

6/2010 SUN & WIND ENERGY

SUN & WIND ENERGY

ISSN 1861-2741 74714 www.sunwindenergy.com 9,50 € • International Issue

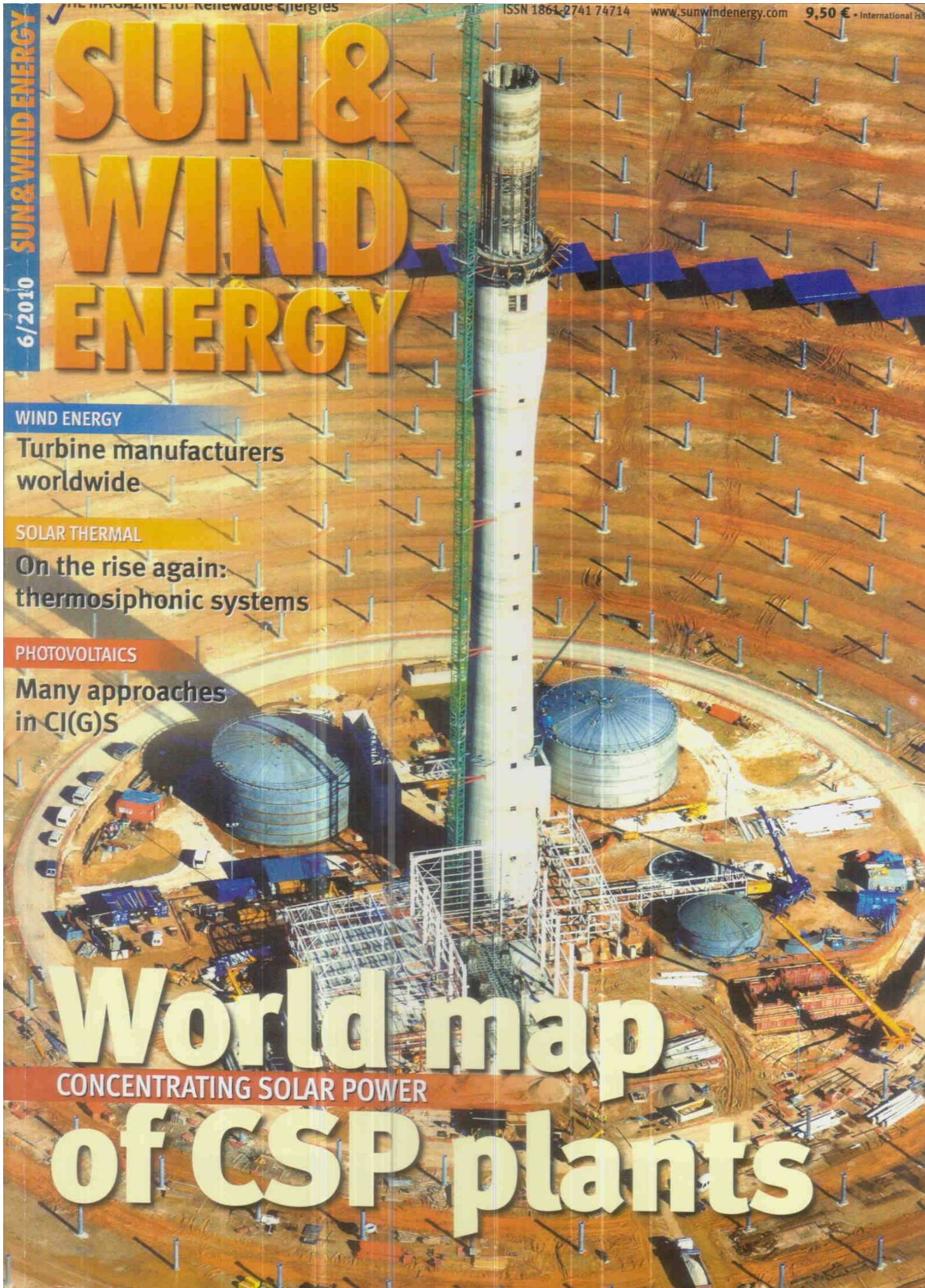
WIND ENERGY
Turbine manufacturers worldwide

