

HARVESTING THE SUN

in the most efficient way



AAL-TROUGH™

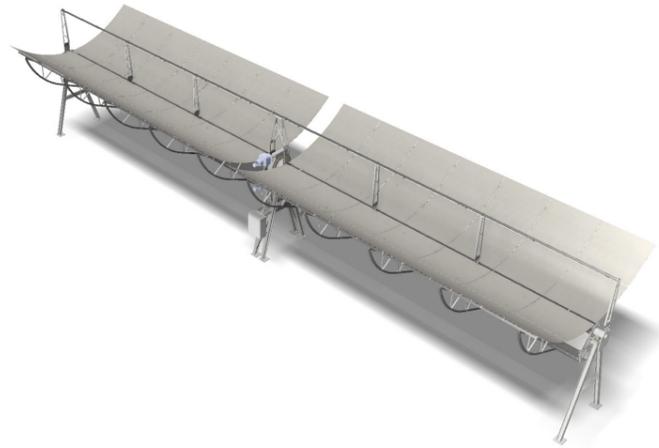
4th generation parabolic trough technology

Reduced weight | Higher efficiency | Worldwide availability

Solar energy cost-competitive **WITH FOSSIL FUELS**

The **AAL-Trough™ 4.0** is the fourth generation of Aalborg CSP's parabolic trough technology designed to meet industrial energy challenges in a renewable and cost-efficient manner. Based on extensive project experience with several concentrated solar power (CSP) plants in Denmark, Aalborg CSP further perfected its solar-thermal technology to enable worldwide availability for renewable energy that is capable of competing head-to-head with the prices of fossil fuels.

Designed for reduced capital costs and improved performance, the **AAL-Trough™ 4.0** provides the industrial market segment with cost-efficient heat, power, steam, cooling and fresh water production - all fueled by the sun. This is achieved through a new, lightweight structure, improved optical accuracy, standardized and locally sourced components which enable savings in terms of transportation and installation time and costs.



OPTIMIZED SYSTEM designed for standardization



LIGHTWEIGHT STRUCTURE

exceptionally light structure which despite its metaphoric name can sustain wind speeds up to 40 m/s.



STANDARDIZED COMPONENTS

LEGO-like components designed for efficient mass-production based on international quality standards.



HIGH OPTICAL & TRACKING ACCURACY

up to 77% optical efficiency significantly increasing thermal efficiency and thereby performance.



UP TO 60% LOCAL SOURCING

standardized components enable local purchase, fabrication, safety and quality inspections.



COMPACT TRANSPORT

standard-size elements allow space-efficient packaging, delivery and optimized transport costs.



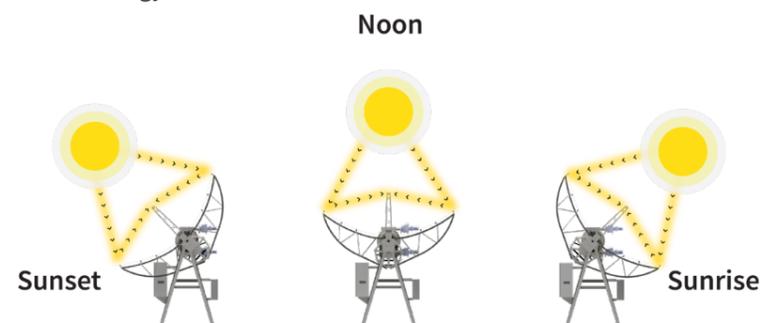
RAPID INSTALLATION

easy-to-install components with locally trained workforce allows fast and cost-efficient construction.

