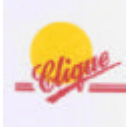


# Solar Energy for Industrial Process Heat Applications

up to 200°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: Concentrating Solar Collector System** in India that has opened up the possibilities of saving significant proportion of Liquid or Gaseous Fossil Fuels or Electricity used in **Industrial Process Heat Applications** in economically viable manner! It can save 25 to 100% of the energy used in industrial units depending on temperatures and load cycles of the process. Potentially this technology can save about 6 to 10% of our national oil imports when fully exploited!!

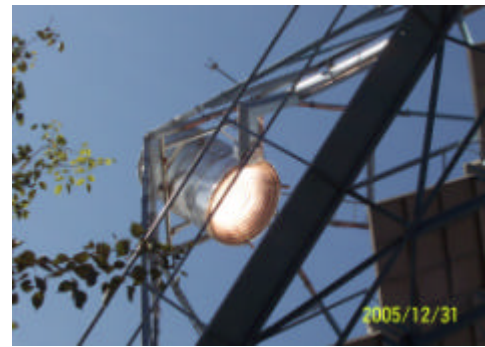
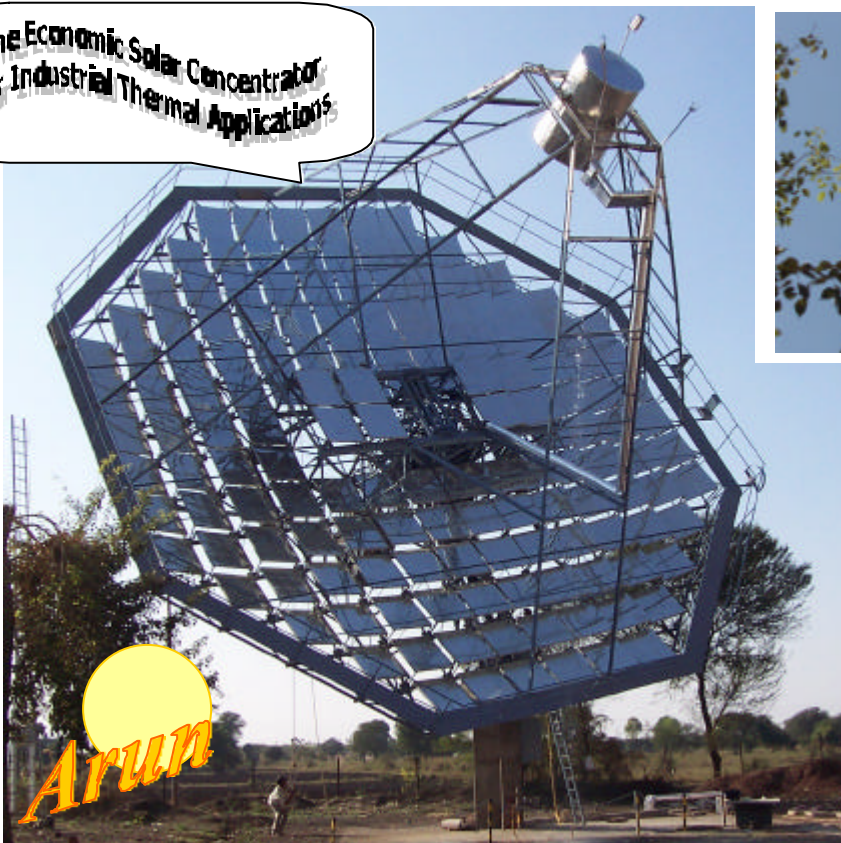
**First time in INDIA: Solar Concentrator System for Industrial Process Heat with Largest aperture area and highest annual heat generation capacity Highest operating temperatures and highest stagnation temperatures Capacity of Day-long energy storage and integration with a wide range of applications**

- 160 m<sup>2</sup> unit of ARUN™ has been designed and installed by **Clique Developments Pvt. Ltd., Mumbai** under R and D project of **IIT-Bombay** sponsored by **Ministry of Non-conventional Energy Sources (MNES), New Delhi** for pasteurisation of about 35,000lit/day milk at **Mahanand Dairy, Latur** saving 80 to 100 lit of Furnace Oil daily. Its stagnation temperature has been measured to be around 850°C. As a result of installation of ARUN™, **the dairy does not need to fire the boiler on sunny days.**
- A 30 m<sup>2</sup> unit of ARUN<sup>0</sup> was tested by 'Regional Test and Technical Back-up Centre' of Ministry of Non-conventional Energy Sources (MNES) at School of Energy Studies, University of Pune in 2003.

