Mechanical Engineering Department

Academic Year – 2019-20	Class: TE
Semester – II	Date : 17/1/2020
CO: CO2	PO: PO1, PO2, PO7,PO10, PO12

Innovative Teaching Methods

Title of Innovation method/activity: Innovative Teaching Learning Method (Industry based Case study) for study of Solar powered vapour absorption refrigeration system

1. Name of Faculty: Dr. S.B.Sonawane

2. Subject: Refrigeration & Air Conditioning

3. Objective of Method:

I. Understand the working of Solar powered vapour absorption refrigeration system

II. Create the awareness of energy saving using solar energy for refrigeration application

III. Describe the use of solar powered VAS for different applications like paint shop in automobile industry, hospitals, dairy etc

IV. Understand the cost benefit analysis using system performance and capital cost.

4. **Topic Covered through Activity**:

Solar powered vapour absorption refrigeration system

5. Description of method with Benefits (8 – 10 lines):

Layout and working of solar powered vapour absorption system installed at automobile industry for producing refrigeration effect in paint shop and solar steam based VAS for air conditioning application have been demonstrated by the faculty member in the class room. Faculty member has explained the evaluation of payback period of system using annual benefits (measured in terms of electricity saving) and capital cost of plant. Quiz is conducted on the present topic to assess the topic understanding.

Benefits of method:

- Students can learn better from examples than from logical development starting with basic principles. The use of case studies can therefore be a very effective classroom technique.
- It helps students to understand the practical aspects of system
- It teaches students to assess techno-economical viability of realistic projects
- Students are actively engaged in figuring out the principles by abstracting from the examples.

The method:

Faculty member has prepared the presentation on 'Solar powered vapour absorption refrigeration system' (shown in Fig. 1) based on his industrial visit and data published in Sun Focus technical Magazine of Ministry of New and Renewable Energy Dept. of Govt. of India. Working and practical aspects of the system have been explained in the class room. Thermodynamic processes like heat absorption, evaporation, condensation, expansion and absorption have been described. Quiz is conducted on fundamentals of VAS, desirable properties and practical aspects and performance of the students have been assessed.

