Solar Heat for Industrial Process

Presented at workshop on Solar Heat for Industrial Process

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General heat requirements for various industries

- **Globally, industrial process heat accounts for more than two-thirds of total energy consumption in industry, and half of this process heat demand is low- to medium-temperatures (< 400°C).**
- **Low heat : Between 60 DegC to 90 Deg C**
- **Medium Heat : 110 Deg C to 400 Deg C**
- **High heat : above 400 Deg C**

In this we shall be discussing about low and medium heat , with low- and medium-temperature heat accounting for more than 50% of total industrial process heat use and solar thermal systems have a large potential in this segment.

Solar Thermal applications in various fields of industries

Industry	Required temperature for process heating	Application - Process	Boiler feed water heating/Process heating
Automobile	65 - 95 deg C	Pretreatment 1.Components wash - before assembling, 2. degreasing - before painting/coating, 3. coating - Phosphating of components before painting	Process heating
Dairy	95-100 deg C	Pasteurization	Process heating
Tea	65 - 75 deg C 120 - 130 deg C	Drying of tea leaves	Difrect heating Boiler feed water heating
Sugar	120 - 130 deg C	Crystallization	Boiler feed water heating

Solar Thermal applications in various fields of industries (Continued)

Industry	Required temperature for process heating	Application - Process	Boiler feed water heating/Process heating
Vegetable oil	160 - 170 deg C	Oil processing	Boiler feed water heating
Pharmaceutical	160 - 170 deg C	Tablet drying	Boiler feed water heating
Food - fruit pulp	120 - 130 deg C	Steaming, Concentration of fruit pulp	Both
Textile and Dyeing	140 - 170 deg C	Dyeing of textiles	Boiler feed water
Textile - Steam ironing	160 deg C	Steam ironing	Boiler feed water heating

Few of our projects executed

1.Wheels India Ltd., Padi. Chennai

2. Sona Koyo Ltd, Sriprumpudur. Chennai

3. Harita seating Ltd, Hosur

Wheels India Ltd., Padi. Chennai

(Commissioned in 2013)

Applications Process heating – Components wash at (65 – 75)° C

Wheels India Ltd., Padi. Chennai
(Commissioned in 2013)

Applications Process heating – Components wash at (65 – 75)° C

Sr. No.	Item	Details
1	Capacity of Solar Water Heating System	1,05,000 LPD
2	Arrangement existed for hot water requirement (before solar) Type of equipment used (boiler / geyser)	Boiler
2a	Details of hot water requirement for different applications	Chemical wash tank for components wash & pretreatment purposes
2b	Type of fuel being used	Furnace Oil
2c	Fuel consumption per year	1,37,880 L
2d	Cost of fuel & amount spent on fuel per year	@ Rs.42/L…Rs.57,90,960 per year

Wheels India Ltd., Padi. Chennai
(Commissioned in 2013)

Applications Process heating – Components wash at (65 – 75)° C

Sr. No.	Item	Details
3	**Details of solar water heating system installed**	
3a	Type and capacity of Solar Water Heating System	ETC tube manifolds without storage with built in heat exchanger 105nos x 1000 LPD system
3b	Type of circulation	Forced circulation with heat exchanger
3c	Integration with existing boiler/geysers	Yes
3d	Cost of the project	Rs. 160,25,000.00
4	Annual Savings amount	Rs.3,706,000 (245 Ltrs of FO / day @ Rs 42/- per Ltr
5	Percentage of Annual Savings	64%

Wheels India Ltd., Padi. Chennai

(Commissioned in 2013)

Applications Process heating – Components wash at (65 – 75)° C

Sr. No.	Item	Details
Executed under ESCO Model		
6	Total cost of the solar thermal system:	Rs.16,025,000.00
7	Initial Payment as a advance from the Customer	Rs.1,602,500
8	After installation of the Solar Thermal System – the amount paid by the customer	Rs.4,294,700
9	MNRE Subsidy	Rs. 4,095,000.00
10	Monthly Payment	Rs.173,000
11	Term of Period	5 years
12	Monthly Payment as a % of Monthly savings	55%
	Maintenance charges – 5 years	Free