SOLAR THERMAL
On the rise again: thermosiphonic systems

PHOTOVOLTAICS
Many approaches in CI(G)S

World map of CSP plants

CONCENTRATING SOLAR POWER



Thermosiphonic solar water heaters

Manufacturer	Product	Type of system	Type of collector	Collector surface [m ²]	Absorber coatings	Tank material	Volume of tank [litres]	Tank insulation [mm]	Frame material	Sacrificial anode	Mounting system	Piping	Performance of electric heater [kW]
Anu Solar Power, India	Anu SWH	both	water in tube	2.00	black chrome	stainless / enamelled	multiples of 100	PU, 50	powder coated steel	yes	flat roof / ground	EPDM	2.0 ⁶
Ao Sol, Portugal	CPC 3E+	closed	flat plate CPC	2.00	black chrome	copper / enamelled	190 / 200 / 300 / 350	10	galvanised steel	yes ³	all	copper	1.0
Apricus, China	Apricus AP-30	closed	heat pipe	2.83	blue	enamelled	340	PU, 50	stainless steel	yes	all	none	3.6
Ariston Thermo, Italy	Kairos Thermo 150-1	closed	flat plate	2.00	black paint	enamelled	150	PU, 45	galvanised steel	yes	inclined roof / flat roof	insulated copper	1.5
Chiryu Heater, Japan	250S-4	open	flat plate	3.90	black paint	plastic	230	styrene foam	galvanised steel	n/a	all	plastic	n/a
Chromagen, Israel	TSA 150	closed	flat plate	1.86	blue	enamelled	150	PU, 40	galvanised steel	yes	inclined roof	insulated stainless steel	2.5
CMG, Italy	New Efficient Horizon	closed	heat pipe	2.31	blue	vitricated	160	rock wool, 50	stainless steel	yes	all	copper	n/a
Creative Solar Energy, China	Collector, tank	closed	flat plate	1.87	blue	stainless	n/a	n/a	n/a	n/a	inclined roof	insulated stainless steel	2.0
Dimas, Greece	SOL+	closed	flat plate	2.70	blue	enamelled	200	PU foam	galvanised steel	yes	all	stainless steel	1.5 up to 4.5
Elsol, Israel	200liters	closed	flat plate	2.60	black chrome	steel	200	PU, 40	galvanised steel	yes	flat roof	insulated copper	2.5
Emmvee Solar Systems, India	Solrizer	open	flat plate	2.00 / 4.00	blue / black chrome	stainless	100 / 200	PU, 50 / rock wool, 100	galvanised steel, aluminium	yes	inclined roof / flat roof	plastic material, insulated galvanised iron	2.0 ⁷
Ezinc, Turkey	KG170 / KG300	closed	flat plate	2.15 / 4.30	blue / black paint	enamelled	170 / 300	PU, 50	galvanised steel, aluminium	yes	all	insulated stainless steel	2.0 / 3.0
HaiLin Solar Energy Equipment, China	Victory 450Pro	closed	n/a	1.85	blue	enamelled	450	PU, 50	galvanised steel	yes	all	insulated copper	3.0
Heliomex, Mexico	HM	open	flat plate	2.00	all	n/a	150 / 300	PU	galvanised steel	yes	ground	copper	n/a
Jixiang Solar Energy, China	JX-SB58/1800/15	closed	heat pipe	2.15	blue	stainless	150	PU	stainless steel, galvanised steel	yes	all	insulated copper	2.5
Kloben, Italy	EVO CPC 270	closed	heat pipe	2.83	n/a	enamelled	270	PU, 60	stainless steel	yes	all	none	1.6
Módulo Solar, Mexico	AXOL AP 150	open	flat plate	1.85	blue	enamelled	150	PU	galvanised steel	yes	flat roof	plastic	n/a
Nobel, D. Xiliniakis & Co, Greece	Apollon	closed	flat plate	2.03	black chrome / black paint	enamelled	320	PU, 50	galvanised steel	yes ⁴	inclined roof / flat roof	stainless steel	1.5 up to 4.0
NRG, India	Sunny	closed	water in tube	2.00	black chrome	stainless / epoxy coated steel / copper	100 up to 1,500	PU, 60 / rock wool, 100 ²	powder coated steel	yes	flat roof	insulated steel / plastic material	2.0
Ouraset, Turkey	ASSET 302	closed	flat plate	4.20	blue	enamelled	300	PU, 50	galvanised steel	yes	all	copper	2.0
Papaemmanouel, Greece	Solar Flame 200/BL/2,37-14	closed	flat plate	1.15	blue	enamelled	200	PU, 50	galvanised steel	yes	all	insulated stainless steel	2.0
