The cool new way of sustainable heating

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Learning Objectives

- Understand Absorption Technology
- Identify District Energy Applications
Outline

1. Technology Overview and Basic Components
2. Real World District Energy Applications
3. Conclusions
Overview of the Absorption Technology

1. Water as the refrigerant
2. Lithium Bromide salt as the absorbent
3. Thermally Driven
   • Waste steam / hot water, low cost natural gas, solar thermal
4. Around ~ 75 years
5. Very low (0.01 kW / kW) electric consumption
6. Thousands of commercial, industrial installations worldwide
Four Basic Components
Chiller Mode

- **Cooling (Condenser) Water**
  - Outlet: 35°C to cooling tower

- **Driving Heat Source**
  - Steam up 10barg
  - Hot Water: 55 – 160°C
  - Direct gas/oil fired
  - Exhaust gas fired

- **Chilled Water**
  - (Typically Inlet: 12°C, Outlet: 6°C)

- **Chilled Water**
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- **Cooling (Condenser) Water**
  - Inlet: 30°C
  - Outlet: 35°C to cooling tower

- **Evaporator**

- **Absorber**

- **Generator**
79 MW District Cooling Application
Steam Driven 8bar(g)

**SYSTEM INVOLVES STEAM ABSORPTION CHILLERS**

Gas turbine 2MW

WHRB

Boilers
- 45,000 kg/hr × 2
- 24,000 kg/hr × 1
- 2,000 kg/hr × 2

Absorption Chillers
- 17.5 MW × 3
- 8.8 MW × 2
- 4.4 MW × 2

Condenser Water
- 40°C
- 32°C

Chilled Water
- 7°C
- 15°C

Steam for Heating
- 8 bar(g)

Steam for Cooling
- 8 bar(g)
71 MW District Cooling Application
Absorption + Centrifugal + Ice Thermal Storage
Four Basic Components
Heat Pump Mode

- **Condenser**
- **Generator**
- **Evaporator**
- **Absorber**

**Components**
- **Heat Pump Mode**
- **Condenser**
- **Evaporator**
- **Absorber**
- **Generator**

**Typically driving Heat Source**
- Steam up to 10 barg
- Hot Water up to 160°C
- Direct gas/oil fired
- Exhaust gas fired

**Heating water supply**
- ~ 90°C to application

**Low temperature heat source**
- Typically 30°C - 50°C

**Return Heating water from application**
District Heating
Biomass Based System

1. Driving Heat Source – Hot Water from Biomass Boiler (170°C)
2. Evaporator Water cools Flue (Exhaust) Gases from the Boiler
   Inlet 49°C   Outlet 40°C
3. Heating Capacity ~15 MW, COP 1.67
4. Delivers 88°C for 100,000 Homes
5. Primary Energy cut by ~17%
6. Payback ~2 years
7. CO2 Emissions reduced by ~41,000 tons annually
Conclusions
Nothing is more sustainable!

1. Thermally Driven
2. Water as the refrigerant - “0” ODP & GWP
3. Successfully deployed for District Cooling and Heating
4. Saves energy, water and cuts emissions
5. Fast Economic Payback
6. Truly green sustainable solution
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http://york.com/absorption-chillers