



SOLAR DECATHLON

Capitalize on Solar Thermal !!!, to **heat** and **cool**



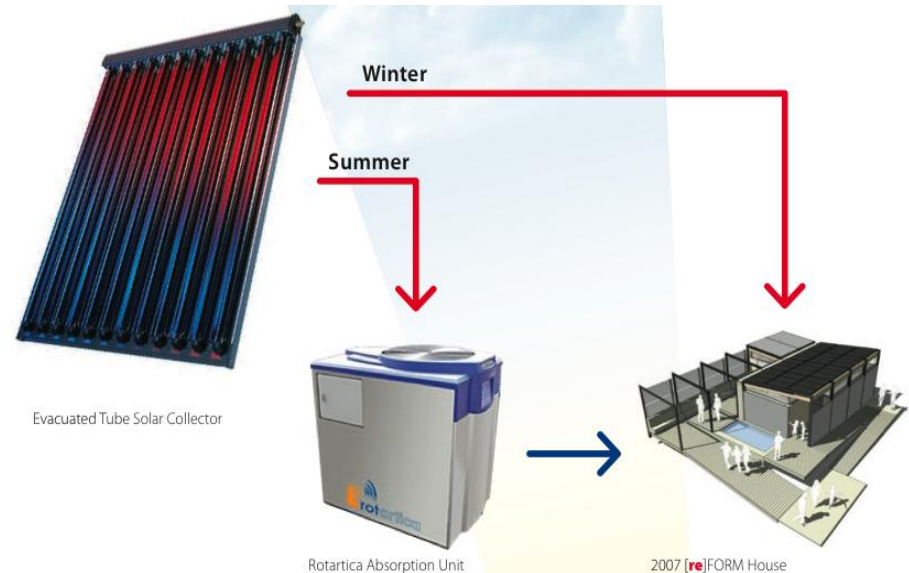


SOLAR DECATHLON

- The competition
- The analysis
- The design: structural, **thermal**, electrical
- The market
- The construction
- The event
- The results
- The future

Engineering (Thermal)

- 15 arrays of evacuated solar tube collectors
 - Generates hot water
 - Used to heat house in winter time using hydronic fan-coil unit
 - Used to cool house in summer through absorption chiller



Evacuated Tubes

- Evacuated glass tubes encasing concentric copper pipe with absorber plate
 - Seido 2-8 tubes (<http://www.sssolar.com>)
- Efficiency = $q_{\text{absorbed}}/q_{\text{incident}}$
 - Function of ambient conditions, solar irradiation and inlet temperature
 - Efficiency ~ 0.6 based on gross collector area