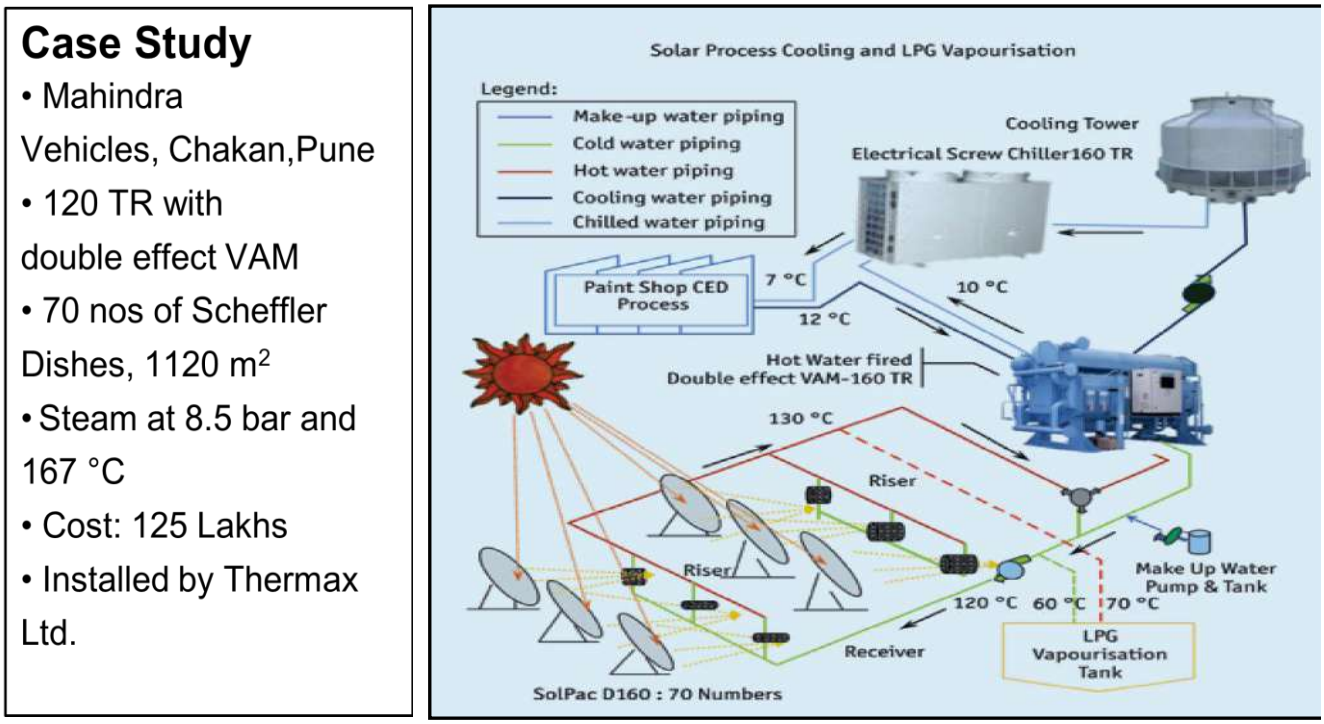


Fig. 1 Solar powered vapour absorption refrigeration system (Source: Sun Focus)

Roles and Responsibilities

- **Teacher**
    - Develop the awareness among the students about the industrial applications of 'Solar powered vapour absorption refrigeration system (VAS)'
    - Prepare presentation on the present topic.
    - Provide the study material and appropriate guide lines at every stage to the students
    - Remain available during the completion of task.
    - Prepare assessment methodology.
- **Student**
    - Learn the present topic and go through the presentation material
    - Understand the practical aspects of system
    - Learn the system performance and payback analysis using available data
    - Answer the questions asked in Quiz

6. Assessment Tools

Quiz is conducted in the class room after learning the present topic. Questions of the Quiz and corresponding right options are as follows. Each question carries one mark. Maximum marks for the Quiz are 10.

1	Compared to compression systems, absorption systems offer the benefits of …..
a	Higher COPs
b	Lower refrigeration temperatures
c	Possiblity of using low-grade energy sources
d	All of the above
Right Option	c
2	Absorption of the refrigerant by the absorbent in a vapour absorption refrigeration system is accompanied by …
a	Absorption of heat
b	Release of heat
c	No thermal effects
d	Reduction in volume

Right Option	a				
3	An absorption system consisting of only two closed vessels ….				
a	Can provide continuous refrigeration				
b	Provides refrigeration intermittently				
c	Can work on solar energy alone				
d	Has no practical application				
Right Option	b,c				
4	The conventional, continuously operating single stage vapour absorption refrigeration system				
a	Requires only thermal energy as input				
b	Uses a thermal compressor in place of mechanical compressor				
c	Does not require a condenser				
d	Consists of two expansion valves				
Right Option	b,d				
5	For an ideal refrigerant-absorbent mixture				
a	There is neither expansion nor contraction upon mixing				
b	The mixing process is exothermic				
c	The mixing process is endothermic				
d	Obeys Raoult's law in liquid phase and Dalton's law in vapour phase				
Right Option	a,d				
6	For a refrigerant - absorbent mixture with a negative deviation from Raoult's law				
a	The mixing process is exothermic				
b	The mixing process is endothermic				
c	The actual equilibrium temperature will be less than that predicted by Raoult's law				
d	The actual equilibrium temperature will be more than that predicted by Raoult's law				
Right Option	a,d				

7	Refrigeration capacity of VAS plant at Mahindra & Mahindra Chakan is
a	120 TR with double effect
b	100 TR with double effect
c	80 TR with single effect
d	150 TR with single effect

Right Option	a				

8	VAS chilling plant installed at Mahindra & Mahindra Chakan used for
a	Machine shop
b	Paint shop
c	Quality department
d	R&D department

Right Option	b				

9	Which of the following statements are true
a	Water - lithium systems are used for refrigeration applications above $0^{o}C$ only
b	Ammonia - water systems can be used for refrigeration applications below $0^{o}C$ only
c	Small ammonia - water systems are used in domestic refrigerators
d	Small water - lithium bromide systems are used in room air conditioners