Riello, Italy	CSN-20	closed	flat plate	2.00	black paint	enamelled	150	PU, 40	aluminium	yes	all	copper	1.5
Sammler, Greece	A160	closed	flat plate	1.92	black paint	enamelled	150	PU, 40	galvanised steel	yes ⁴	all	insulated stainless steel	n/a
Schüco, Germany	TS 300	closed	flat plate	1.80	blue	enamelled	293	PU, 50	aluminium	yes	inclined roof / flat roof	insulated stainless steel	1.5 up to 3.0
Shentai, China	DAC-H	closed	heat pipe	1.41	blue	stainless	150	PU	galvanised steel	yes	flat roof	none	2.0
Sigma, Greece	SI 150/2.5	closed	flat plate	2.35	black paint/ blue	enamelled		rock wool, 60	galvanised steel	yes	inclined roof / flat roof	insulated copper	2.0 up to 4.0
Solardome, South Africa	SLD 300 litre close-coupled Direct	closed	flat plate	4.60	black paint	copper	300	PU, 60	aluminium	no	all	insulated copper	3.0
Solar Geysler, Pakistan	Solar Geysler	open	water in tube	1.20 / 1.60	blue	stainless	130 / 169	PU, 60	galvanised steel	no	flat roof	insulated stainless steel	1.5
Solahart Industries, Australia	302Kf	closed	flat plate	3.80	black chrome	enamelled	300	PU, 55	galvanised steel / aluminium	yes	all	copper	2.4
Sole, Greece	Eurostar	closed	flat plate	2.12	blue	enamelled	150	PU, 50	galvanised steel	yes	all	copper	2.0 up to 4.0
Soletrol, Brazil	Soletrol Special	open	water in tube	1.60	black paint	thermo plastic	200	PU, 30	aluminium	no	inclined roof	EPDM	2.0
Solimpeks, Turkey	Marvel	closed	flat plate	2.50	blue	stainless	170	PU, 60	stainless steel	no	all	stainless steel	2.0
Solitaire Solar, Dubai	TS3004	open	flat plate	4.00	black chrome/ black paint	enamelled	300	PU, 60	stainless steel	yes	inclined roof	insulated copper	1.8
Sunda, China	160SH-8TF	closed	heat pipe	3.00	blue	enamelled	160	PU, 50	aluminium	n/a	all	none	1.5
SunEarth, USA	SunSiphon	both	flat plate	4.00	black paint	stainless	305	PU, 40	aluminium	n/a	inclined roof	insulated copper	4.5
Sun Master, Austria	TS-System	closed	flat plate	1.90	blue	enamelled	150	PU, 50	aluminium	yes	inclined roof / flat roof	stainless steel	2.0 / 3.0
Sunset, Germany	Schwerkraftsystem II	closed	flat plate	n/a	blue	enamelled	200	PU	aluminium	yes	all	n/a	2.5
SunRay, New Caledonia	SR 304 XL	open	flat plate	4.00	black chrome	stainless	300	PU, 40	aluminium	no	all	copper, insulated copper	2.0
Sunway, Mexico	Sunway	open	flat plate	1.90	black paint	enamelled	151	PU	steel	yes	n/a	n/a	n/a
Termicol, Spain	T300ASE	closed	flat plate	3.80	blue	enamelled	300	PU, 50	galvanised steel	yes	all	insulated copper	n/a
Thermics, Italy	Pegasus	closed	heat pipe / water in tube	3.84	blue	stainless	250	PU / rock wool	aluminium	no	all	insulated stainless steel	n/a
Transsen, Brazil	Acoplado	open	flat plate	2.00	black paint	stainless	200	PU, 30	galvanised steel	no	inclined roof	copper	n/a
Tuma, Brazil	Solarem	open	flat plate	2.00	black paint	stainless	200	PU, 40	plastic	optional	all	plastic	2.5
Viessmann, Germany	Vitosol 222-T	closed	heat pipe	1.80	blue	enamelled	150	PU	galvanised steel	yes	inclined roof / flat roof	none	1.5
Wagner & Co, Germany	SECUterm	closed	flat plate	2.02	blue	enamelled	160 / 200 / 300	PU	n/a	yes	all	insulated stainless steel	1.5
WesTech Solar Technology, China	n/a	both	heat pipe	1.50 up to 4.60	blue	PPRC-coated steel	150 up to 500	PU	stainless steel, galvanised steel	yes	all	none	1.5 / 2
Xinwang Green Energy, China	Aucklat	closed	heat pipe	1.80	blue	stainless	200	n/a	galvanised steel	yes	inclined roof / flat roof	none	1.5

