International Renewable Energy Storage Conference **IRES**

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Hybrid Thermo - Chemical Network and Storage

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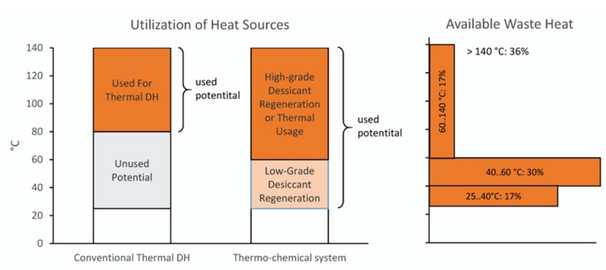
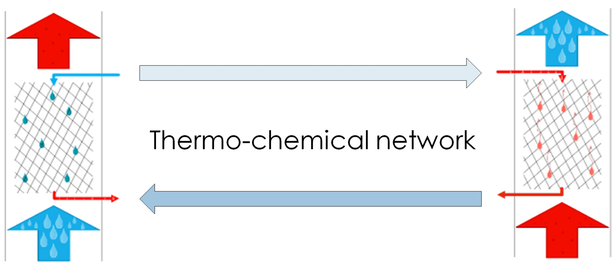


Low temperture residual heat as driving force for the network: Most of it is provided at temperatures below 60°, which normally is insufficient for further storage and translport. Conversion to thermo-chemical potential allows for high energy density storage and transport without thermal losses

(Source Enova, Utnyttelse av spillvarme fra norsk industri - en potensialstudie, 2009)



Absorption Process: Demand Side Technology
- Humidity uptake from air
- Heat generation
- Air Dehumidification, Support of cooling above dewpoint temperature
- Heat recovery, latent energy recovery
- Drying of Materials in air circulation mode

Transport Network
- Pipeline or road/water transport
- Small scale network at initial stage
- Use of heat from return channel of distance heat networks with fluid regeneration at demand side

Desorption Process: Supply Side Technology
- Regeneration by residual heat
- Regeneration by renewables and Aquifer Storage.
- Temperature range 20 -60°C
- Combinatinon with air humidification process
- Supply Side TCF Storage, equalising irregular heat supply and/or fluctuating temperatures

Watergy Desiccant Energy Networks

Waste heat valorisation for desiccant regeneration, transport and storage of concentrated desiccant solutions within an urban desiccant network to applications with high humidity load.

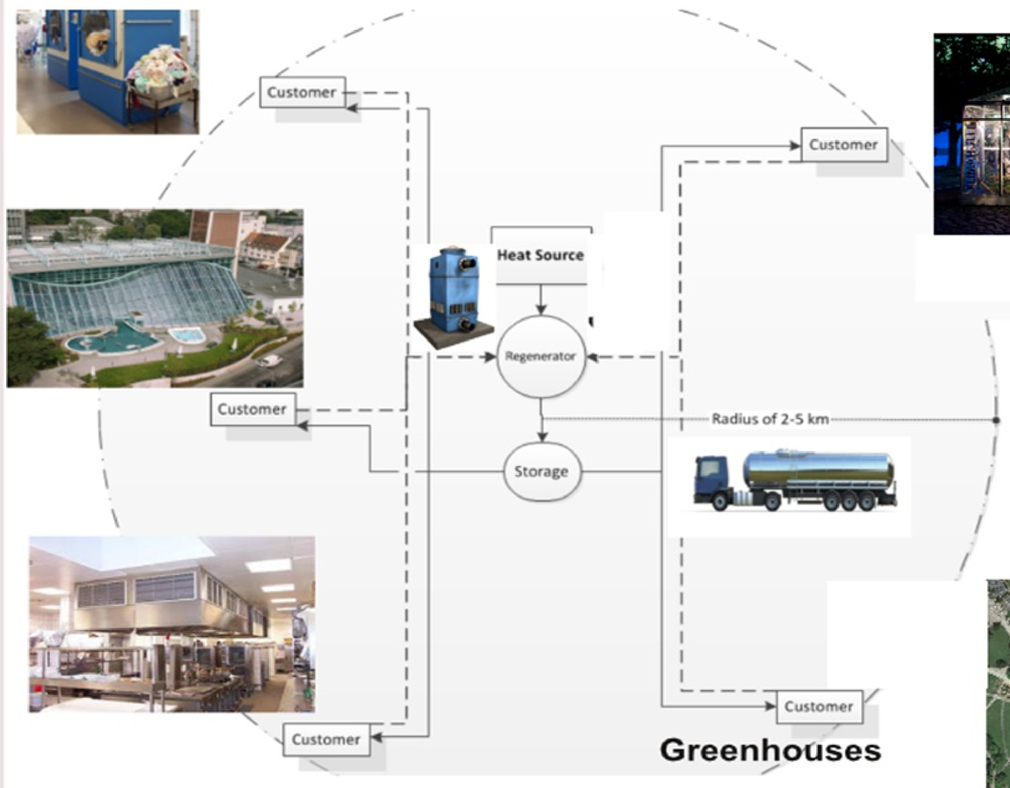
Industrial Drying

Loundry, Wood, Paper, Textile, Food, etc.