Wheels India Ltd., Padi. Chennai

(Commissioned in 2013)

Applications Process heating – Components wash at (65 – 75)° C

Payback Calculation(for information only, since executed under ESCO model):

Year	Investment cost (Rs.)	MNRE subsidy (Rs.)	Energy savings (Rs.)	Carry forward (Rs.)
First year	16,025,000	4.095,000	3,706,000	8,224,000
Second Year	8,224,000	0	3,706,000	4,518,000
Third Year	4,518,000	0	3,706,000	812,000
Fourth Year	812,000	0	3,706,000	-2,894,000
Pay Back Period : 3 Years& 3 months				

Wheels India Ltd., Padi. Chennai

(Commissioned in 2013)

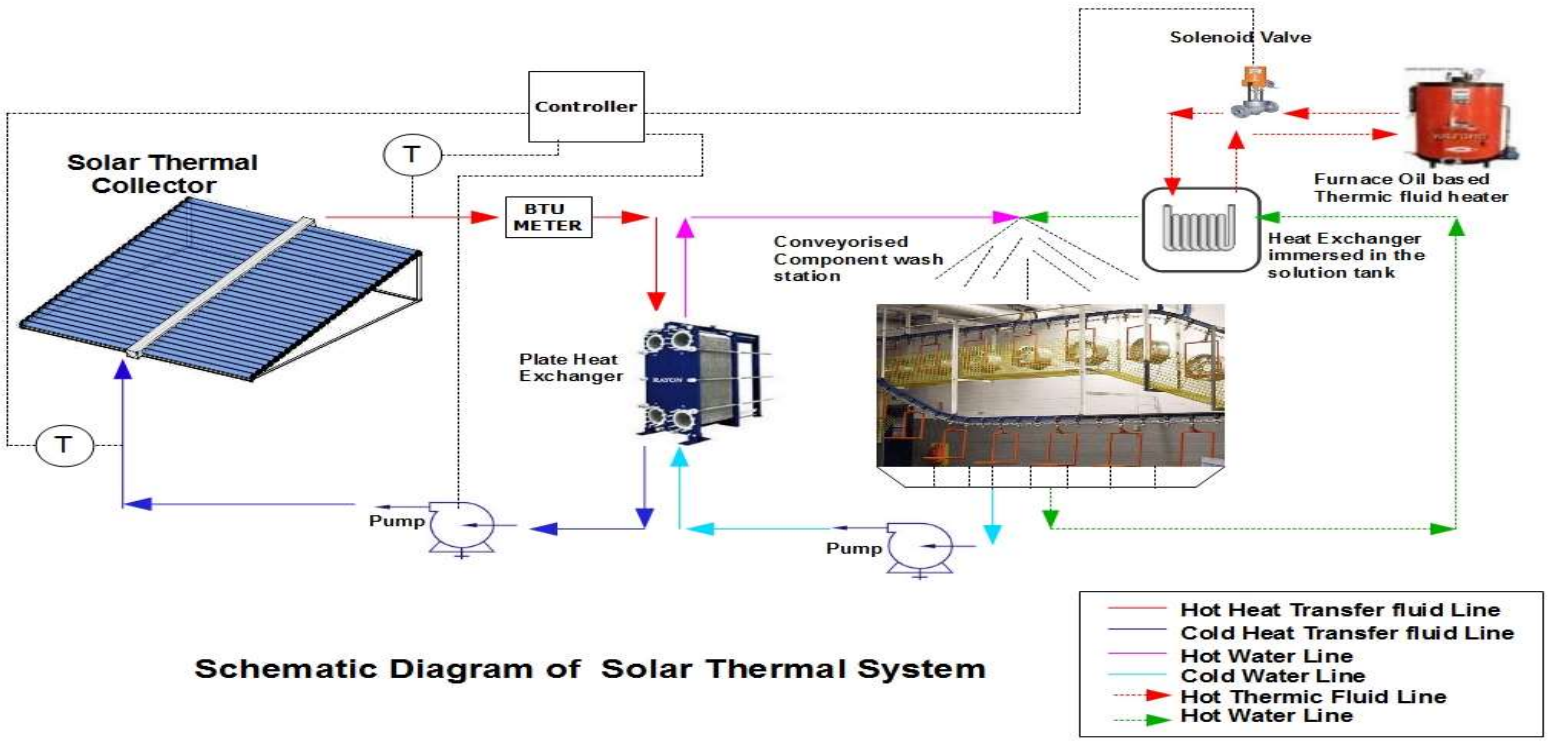
Applications Process heating – Components wash at (65 – 75)° C

