IEA SHC T45 – LARGE SYSTEMS

Some initial inputs from Sweden

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ALUMINUM ABSORBER

- Electrolytic from the 70’s (Gränges Aluminium)
- Vacuum deposit from mid 90’s (TeknoTerm)

Advantages in large collectors (Advantages related to LCA)
Based on a Master thesis at CHALMERS, 1981

Lyckebo – 4 300 m² - 3 MW<sub>th</sub> - 1983
designed for 25 000 m² and
100 000 m³ water - rock cavern

RDD interest to replace oil using seasonal storage

Dismantled - 2001
Falkenberg – 5 500 m² - ~4 MW\textsubscript{th} - 1989

Recycled 2008: 40t Al; 2t Cu; 1,4t Fe; glass; insulation ..
Combined with wood chips boilers for DH

Kungälv - 10 000 m²  ~ 7 MW$_{th}$ - 2000

Combination with wood chips
Design from 1981 + Teflon
1983 + sputtered absorber
1998 + AR-glass ..
Göteborg/Hammarkullen ~ 1700 m² - 1985

Site built using PMMA covers
EKSTA / Onsala, 220 m², 1995-

Pre-fabricated roof modules
Roof module collector
Standard building dimensions
Gårdsten 2000

Renov. Prefab modules for DHW
Main approach in early 80’s ..

- **Large modules ..**
  - Requires in principle an Al-absorber ..
  - A teflon film was introduced to reduce convection ..
  - PRO1: Improved performance and logistics ..
  - PRO2: Less piping, lower mounting costs ..

- **Collector array design ..**
  - Low flow, smaller pipes, lower costs ..
    (introduced in scientific papers a lot later ..?)
  - Hydraulics .. even flow distribution without valves ..

- **Why are a number of new “large” solar heating systems still designed with numerous of small collector modules .. !?**
Solar heating plants 2007

- Yellow circles: > 350 kW\textsubscript{th}
- Red circles: > 3 500 kW\textsubscript{th}
Largest SH collector array ..

- Ingelstad, SE – 1 320 m² / 1979 †
- Lambohov, SE – 2 900 m² / 1980 †
- Lyckebo, SE – 4 320 m² / 1983 †
- Falkenberg – 5 500 m² / 1989 †
- Nykvarn, SE – 7 500 m² / 1992 †
- Marstal, DK – 8 500 m² / 1996 -
- Kungälv, SE – 10 000 m² / 2000 -
- Marstal, DK - 18 300 m² / 2003 -
- ????????, XX – 35 000 m² / 2010 ? -
Recent activities in SE..

- **Solar district heating**
  - New DH system with wood chips boiler + 1 000 (2 000) sqm for a large village in operation in 2010.
  - Planning of a 10 000 sqm system in a large DH.

- **Distr. systems in DH**
  - FIT
  - 70-80% of all large buildings have district heating.
  - Interest from building owners to use solar.
  - > 10 systems with 100 – 1 000 sqm in operation

- **Evaluation distr. Systems**
  - into Task 45
  - Technical.. Legislative.. PED..
  - Ownership.. FIT.. Third party access..
Kockum Fritid – Malmö - 2001
Site built HX units
Prefab HX units!!

Malmö - 2004
Prefab HX unit
System operation
Vislanda - 2009
Timrå - 2009
Large system group ..

- **Management ..**
  - J-O. Dalenbäck, CHALMERS (SDHTO) ..
  - P. Kovacs, SE Techn. Research Institute (CEN etc) ..

- **Engineering consultants ..**
  - Andersson & Hultmark ..
  - Energianalys

- **Enterprises**
  - S-Solar, Aquasol, et al (collectors, systems, etc.) ..
  - Armatec et al (prefab sub-units, etc)
  - DH association, Building owners, etc ..