MIRROXX
solar heat for industry

Mirroxx Fresnel Collectors for Process Heat, Solar Cooling and Polygeneration

Task 38 Follow up Definition Workshop

March 28th, 2011 – Paris / France

Technology Introduction

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Mirroxx Fresnel collectors are designed to generate heat at 130 - 400 °C

„Process Heat“	250 - 450 °C	**Large PTC and Fresnel**	Utility scale power generation industrial process heat
	130 - 220 °C	**Small PTC and Fresnel**	Industrial process heat solar cooling commercial water heating distributed power generation
	90 - 130 °C	**Vacuum tube CPC collectors**	Solar cooling (single stage) Low temperature process heat
	40 - 80 °C	**Flat plate collectors**	Domestic water heating, space heating

Dimensions

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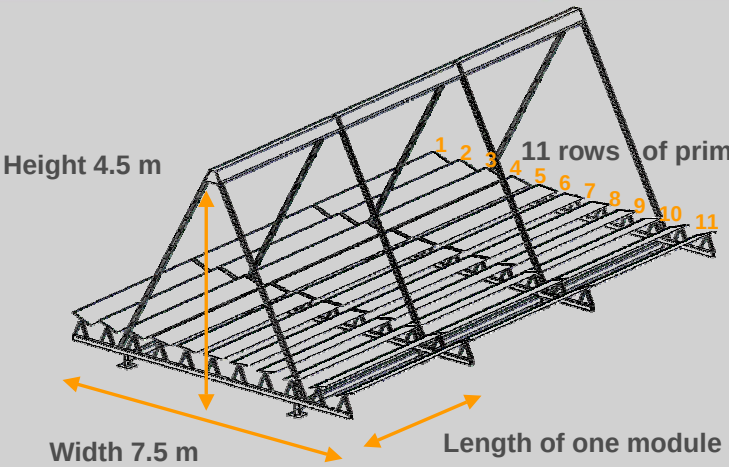

Technology

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Mirroxx Fresnel collector perfectly suited for roof top installation

- Length: modular in steps of 4m
- Total width: 7.5m
- Aperture width: 5.5m
- Height: 4m
- Weight: 27 kg/m²
- Peak power: 560 W/m²

Facts & Figures

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- Heat transfer fluid
  - Pressurized water
  - Steam
  - Thermal oil
- Receiver SCHOTT PTR® 70
  - Maximum pressure
    up to **120 bar** (different versions 40, 60, 120 bar)
  - Maximum temperature
    up to **380 °C with thermal oil**
    up to **330 °C with saturated steam or pressurized water**
  - Thermal loss per m² of primary reflector
    u1 = 0.00043 W/(m²K²) (according to DLR)

Summary Advantages

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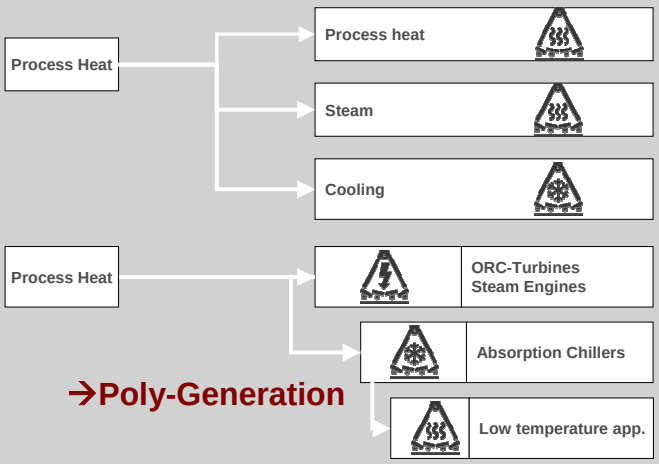
Rooftop installation
- Low wind load
- Good weight-spread
- High ground usage factor
- No north-south alignment necessary