- **Actual revenue in this project:**

- **Note: Since this project is under ESCO model, the customer pays only part of the cost of energy saved, which is Rs.173,000.00 per month for 60 months (which is around Rs.2,076,000.00 per year)**
- **Total revenue for the investor / manufacturer for this project is:**
- **Total project cost : 16.025,000.00**
- **1. Initial payment : 16,02,500.00 (Client payment)**
- **2. After installation : 42,94,700.00 (Client payment)**
- **3. MNRE Subsidy : 40,95,000.00 (From MNRE)**
- **5. 60 months monthly payments : 10,380,000.00 (Client pay in 60 months)**

- **Total revenue for the EPC : 20,372200.00**

Wheels India Ltd., Padi. Chennai
(Schematic diagram)



Schematic Diagram of Solar Thermal System

Sona Koyo Steering Systems Limited

(Commissioned in 2012)

Applications Process heating – Components wash at (65 – 75)° C

Sona Koyo Steering Systems Limited

(Commissioned in 2012)

Applications Process heating – Components wash at (65 – 75)° C

Sr. No.	Item	Details
Sr. No.	Item	Details
1	Capacity of Solar Water Heating System	35,000 LPD
2	Arrangement existed for hot water requirement (before solar) Type of equipment used (boiler / geyser)	Boiler
2a	Details of hot water requirement for different applications	Chemical wash tank for components wash & pretreatment purposes
2b	Type of fuel being used	Furnace Oil
2c	Fuel consumption per year	43,200 L
2d	Cost of fuel & amount spent on fuel per year	@ Rs.42/L…Rs.1,814,400 per year

Sona Koyo Steering Systems Limited

(Commissioned in 2012)

Applications Process heating – Components wash at (65 – 75)° C

Sr. No.	Item	Details
3	**Details of solar water heating system installed**	
3a	Type and capacity of Solar Water Heating System	ETC tube manifolds without storage with built in heat exchanger 35nos x 1000 LPD system
3b	Type of circulation	Forced circulation
3c	Integration with existing boiler/geysers	Yes
3d	Cost of the project	Rs. 5,385,120.00
4	Annual Savings amount	Rs.1,254,960 (83 Ltrs of FO / day @ Rs 42/- per Ltr
5	Percentage of Annual Savings	69%

Sona Koyo Steering Systems Limited
(Commissioned in 2012)
Applications Process heating – Components wash at (65 – 75)° C

Sr. No.	Item	Details
Executed under ESCO Model		
6	Total cost of the solar thermal system:	Rs. 5,385,120.00
7	Initial Payment as a advance from the Customer	Rs. 538,500.00
8	After installation of the Solar Thermal System – the amount paid by the customer	Rs.1,346,280.00
9	MNRE Subsidy	Rs. 1,365,000.00
10	Monthly Payment	Rs. 40,225.00
11	Term of Period	5 years
12	Monthly Payment as a % of Monthly savings	38 %
13	Maintenance charges – 5 years	Free

Sona Koyo Steering Systems Limited
(Commissioned in 2012)
Applications Process heating – Components wash at (65 – 75)° C

