

Solar technology: An alternative

Mahindra and Mahindra has always strived to achieve the status of a carbon neutral company. At Chakan, their new facility, they were incurring huge costs for procuring LPG and electricity and wanted to reduce these efficiently. To begin with they made an initial investment towards the ARUN dish for their washing needs which resulted in substantial savings. Thermax advocated using a solar thermal based cooling solution. The management realised they will not have to incur any additional costs for the VAM machine and shall have tremendous savings in form of LPG and electricity costs.

Beneficiary's perception

The consumer speaks

“The Scheffler dish based system has helped us save considerable amount of LPG and is running satisfactorily as per our needs.”

- General Manager, Mahindra and Mahindra

Using Scheffler dish for cooling and LPG vaporisation application

Mahindra Vehicle
Manufacturers
Limited, Chakan,
Pune



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Mahindra Vehicle Manufacturers Ltd. has installed 70 Scheffler dishes from Thermax Ltd for cooling and process heat requirements. These dishes are connected in a series and a parallel combination. This assembly of 70 dishes with a total aperture area of 1120 m² is utilised for a cooling solution in the paint shop and in LPG vapourisers for process requirements. These are installed in the open space near the utility section to minimise thermal losses. It is capable of delivering temperatures up to 150°C, and the SolPac D16 comes with a tracking mechanism for improved efficiency. The system is capable of tracking the sun automatically throughout the day with the help of an automatic tracking system (i.e. east to west) there by focussing the sunlight exactly on the receivers connected to the header. The process of energy generation is natural, eco friendly and long lasting. Each module of a Solpac D16(16 m²) has a total shade free area requirement of 35 m² and a weight of 400 Kg. A single module has an output capacity of upto 6 kW_{th}.

SolPac D16 parameters (single Scheffler Dish concentrator)

Heat Delivery	30000-35000 Kcal/day
Total aperture area	16 m ²
Total shade free area	35 m ²
Total weight	400 Kgs
Tracking	Single axis automatic tracking

SolPac D16 parameters (single Scheffler Dish concentrator)

No. of Scheffler dishes	70
Total aperture area	16*70 = 1120 m ²
Total shade free area	35*70 = 2450 m ²
Total weight	400 kgs*70 = 28 tonnes
Manufacturer	Thermax Ltd

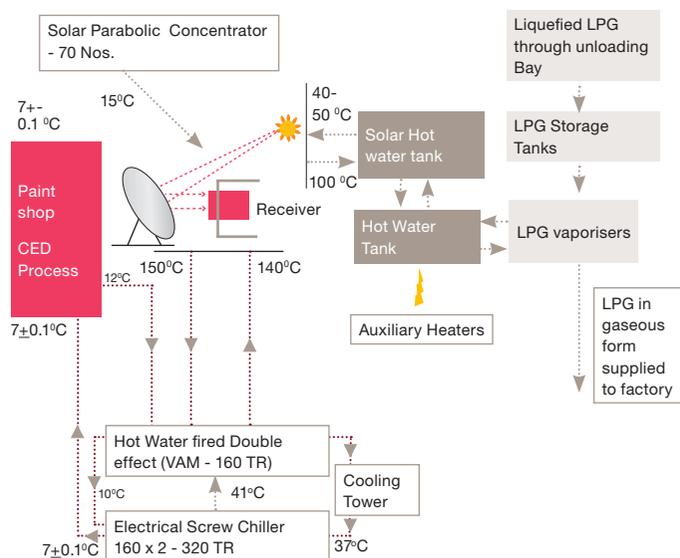


Application

Totally 70 single axis tracked parabolic dishes (Scheffler dishes) have been installed at the site. The principle application of these dishes is to supply a) pressurised hot water at 100°C to the LPG vapouriser system to be utilised to gasify LPG which is fed to the factory; b) pressurised hot water at 150°C fed to a double effect VAM machine. This machine is of 160 TR capacity and is used in the paint shop for cooling paint used for vehicle bodies. The system for LPG gasifiers has a backup heater which is activated when solar energy is sparse.



Layout of the plant:



Fuel savings and project economics

The total project cost of the system is 2,10,00,000 INR. This project cost also includes balance of system cost such as piping, civil works, etc which vary and are specific to every installation. Since this is a Scheffler dish based system with single axis automatic tracking the subsidy based on benchmark costs is pegged at 5400 INR per square metre. The total subsidy applicable for the system based on MNRE benchmarks for 1120 m² is 60,48,000 INR. Thus the overall project cost minus the subsidy available from MNRE is 1,49,52,000 INR

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

Based on the above assumptions the various results of the financial feasibility analysis that emerge are as follows:

WACC	13.41%
Project IRR	30.29%
Equity IRR	62.62%
Payback	3.7 years
Fuel savings (LPG)	50 tonnes per annum (approximately)

Thus the project results in a payback of 3.7 years and MVML shall have recovered the entire investment made in terms of project expenditure from the savings they make in LPG purchase costs. The monthly savings of LPG are in the range of 5550 kg of LPG each month translating into savings of almost 3,88,000 INR on a monthly basis. Additionally they shall reducing the GHG emissions and operating in an energy efficient 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.