Plate

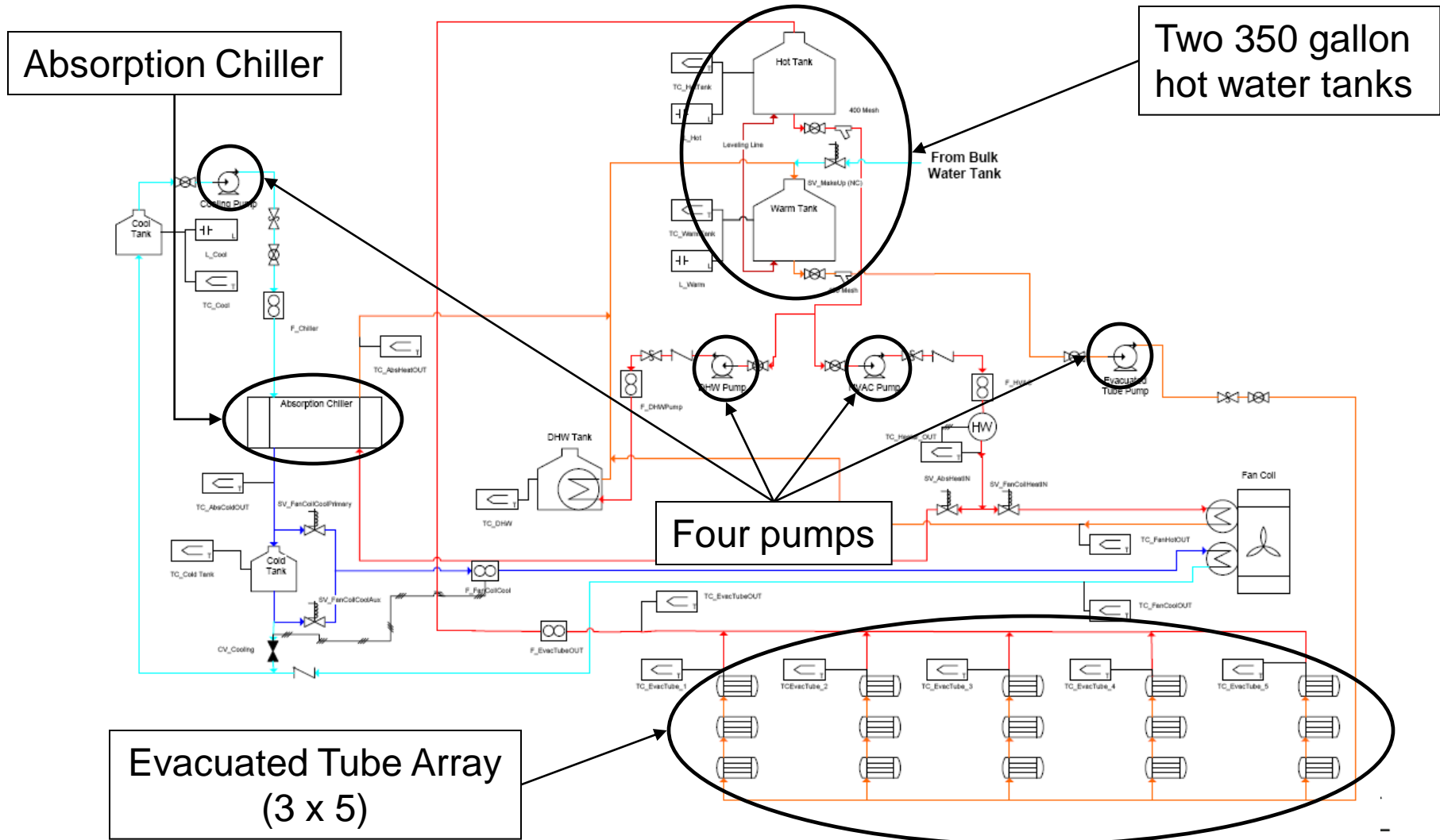
Concentric
Copper Tubes

Glass Enclosure

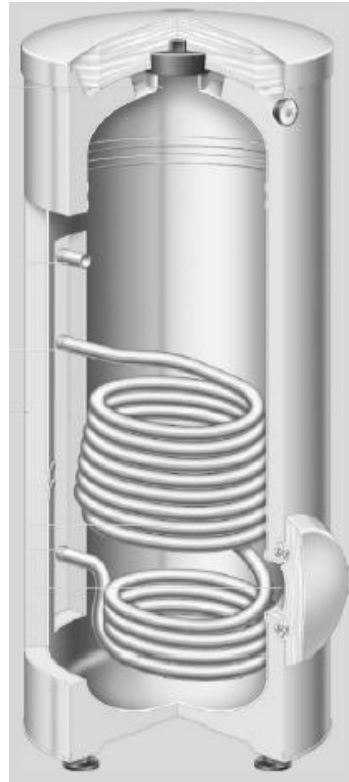




Thermal System Layout



Domestic hot water tank

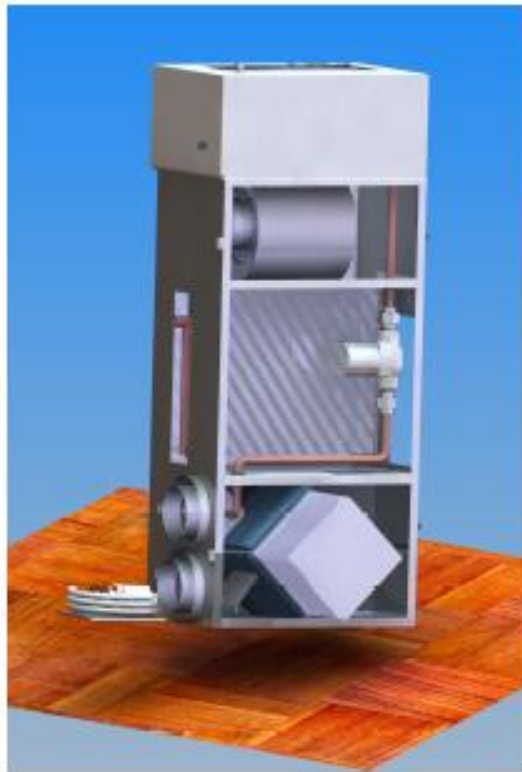


79 gal DHW tank

- Vitocell V-300 (Viessmann)
- 4" foam insulated stainless steel tank
- SS tubular heat exchanger coil
- Located in bathroom
- Hot water for shower

Hydronic Fan-coil unit

**ENERBOSS 400 M Series
Integrated Air Handlers
For Multi-unit Buildings**



Constant CFM fan output
450 CFM (heating or cooling)
250 CFM (continuous fan)

Separate heating & cooling coils
(14,793 Btu/hr ; 8,430 Btu/hr)

Heat Recovery Ventilator (HRV)
– exhaust/fresh make-up
65 CFM ventilation (normal)
120 CFM ventilation (high)

www.nu-airventilation.com

Thermal System Cost

- Evacuated tubes ~ \$15,000 (120 tubes)
- Absorption Chiller ~ \$16,000
- Pumps ~ \$1,000
- Storage Tanks ~ \$2,500

Total Cost ~ \$34,500

Rotartica unit acquired from Spain
(<http://www.rotartica.com>)



Acknowledgements

- All the many hard working UC students
- Numerous supporters and financial sponsors
- On and off-campus volunteers