## How to use ARUN™

- For variety of industrial process heat applications at 80 to 200°C in **ADD-ON** mode in parallel or series with the existing boiler or heater any time of the day or night saving 25 to 100% of 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.
- It can also be used as **SURYAMUKHI<sup>0</sup>** - a tracking unit for Solar Photo-Voltaic panels for about 25 to 33% higher energy generation from PV panels.

The Economic Solar Concentrator For Industrial Thermal Applications



## 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
- Water, thermic fluid, industrial oils or air as working fluid, integrable with various industrial thermal processes in 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 with minimum maintenance
- Strict quality controls and performance tested as per the testing procedures developed at IIT-Bombay
- Most modern technology that surpasses the temperature and thermal output of flat plate water heaters
- Much more productive and versatile compared to any other solar thermal concentrator system available
- Presently available in two sizes: ARUN™70 and ARUN™160
- 100% indigenous technology

### Technical specifications and performance parameters of ARUN™

|                      |                                     |
|----------------------|-------------------------------------|
| Fluids used          | Water-steam or thermic fluid or air |
| Temperature range    | Up to 200°C                         |
| Operating wind speed | 15 m/s or 54 kmph                   |
| Survival wind speed  | 39 m/s or 140 kmph                  |
| System life          | 25 years                            |

| Performance of a single unit of ARUN <sup>o</sup>                    | ARUN70                    | ARUN160                   |
|--|---------------------------|---------------------------|
| Aperture area  | 70 m <sup>2</sup>         | 160 m <sup>2</sup>        |
| Thermal power (annual average)                                       | 20 to 35 kW <sub>th</sub> | 50 to 80 kW <sub>th</sub> |
| Annual operating hours   | 3050 to 3125 h/yr         | 3200 to 3350 h/yr         |
| Annual fuel savings (Furnace Oil or Diesel)                          | 6 to 8 kL/yr              | 16 to 24 kL/yr            |
| Annual electricity savings   | 55 to 70 MWh/yr           | 140 to 180 MWh/yr         |
| Aerial clear space required for a dish                               | 15 x 10 x 12 m ht         | 25 x 20 x 18 m ht         |
| Foot-print / clear area required on ground / roof                    | 2 x 2 m                   | 3 x 3 m                   |
| Tracking and control power and energy                                | 1 kWh/day @ 300W          | 2 kWh/day @ 500W          |
| Annual reduction in CO <sub>2</sub> emission (depends on fuel saved) | 20 to 100 ton             | 42 to 200 ton             |

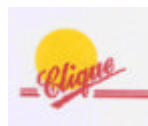
### Where to use ARUN™ for process heat applications up to 200°C

- In **Milk processing**, for pasteurisation, cleaning and other thermal processes
- For **Thermic Fluid Heating** in different processing industries, heating of **Furnace Oil** or **LSHS**
- Heating and maintaining the baths for 7-tank or 9-tank **Galvanizing** or **Phosphating** processes
- 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, **Paper industry**, **Textile Mills** 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, space cooling using **Vapour Absorption refrigeration** and **Air Conditioning** systems
- **Cold Storage Units** for perishable food, marine and horticultural products at remote places.

### Economics of ARUN™

- Saves costly fossil fuel for 25 years with negligible running cost
- 80% depreciation and 15% subsidy. Also grant from MNES under R and D for new applications
  - Positive cash flow right from the first year of the project with soft loans
- Reduces CO<sub>2</sub> emissions to the environment. The Carbon Credits can be traded internationally

*For further details, contact*



## Clique Developments Private Limited

501 "Third Avenue" Apt, Kasturba Cross Road #3, Borivali (E), Mumbai 400066, INDIA

Phone : +91 (22) 2802 0747, 2862 3058; Fax : +91 (22) 2805 6903

website : [www.cliquetechnologies.com](http://www.cliquetechnologies.com); [www.clique.in](http://www.clique.in)



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