Industry
- Primary mirrors made of flat glass vs. aluminum (durability, reflectivity)
- Precise temperature and power control
- Less absorber tube per m² allows high quality 70 mm vacuum absorber tube (industrial standard)
- Remote control and monitoring via LAN and internet

Steam
- Stationary receiver, no flexivle connections
- Concentrated sunlight hits absorber tube always from below

Low O&M
- Easy cleaning (flat glass / good access)
- Low water demand for cleaning
- Reliable components (mirror/tube/drives)

Applications



Mirroxx Solar Cooling

- **Mirroxx Fresnel process heat collector**
  - High ground usage, good weight spread, low wind load
  - High efficiencies at high operating temperatures
- **2E absorption chillers**
  - Driven by a 16 bar pressurized water circuit – low system costs
  - Chillers from different manufacturers at competitive prices
- **3E absorption chillers**
  - Driven by 250°C saturated steam – higher system costs
  - Few chiller types available at higher prices
  - High COP – backup with gas burner is more efficient than compression chiller with electricity from grid
  - Best ground usage = highest cooling capacity per covered area

Market

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Various applications and markets for process heat and cooling

Applications	Markets	Examples	Typical Energy Demand
Process Heat Roof Top	**Food:** **Beverage:** **Paper**: **Textile:** **Automotive:**	Washing, Cooking, Pasteurization, Sterilization Drying, Cold Drying Distillation, Pressing, Cooking, Coagulation Drying after Coloring	1-10 MWth
Process Heat Ground	**Mining:** **Manufacturing**:	Steam for Drying Tube Production; Steam	5-20 MWth
Solar Cooling Roof Top	**Buildings**: **Process Cold**: **Cold Storage**:	Data-Centers, Shopping Malls, Hotels, Office Food, Beverage Food, Beverage	1-10 MWth
District Cooling Ground	**Building Areas:**	Hospitals, Hotels, Holiday Resorts	5-30 MWth
Poly-Generation Ground / Roof Top	**Industry**: **Building**:	Combined Heat and Cooling or Power Combined Heat and Cooling or Power	5-30 MWth
Micro CSP Ground	**Power:**	Decentralized Power Generation for Industrial Zones, Villages, etc.	1-10 MWel

Market

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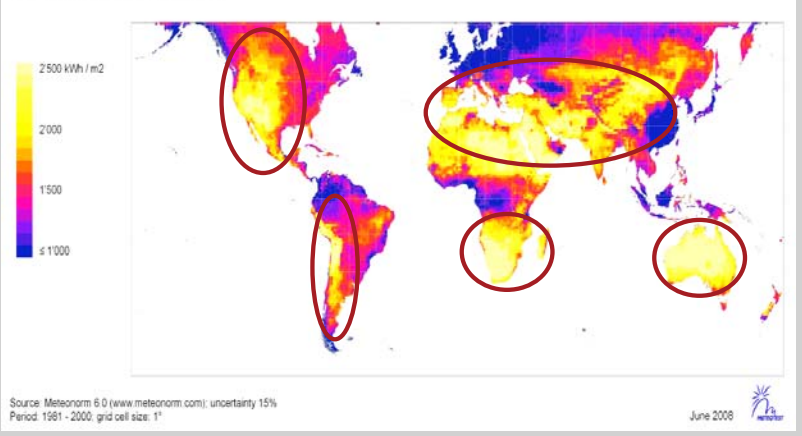
Huge market in regions with DNI > 1500 kWh/m²/a



Recent Installations

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- Completion of direct steam generation system

- Installation Abu-Dhabi

- 1400 m²/ 700kW Installation in Qatar

14 September 2010

2022 World Cup goes to Qatar

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References

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o Freiburg I	2005
o Bergamo / Italy	2006
o Sevilla / Spain	2007
o Grombalia / Tunisia	2008
o Freiburg II	2009
o Masdar / Abu Dhabi	2009
o Doha / Qatar	2010

Certification

Thank you for your attention!

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