Experimental investigation of exhaust driven vapour absorption air conditioning system

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ABSTRACT

***Abstract*----Nowadays vapour compression air conditioning system is widely used in automobiles. For the proper working of vapour air conditioning system compressor is required which leads to lowering the performance of engine. Vapour absorption air conditioning system can be used alternatively in automobiles thus replacing vapour compression air conditioning system. The above hypothesis was studied using Electrolux VARC setup installed in SKNCOE, Pune. Our aim behind experimentation was to check the feasibility of implementation of VARC in automobiles as well as for stationary engines. Large amount of heat is wasted in exhaust of automobiles, this heat is utilised in VARC. It results into economical air-conditioning. Implementation of this concept will after effect into high energy conservation in tropical areas. Since the performance of any thermodynamic system is dependent on temperatures variations in performance of VARC system with respect to various temperature was studied. Along with the performance analysis the paper focuses on the practical approach of implementation of above system for air conditioning system in cars. When using this system, it was found that energy saving upto 10% could have been achieved based on the experimental data of the system.**

***Keywords*---- COP, Boiler Temperature (Generator), NH_3-H_2O, VARC.**

INTRODUCTION

Energy efficiency has been a major topic of discussion on natural resources reservation and cost reduction. The expansion of energy resources is one of the prime motivations for social and technological developments. In the last decades, strong international concern has been raised with regard to the depletion of the natural resources and an increase in pollution levels as a consequence of the higher energy consumption necessary to sustain productive activities.

Refrigeration and Air conditioning systems consume considerable amount of energy around the world. In order to reduce this, share some alterations need to be searched for example for cooling application, Vapour absorption system which is basically driven by low grade energy such as waste heat, solar energy is coming in picture for the last few decades. The advantages of this system lie in the possibility of utilizing of waste energy from industrial plants as well as of using solar energy. Aqua ammonia system is employed for applications below 32 F (0 ^{0}C) in which the refrigerating fluid is ammonia and absorbent or carrier is water. The elimination of the necessary shaft work has been the prime reason for the economic success of vapour absorption system. As these systems require only low grade energy in the form of heat and due to limited energy sources and growing demand, there is a concern in the scientific community to develop energy efficient systems.

From general observations and survey from various automobile stations it has been concluded that introduction of VCC air conditioning system in cars reduces economy of engine by 10% i.e. approximately by 1 to 2 Km-Pl.

SYSTEM DESCRIPTION

As shown in figure 1 setup of vapour absorption systemhas following components:

(1) Absorber
(2) Generator
(3) Air cooled condenser
(4) Temperature indicators
(5) Energy meter

Figure1. VARC setup

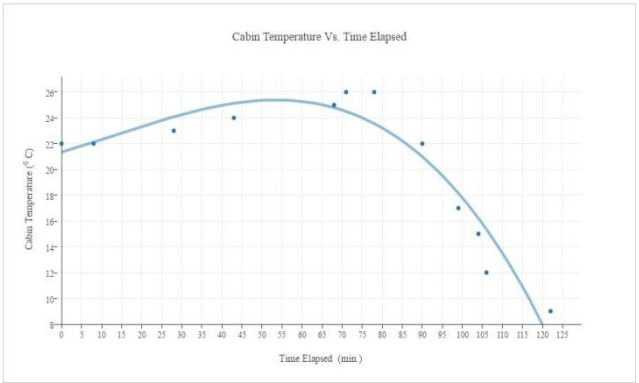
The System shown above in figure is Electrolux Vapour Absorption Refrigeration system, available in IC Engine Laboratory, Department of Mechanical Engineering, Smt. Kashibai Navale College of Engineering,

TABLE1.

Technical data	Specifications
Total volume (lit)	30
Height (mm)	552
Width (mm)	380
Depth (mm)	445
Weight (kg)	13
Internal dimensions (H*W*D) (mm)	438*295*245
Maximum input	230 V (W) 90
Energy consumption annum (kW-hr)	266

TABLE2

Model	Maruti 800(4S-Vertical)	Lubrication System	Pressure Feed System
Maximum Output	27.6 KW @ 5000 rpm	Cooling System	Water Cooling with Thermostat
Maximum Torque	59 NM @ 2500 rpm	Fuel Supply System	MPFI
No. of Cylinders	3	Dynamometer	Hydraulic Dynamometer
Bore* Stroke	66.5 * 72 mm	Calorific Value	42500 KJ/Kg
Compression Ratio	9.2:1	Dynamometer Radius	200mm
Cubic Capacity	796 cc	Coefficient of Discharge for Orifice	0.64
Firing Order	1-3-2	Orifice Diameter	36mm