Payback Calculation(for information only, since executed under ESCO model):

Year	Investment cost (Rs.)	MNRE subsidy (Rs.)	Energy savings (Rs.)	Carry forward (Rs.)
First year	5,385,120	1,365,000	1,254,960	2,765,160
Second Year	2,765,160	0	1,254,960	1,510,200
Third Year	1,510,200	0	1,254,960	255,240
Fourth Year	255,240	0	1,254,960	-999.720
Pay Back Period : 3 Years& 3 months				

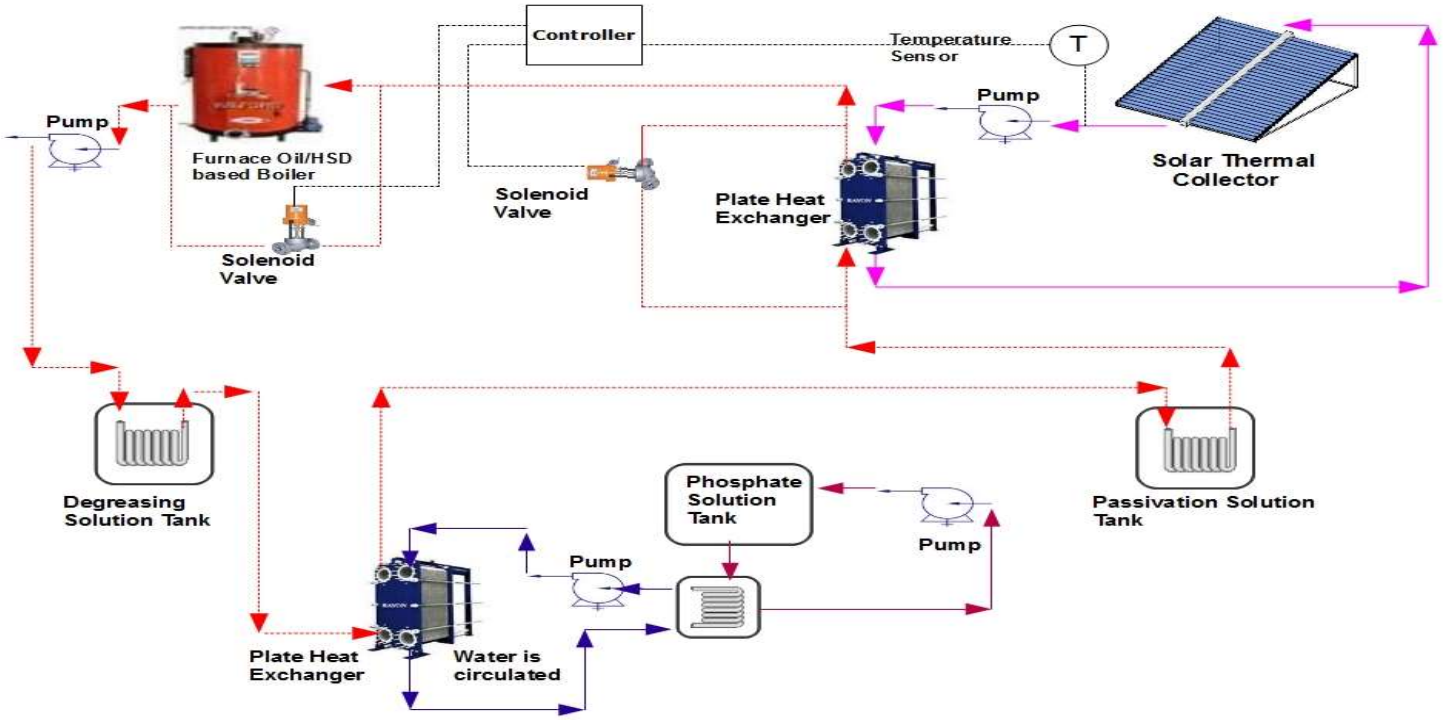
Sona Koyo Steering Systems Limited
(Commissioned in 2012)
Applications Process heating – Components wash at (65 – 75)° C

