum pump runs intermittently for a few minutes and usually is off for several days or months at a time
- Vacuum pump oil service is routine once in five years
- Solid desiccant medium has life cycle of minimum 20 years.

SOLVING THE GREAT CHILLER PROBLEM

- Adsorption chillers can replace all existing chiller systems directly with no changes to the water circulation system to the building
- Adsorption chillers can replace split systems in buildings where many units exist
- Can run continuously to reduce cooling load to near zero by pre-cooling and 'flat line' operation.
- Heat source is flexible since lower heat is required.
- Energy storage is achievable since stored hot water can drive system
- Chemical free low maintenance system shows excellent ROI rates.

MERGING OLD AND NEW TECHNOLOGIES

- Adsorption is an old technology updated with new materials. It's a tried and proven process, materials are constantly being improved to yield even greater efficiency.
- Cold water circulation is an old technology in fact, is the very first cooling application. Adsorption chillers retain the water cooling technology.
- No new skill set for technicians to learn or special handling to implement.
- Adsorption systems are scalable and can be modular so that installations can be progressively developed.
- Desiccant dehumidification can be applied as a remedial measure or performance improvement for existing systems.
- As an add-on to existing systems desiccant dehumidification is cross compatible with all air handling equipment and is still applicable to absorption or adsorption systems.

TO SAVE COST AND ENVIRONMENT

- Adsorption systems yield 99% operating cost savings due to combination of lower energy consumption and maintenance costs by comparison to existing systems.
- Adsorption systems show year on year savings by self comparison due to low maintenance and rising utility energy costs.
- Elimination of pressurized refrigerants and complex lubricants, saves the environment
- Utility grid power consumption for HVAC can be reduced or eliminated, indirectly saving carbon emissions and fuel resources.

THE MISSING LINK: FINANCE CHALLENGES

- Equipment acquisition represents a capital cost. Individuals and businesses already financially crippled by high energy costs.
- Underperforming businesses have difficulty qualifying for even concessionary loans.
- Absence of financial incentives skew viability of environmentally sound decisions.
- Banks unwilling to finance specialized equipment and insist on high value collateral security rather than savings versus cash flow projections.

WHAT IS NEEDED FOR IMPLEMENTATION

Education, cooperation, commitment

- NOU to facilitate consumer and industry introduction to the alternative technologies that will eliminate ODS/GWP refrigerants.
- NOU to pursue demonstration projects or stimulate grouped projects
- Include 'the eliminators' alternative technology in phase out and management planning
- Alternative technologies bridge the aims of NOU and energy conservation. Agencies could cooperate on finance and project activities that bridge emissions and energy efficiency goals.
- Financial institutions need to be educated so that their policy can facilitate wider access to funds for equipment acquisition.
- Agencies and entities involved can show commitment by implementing the technologies at the buildings in which they operate.

HVAC INDUSTRY RESISTANCE

- Businesses in the HVAC/Refrigeration industry resistant to desiccant technology due to lack of consumer demand (little known, viewed as expensive)
- Businesses deep in financial arrangements with suppliers and manufacturers of incumbent technology
- Businesses view the desiccant technology as detractors of the equipment they sell now.
- Businesses foresee loss of service call ,maintenance and parts sales income since desiccant systems require very low maintenance.
- They can be helped to see that water circulation in buildings requires maintenance that costs them less to perform and generates more service calls when the market uses the technology on a wider scale. Also they can shift their service focus from heavy repairs instead to fine tuning the creature comforts for clients.