

Solar Energy for Industrial Process Heat Applications

up to 350°C in Economically Viable Manner using ARUN™

for the **FIRST TIME** in **INDIA** by **CLIQUE** and **IIT-Bombay**



CLIQUE Developments Private Limited, Mumbai with IIT-Bombay has developed

ARUN: Solar Concentrator that has opened up the possibilities of saving significant proportion of liquid or gaseous fossil fuels or electricity used in Industrial Process Heat (IPH) Applications economically.

First time in INDIA: Solar Concentrator System for Industrial Process Heat with
Largest aperture area and highest annual heat generation capacity
Highest operating temperatures and highest stagnation temperatures
Lowest cost to energy output ratio for IPH systems at 120°C or higher
Capacity of day-long energy storage and integration with a wide range of applications

- A 160 m² unit of ARUN™ is designed and installed by **CLIQUE Developments Pvt. Ltd., Mumbai** for pasteurisation of about 30,000 to 45,000 lit/day milk at **Mahanand Dairy, Latur** saving 75 to 100 lit of Furnace Oil daily. As a result of installation of ARUN™, the dairy does not need to fire the boiler on **sunny days** when capacities are matched.
- The technology is evaluated by IIT-Bombay and performance data is continuously monitored since February 2006. It was also tested earlier by 'Regional Test and Technical Back-up Centre' of Ministry of New and Renewable Energy (MNRE) at School of Energy Studies, University of Pune in 2003.
- Approved for 40% grant by **Ministry of New and Renewable Energy Sources (MNRE), New Delhi**

How to use ARUN™

- For variety of industrial process heat applications at 80 to 350°C in **ON-LINE** or **ADD-ON** mode with the existing boiler or heater for heat supply at any time of the day or night saving fossil fuels or electrical energy whenever the Sun shines. It needs only cleaning of reflectors and no fuel at all !
- **Many ARUN™ dishes** can be installed to increase the heating power capacity.



For further details, please contact

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Salient features of ARUN™

- Fresnel Paraboloid Solar Concentrating Reflector with specially designed insulated receiver having minimum thermal losses at the point focus and two-axes tracking of the Sun for maximum heat output
- Specially protected glass reflectors for very long trouble-free life without significant loss of reflectivity
- Water, steam, thermic fluid or oils as working fluid, integrable with various industrial thermal processes in on-line or add-on mode, provision of storage system for heat delivery any time of the day or night
- Built-in safety controls with emergency alarm system and user-friendly console
- Completely automatic operation requiring minimum operator intervention and maintenance
- Strict quality controls and performance tested as per the testing procedures developed at IIT-Bombay
- Latest technology with improved non-IBR steam delivery system that is much more productive based on energy delivery at all temperatures compared to ETC or concentrators like Scheffler cooker, CLFR or parabolic trough
- Continuous field experience of operating at Latur since February 2006
- 100% indigenous technology developed and patented by Clique, an exclusive Engineering Consultancy Group

Technical specifications and performance parameters of ARUN™

Fluids used	Water, steam or thermic fluid
Delivery temperature range	Up to 350°C
Operating wind speed	Up to 10 m/s (36 kmph)
Survival wind speed	Up to 54 m/s (194 kmph)
System life	25 to 30 years

Performance of ARUN™ solar concentrator system	Single dish	A pair of dishes
Aperture area	169 m ²	169 x 2 m ²
Heat delivery rate during day-time	50 to 90 kW _{th}	100 to 180 kW _{th}
Daily energy delivered for 275 to 300 days per year	600 to 700 Mcal	1.2 to 1.4 million kcal
Annual operating hours	3000 to 3500 h/yr	3000 to 3500 h/yr
Annual fuel savings (Furnace Oil or Diesel)	19 to 22 kL/yr	38 to 44 kL/yr
Annual equivalent electricity savings in thermal form	180 to 200 MWh/yr	360 to 400 MWh/yr
Aerial unshaded clear space required	18 x 18 x 16 m ht	2 x 25 x 20 x 16 m ht
Foot-print / clear area required on ground / roof	3 x 3 m	2 x 3 x 3 m
Tracking and control power and energy	2 kWh/day	4 kWh/day
Annual reduction in CO ₂ emission (depends on fuel saved)	60 to 180 ton	120 to 360 ton

Where to use ARUN™ for process heat applications up to 250°C

- In **milk processing**, for pasteurisation, cleaning and other thermal processes
- For cleaning and degreasing operations in **automobile industry**
- Heating and maintaining the baths for 7-tank or 9-tank **galvanizing** or **phosphating** processes
- For **thermic fluid heating** in different processing industries, heating of **Furnace Oil** or **LSHS**
- For **boiler** make-up water and feed-water heating as well as steam generation
- In **chemical processing** plants, galvanizing, colours and dyes industries, **pharmaceutical** industries, **textile industry** for cloth processing, **timber industry** for wood seasoning, for **drying** applications like chilli and fruits drying, drying of chemicals, core heating, paint drying, paper drying, drying of herbs
- In **vegetable oil mills** for solvent extraction and distillation, in **agro industries** for food processing, concentration of extracts, bio-mass dehydration, honey processing, herbal processing, in **sugar mills** for sap concentration, biomass dehydration
- In **service industries** like **hospitals, hotels, offices** for cooking, bathing, washing, sterilization
- For space cooling using **Vapour Absorption Refrigeration (VAR)** systems and **air conditioning** systems
- **Cold storage units** for perishable food, marine and horticultural products at remote places
- For **Solar Co-generation** generating power along with process heat, **clean Hydrogen** generation

Economics of ARUN™

- Saves costly fossil fuel for 25 years with negligible running cost
- 40% grant and 80% accelerated depreciation. Positive cash flow right from the first year of the project
 - Competitive prices compared to available solar concentrators, but higher annual energy output
- Reduces CO₂ emissions to the environment. The Carbon Credits (CERs) can be traded internationally

A WISE INITIATIVE TODAY, FOR ENERGY SECURED TOMORROW