

# *Using ARUN dish for washing application*

*Mahindra Vehicle  
Manufacturers  
Limited, Chakan,  
Pune*



**pwc**



**Mahindra** first entered the vehicle market in 1947 when it introduced the first utility vehicle in India and continues to be one of the market leaders. Its SUVs such as Scorpio, Bolero pickups and electric vehicles register high sale volumes in their respective segments. The brand also has a strong global presence. The current facility of Mahindra under study Mahindra Vehicle Manufacturers Ltd(MVML) was set up in 2007 at Chakan in Pune district. It is a greenfield facility and is spread over 700 acres. It is a flexible and an eco-friendly manufacturing unit with provision for manufacturing multi-purpose vehicles (MPVs), sport utility vehicles (SUVs), and commercial vehicles. The plant has a current capacity of 3.2 million vehicles per annum and is a modular setup ready for any future expansion. It has a staff of over 2000 people and boasts itself to be an environmentally friendly zero water discharge facility.

### **ARUN Dish**

MVML has installed one ARUN dish for generating hot water and running four washing machines to wash engine components. The ARUN dish is a dual axis tracked dish. It is installed on a column of 3m\*3m of 8 m height and the area below the dish is utilised as a test facility for the vehicles thus minimising space requirements. The system delivers pressurised hot water at 120°C for seven hours daily which is utilised in degreasing process of the engine components. The dish is a 100% indigenously developed fresnel paraboloid solar concentrator with a point focus. The innovative dish design and the automatic

two-axis tracking system ensure the highest thermal energy output per square metre of the collector area compared to any other solar concentrator. The simplicity of operation coupled with high safety standards ensures minimum maintenance over an extended period of time. ARUN has an IBR certified solar thermal boiler. It has been integrated with the existing system, without any tweaking in the existing process.

It is capable of delivering steam at 25 bar pressure at a temperature of about 400°C. Each module of a ARUN 160(169 m<sup>2</sup>) has a total shade free area requirement of 180 m<sup>2</sup> and a weight of 18 tonnes. A single module has an output capacity of upto 125 kW<sub>th</sub>.

ARUN 160 parameters (Single ARUN dish concentrator)	
Heat Delivery	700000 Kcal/day
Total aperture area	169 m <sup>2</sup>
Total shade free area	180 m <sup>2</sup>
Total weight	18 Tons
Tracking	Dual axis automatic tracking

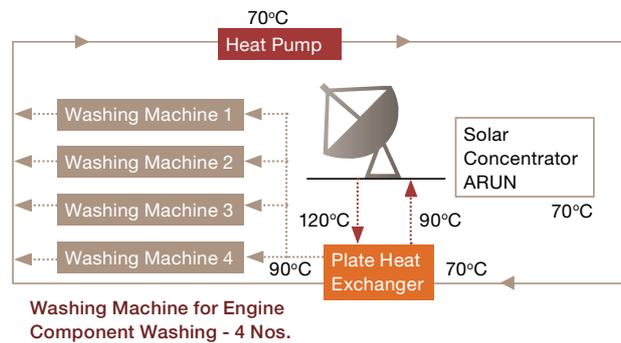
System details	
No of ARUN dishes	1
Total aperture area	169*1 = 169 m <sup>2</sup>
Total shade free area	180*1 = 180 m <sup>2</sup>
Total weight	18 tonnes*1 = 18 tonnes
Manufacturer	Clique Solar



### **Application**

One ARUN dish has been installed at the site, its principal application being supply of pressurised hot water at 120°C to be utilised for degreasing operation. This hot water is used in four sets of washing machines used for washing engine components. The ARUN dish raises the temperature of water from 90 to 120 °C.

### **Layout of the plant**



### **Fuel savings and project economics**

The financial analysis also addresses the issue of an additional accelerated depreciation benefit of 80% of the project cost being available to the unit owner. This accelerated depreciation is available under the IT Act and can be availed on 80% of the cost incurred on solar concentrators. This can be availed to reduce the tax outgo in the first year of expenditure. The financial feasibility assumptions for the project site are as follows:

The ARUN dish based system at MVML has been installed by Clique Solar Ltd. The total project cost is around 39,00,000 INR. This project cost also includes balance of system costs such as piping, civil works, etc which vary and are specific to every installation. Since this is a parabolic dish based system with a dual axis automatic tracking the subsidy on the benchmark costs of 6000 INR per square metre. The total subsidy applicable for the system based on MNRE benchmarks for 169 m<sup>2</sup> is 10,14,000 INR. Thus the overall project cost minus the subsidy available from MNRE is 28,86,000 INR.

Cost of fuel replaced (electricity)	8 INR per kWh (Commercial consumer)
Annual escalation in fuel price	5 %
Debt: Equity for beneficiary's contribution	70:30
Cost of equity	16 %
O&M as percentage of the project cost	1%
Inflation in O&M	1 %
Duration	1 %
Days of operation	275

The results of the financial feasibility analysis that are as follows:

WACC	13.41%
Project IRR	49.37%
Equity IRR	145.44%
Payback	2.1 years
Fuel savings(electricity)	200,000 kWh per annum (approximately)

Thus the project results in a payback of 2.1 years and MVML shall have recovered the entire investment made in terms of project expenditure from the savings made in electricity purchase costs. The monthly savings of electricity are in the range of 22,500 units of electricity each month translating into savings of almost 1,80,000 INR monthly. In addition to it they shall also be reducing GHG emissions and operating in a sustainable manner. Post recovery of the investment MVML shall run the plant at minimal operational costs for the entire project life of 25 years. Thus it makes a compelling case for other industries to go for CST based systems for their process needs.

### ***Beneficiary's perception***

#### ***The consumer speaks***

“We are satisfied with the ARUN solar dish because it delivers the temperature (output) as committed prior to installation. Also, Clique Solar is very prompt in after-sales services”

- General Manager, Mahindra and Mahindra

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