- **Actual revenue in this project:**

- **Note: Since this project is under ESCO model, the customer pays only part of the cost of energy saved, which is Rs.40,225.00 per month for 60 months (which is around Rs.483.300.00 per year)**
- **Total revenue for the investor / manufacturer for this project is:**
- **Total project cost : 5,385,120.00**
- **1. Initial payment : 538,500.00 (Client payment)**
- **2. After installation : 1,346,280.00 (Client payment)**
- **3. MNRE Subsidy : 1,365,000.00 (From MNRE)**
- **5. 60 months monthly payments : 2,416,500.00 (Client pay in 60 months)**

- **Total revenue for the EPC : 5,666,280.00**

Sona Koyo Steering Systems Limited
(Commissioned in 2012)
Applications Process heating – Components wash at (65 – 75)° C



Harita Seating Systems Ltd, Thally Road, Hosur

(Commissioned in 2014)

Applications process heating – Components wash at (65 – 75)° C

Harita Seating Systems Ltd, Thally Road, Hosur
(Commissioned in 2014)
Applications process heating – Components wash at (65 – 75)° C

Sr. No.	Item	Details
Sr. No.	Item	Details
1	Capacity of Solar Water Heating System	60,000 LPD
2	Arrangement existed for hot water requirement (before solar) Type of equipment used (boiler / geyser)	Direct heating burner with FO
2a	Details of hot water requirement for different applications	Chemical wash tank for components wash & pretreatment purposes & for Canteen use
2b	Type of fuel being used	Furnace Oil
2c	Fuel consumption per year	77, 650 L
2d	Cost of fuel & amount spent on fuel per year	@ Rs.38/L…Rs.2,950,700 per year

Harita Seating Systems Ltd, Thally Road, Hosur
(Commissioned in 2014)
Applications process heating – Components wash at (65 – 75)° C

Sr. No.	Item	Details
3	**Details of solar water heating system installed**	
3a	Type and capacity of Solar Water Heating System	ETC tube manifolds without storage with built in heat exchanger 35nos x 1000 LPD system
3b	Type of circulation	Forced circulation
3c	Integration with existing boiler/geysers	Yes
3d	Cost of the project	Rs. 9,231,630
4	Annual Savings amount	Rs. 2,065,680 (151 Ltrs of FO / day @ Rs 38/- per Ltr
5	Percentage of Annual Savings	70%

Harita Seating Systems Ltd, Thally Road, Hosur
(Commissioned in 2014)
Applications process heating – Components wash at (65 – 75)° C

Sr. No.	Item	Details
Executed under Equipment leasing Model		
6	Total cost of the solar thermal system:	Rs. 9,231,630.00
7	Initial Payment as a advance from the Customer	Rs. 923,000.00
8	After installation of the Solar Thermal System – the amount paid by the easing company	Rs.5,968,630.00
9	MNRE Subsidy	Rs.2,340,000.00
10	Monthly Payment	Rs. 129,320.00 (Leasing company makes 12% interest on the loan amount)
11	Term of Period	5 years
12	Monthly Payment as a % of Monthly savings	75 %

Harita Seating Systems Ltd, Thally Road, Hosur
(Commissioned in 2014)
Applications process heating – Components wash at (65 – 75)° C

Payback Calculation executed under equipment leasing model:

Year	Investment cost (Rs.)	MNRE subsidy (Rs.)	Energy savings (Rs.)	Carry forward (Rs.)
First year	9,231,630	2,340,000.00	2,065,680	4,825,950
Second Year	4,825,950	0	2,065,680	2,760,270
Third Year	2,760,270	0	2,065,680	694,590
Fourth Year	694,590	0	2,065,680	-1,371,090
Pay Back Period : 3 Years& 4 months				

THANK YOU