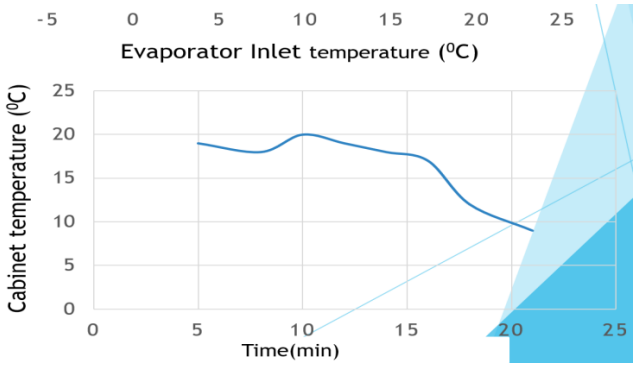


Figure2. Cabin temperature vs. time elapsed

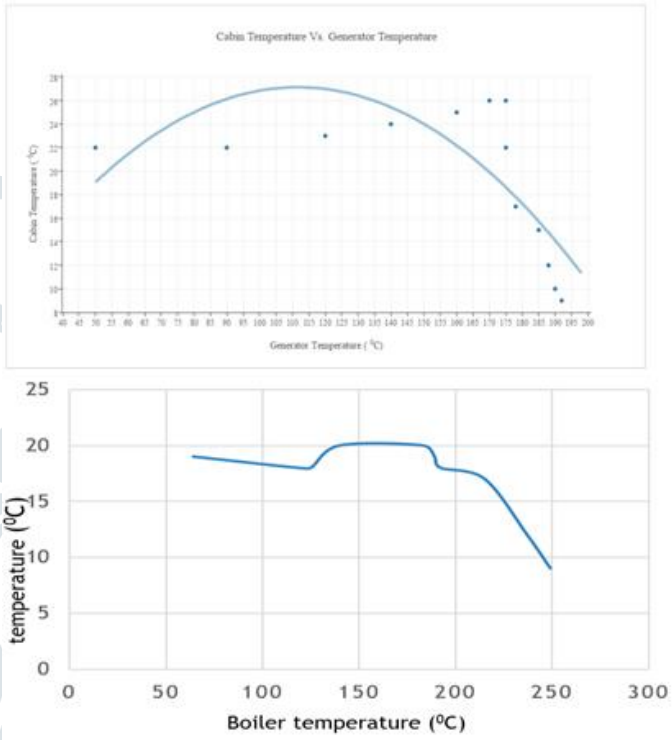


Figure 3. Cabin temperature vs. generator temperature

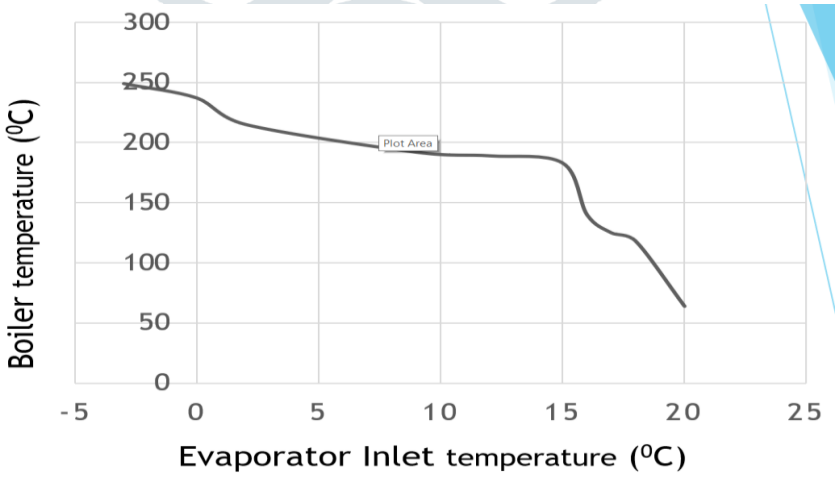


Figure 4. Boiler temperature Vs Evaporator Inlet temperature

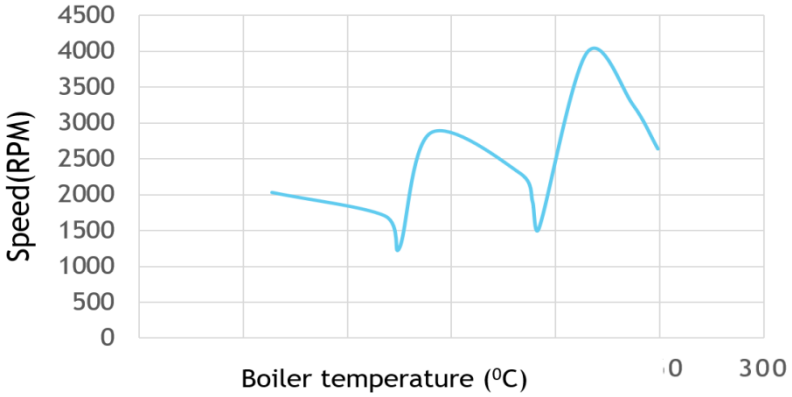
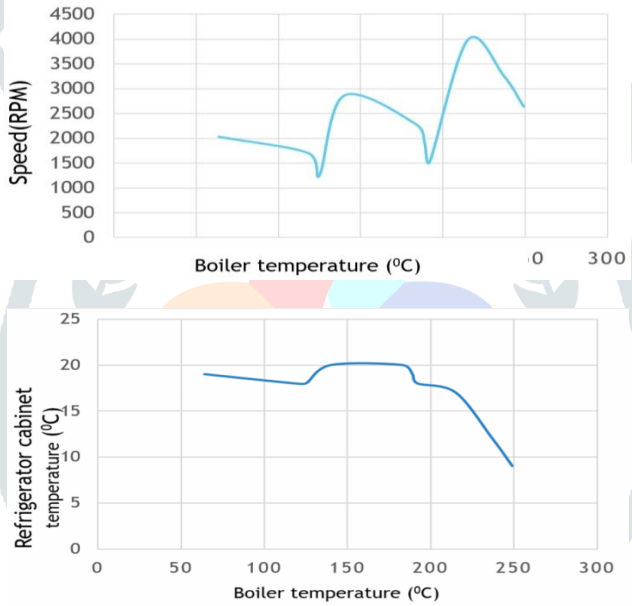


Figure 5. Speed vs Boiler temperature

CONCLUSIONS

The above concept can be efficiently utilized forcooling from room temperature to 10^0C in just 22 minutes

This system can be implemented for stationary engines air conditioning.



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