Maximizing solar heat with **SUN-TRACKING TECHNOLOGY**

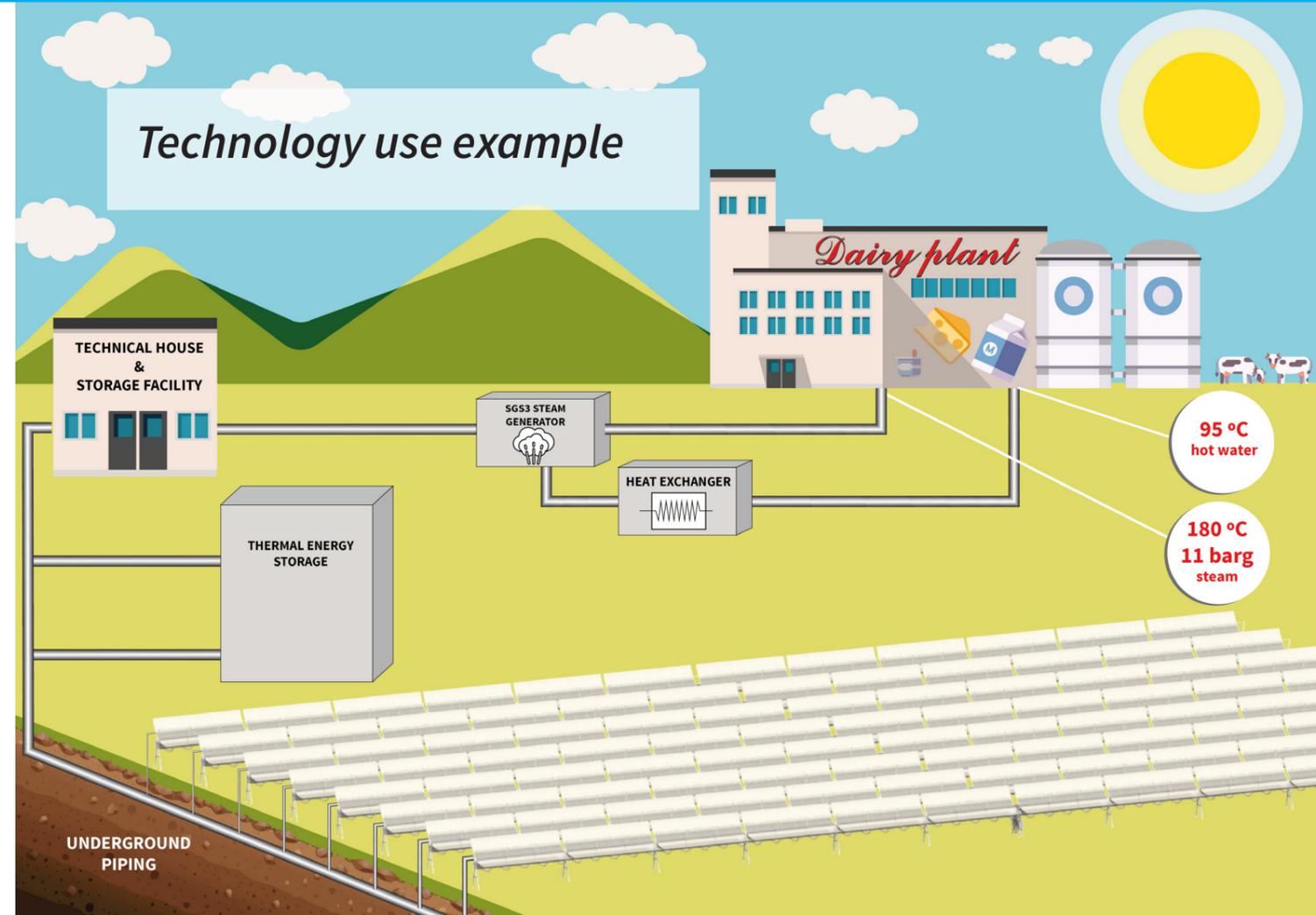
- Stable energy source
- Tracking the sun's daily circuit
- Flexible system
- Easy integration with other energy systems
- Automatic operation
- Remote control
- Defocusing function
- Low maintenance requirements

The CSP parabolic trough technology applies sun-tracking curved mirrors (called parabolic troughs) to maximize the sun's energy and consequently the efficiency of heat production. The sunrays are captured and reflected onto a receiver pipe filled with a heat transfer fluid (water or thermal oil) that is located in the central point of the troughs. Here, the concentration and a significant better utilization of the sun's energy is obtained.

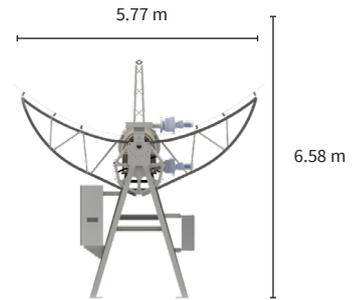


Parabolic trough following the sun's path

Technology use example



SPECIFICATIONS



DESIGN SPECIFICATONS - SINGLE TROUGH

Dimensions	L: 12m, W: 5.77m, H: 3.4m
Construction	Rotating torsional body and wing design
Weight	2,930 kg
Parabolic mirrors	28 pcs 67.3 m ²
Receiver tube	ø70mm or ø80mm Stainless Steel pipes surrounded by a special glass vacuum tube
Heat loss in receiver tube	≤10% at 400 °C ≤1% at 100 °C
Heat transfer media	Water Thermal oil
Corrosion surface class	C3 as standard
Component class	IP66
Type of drive system	Hydraulic or electrical
Trough rotation speed	Tracking 1.8° / min Fast 7° / min
Trough rotation angle	220° (appr. 16 min hydraulic and 10 min electrical)

PERFORMANCE

Design temperature	≤400 °C
Design pressure	≤40 barg
Max performance	540 KW
Optical efficiency	≤77%
Max wind speed (operation)	15m/s (54 km/h) mean wind speed
Max wind speed (operation with 3 sec gust)	20m/s (72 km/h) mean wind speed with 3 sec gust
Max wind speed (stow)	40 m/s (146 km/t) wind speed
Design criteria for wind speed	40 m/s
Operation mode	Automatic operation Remote control Local control
System safety	Automatic defocus using hydraulic pressure or electrical defocus using battery back-up
System lifetime	25 years

ROW DIMENSIONS

Max troughs / row	12 pcs
Dimensions	L: 150m, W: 5.77m, H: 6.58m
Max aperture area	809 m ²

APPLICATION

District heating	District heating / hot water ≤95 °C
Process industries	Steam ≤180 °C ≤36 bar Heat transfer fluid ≤400 °C

AALBORG CSP
- Changing Energy

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