Right Option	a				

10	Solar steam based VAS system installed at Muni Seva Ashram Vadodara for ----
a	Preservation of food
b	Heating purpose
c	Agro processing
d	Air conditioning

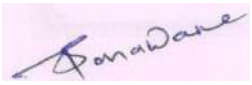
Right Option	d				

6. Evaluation sheet of attendee

Sr. No.	Name of students	Score out of 10
1	KISHOR SANJAY AHIRE	9
2	KOMAL FAKIRA AHIRE	6
3	MAYUR PRAKASH AHIRE	8
4	SAGAR JAGANNATH AHIRE	8
5	APURV SURESH GAYKHE	6
6	PRATIKSHA SUBHASH BACHHAV	5
7	YADNESH GOVINDRAO BASTE	10
8	KARTIKKUMAR RAJARAM BHAND	6
9	AKASH SANJAY BHANDARE	7
10	SATYAM ARUN BIRAR	10
11	PRIYANKA DNYANESHWAR BODKE	8
12	DHANANJAY MHASU BORADE	7
13	SHRADDHA PANDHARINATH BORSE	7
14	RUPESHKUMAR SURESH BURHADE	10
15	GAURAV VISHWAS CHAUDHARI	10
16	PRAFULLA DATTATRAY CHAUDHARI	7
17	RAHUL NAVNATH CHAURE	9
18	KETAN UMESH CHAVAN	8
19	SHREYAS SHARADRAO DANGE	9
20	GAURAV MANIK DANGRE	9
21	ATHARVA KAMALESH DARANGE	7
22	KETAN ANIL DASHPUTE	6
23	SAHIL SANJAY DIWATE	9
24	PRATIK GAUTAM GAIKWAD	10
25	PAVAN HEMANT GANGURDE	8
26	PUSHPAK MEGHRAJ GANGURDE	7
27	ROSHAN RAJIV GANGURDE	10
28	SAURABH DNYANESHWAR GITE	7
29	BHUSHAN BAPURAO GUNJAL	10
30	DANISH PARVEZ HASAN	8
31	CHANDAN THAKURSINGH HOLARIA	8
32	AJINKYA SHANTARAM INGLE	6
33	PRATIK BABAJI JADHAV	6
34	RITESH PREMCHAND JADHAV	8
35	TEJASWINI TRIBHUVAN JADHAV	9
36	VIKAS SUDAM JADHAV	8
37	APOORVA RAJENDRA JAGTAP	9
38	SHUBHAM RAJESH JAGTAP	10
39	VISHAL ANAND JANGID	10
40	PARIMAL SANJAY JOSHI	8
41	MAYUR RAJENDRA KADAM	8
42	JAYESH MANOJ KALANTRI	10
43	SANKET DIPAK KALE	8

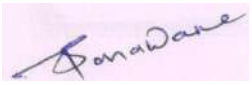
44	OMKAR SUDHAKAR KANDEKAR	9
45	AKASH KAILAS KARDILE	9
46	ASMITA ANNASAHEB KHAIRNAR	8
47	GAURAV ANIL KOTHAWADE	7
48	MANISH SUBHASH KSHIRSAGAR	7
49	KUNAL SURESH WARKE	10
50	JAYESH GHANSHYAM LOLAGE	7
51	SUNIL CHANAPPA MALI	8
52	GANDHALI SUNIL MHALAS	10
53	SHRIRAM KAILAS MHASANE	8
54	AJAY RAJENDRA MORE	5

7. For review and critique contact: e-mail address of faculty and HOD
sonawane.sandipkumar@kbtcoe.org, hod.mech@kbtcoe.org



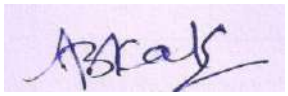
Dr. S.B.Sonawane

Subject In charge



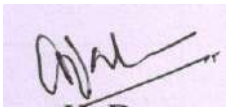
Dr. S.B.Sonawane

Module Coordinator



Dr. A.B.Kakade

NBA Coordinator



Dr. V.C.Shewale

HoD