¹ blue = high selective PVD coating, black paint = selective painting; ² rock wool for larger systems; ³ only for steel tanks, copper tanks without; ⁴ two anodes; ⁵ all = flat roof, ground standing, inclined roof; ⁶ and multiples of 2; ⁷ depends on capacity

Source: Manufacturers' information

tank. Here, there is an air bubble which is now compressed and can thus act as a pressure vessel. Even during longer downtime periods there will be no pressure build-up and the system will remain operational. Storage tank temperatures exceeding 100 °C are thus avoided. Releasing steam is not necessary. Wagner & Co estimates that the SECUTerm can reach a solar fraction of up to 100 % in sunny locations in Southern Europe so that, ideally, electrical auxiliary heating is not required.

Stagnation protection is something that is also important to NRG Technologists Pvt. Ltd. from India. The company is now offering air release valves and pressure-temperature (PT) valves as standard in the larger 500 to 1,500 litre systems for residential purposes. NRG realises that when people go on vacation they never drain the system, so the temperature in the tanks is bound to exceed boiling temperature which causes problems because venting is not adequate with only an air vent or an air release valve. A PT valve helps alleviating the problem of water overheating to high temperatures, which can cause scalding of the person using the water in the bathroom. Solar Geyser Pvt. Ltd. has just introduced hot and cold water mixers, true temperature displays and wireless digital solar micro controllers.

Storage tanks: coatings increase durability and stability

A number of companies have spent the last few months working on storage tanks. Sun Ray from the French overseas department of New Caledonia have developed new vertical tanks with 154 litres, 204 litres, 304 litres and 404 litres capacity. Emmvee Solar Systems Pvt. Ltd. from India use Solarizer Plus and Solarizer Supreme in their products and a glass line enamel coating inside the storage tank. Solardome SA from South Africa have developed another solar water heater with 110 litres capacity with a copper hot water cylinder for low-cost applications. In this case, it is a collector tank. The collector is also the storage tank. The technical innovation: Solardome has reinforced the Sunstor copper storage tank. The inner cylinder is externally encapsulated with an epoxy-glass layer.

NRG has re-introduced copper tanks for its evacuated tube system Sunny Supersol. The reason: since the water quality in India is bad and because of rampant use of ground water, there are a lot of corrosion issues with stainless steel. NRG's experience is that these tanks tend to fail in three to five years' time due to small pitting corrosion holes. To overcome this problem, NRG has launched Sunny Supersol with a copper tank, which makes it more expensive but also alleviates all water quality problems and ensures a long product life.

Ao Sol, Energias Renovaveis SA from Portugal has up to now only used copper tanks. The new product line however sees the use of enamelled steel tanks. In 2010, the company has extended its product range to include devices with 200 and 300 litres capacity. Since 2009, there are variants with 190 and 350 litres.



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