Swimming- and sport facilities

Buildings

High internal occupancy (schools, conference rooms)
Restaurants, Kitchen

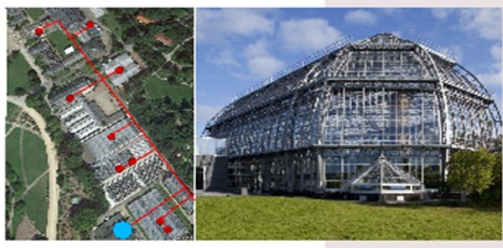


Building integrated greenhouses

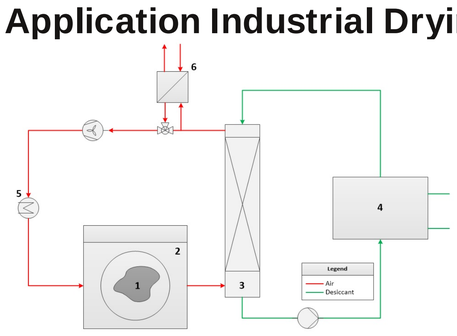
Facade- and rooftop greenhouses
Urban gardening
Climate envelopes
Humid air - solar collectors

Greenhouses

Production greenhouses
Research greenhouses

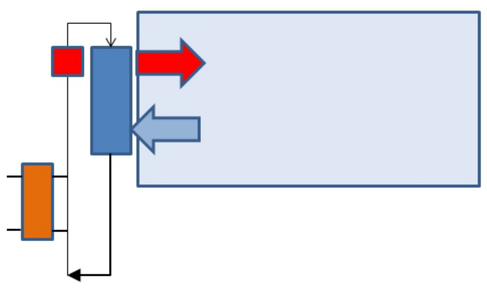


Application Industrial Drying:



The desiccant network allows supply of desiccant in a demand side storage (orange) and dehumidification services within a closed air cycle. Compared to heat recvovery ventilation, the supply air from the absorber (blue) is always warmer than the exhaust air from the enclosure. As sensible heat from air and latent heat conversion is transferred to the desiccant fluid, there is also the option of heat accumulation and retention of heat release (e.g. collection of heat from internal sources during daytime and use for room pre-heating in the morning). The internal air cycle allows to prevent exceeding humidity rates and as providing direct contact between desiccant fluid anfd air, also removes organic particles from air. This allows to clearly reduce ventilation rates and by this also a large part of the energy losses.

Application Building Heat Supply and Humidity Control



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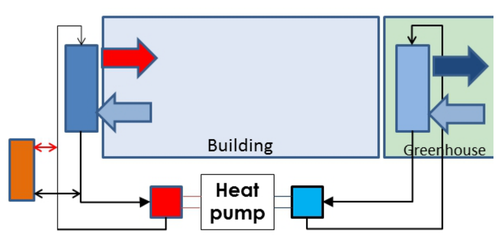
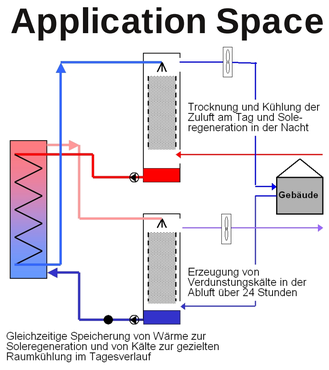


During circulation mode, the second absorber can be used to capture low temperature heat and latent heat from ambient air. By integrating a humid air solar collector, e.g. a façade greenhouse, the temperature and humidity rate supplying the heat pump is clearly increased. Greenhouse air can be used, as long as its enthalpy rate is higher than ambient air. Also a part of the façade energy losses of the building are captured by the greenhouse. During phases of sunshine, the higher efficiency of the heat pump, caused by higher feed temperatures can be used to feed a thermal storage (orange box), so that the heat pump can be switched off during the night or during periods without sunshine. .

Application Space Cooling and Humidity Control



A basic cooling function can be provided by evaporation of water in the exhaust air channel of a building. During night, this function can be used to fill a cool storage that can be used during the phase of highest cooling demand in daytime. Cool water from this process helps to remove heat in the desiccant fluid: The cool desiccant can provide supply air dehumidification and –cooling in one step. The desiccant allows dehumidification of air without reaching the due point. This allows to run the air conditioning at significantly higher cooling temperatures (~16°C instead of ~6°C). The basic cooling system is combined with a heat pump to allow applications for any ambient condition.

H-DisNet

Intelligent Hybrid Thermo-Chemical District Networks: EU Horizont 2020 Funded Project, Grant No. 695780
www.h-disnet.eu , Project Partners: KU Leuven (B), TU Berlin (D), Watergy GmbH (D) ZHAW Zürich (CH), University of Newcastle (UK) , Thermaflex International Holding B.V. (NL), Aurubis AG (B)

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