

ABSORPTION COOLING SYSTEM USING EXHAUST HEAT

**Parametric Study of a Single Effect Lithium Bromide-
Water Absorption Cooling System**

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5-1 Conclusions

Current concerns about global warming resulting from emissions of harmful gases and hydrocarbon compounds require appropriate techniques to conserve energy wasted in the form of thermal energy that harms the environment and to ensure that it is used in appropriate technologies to accomplish useful tasks. H_2O -LiBr single-effect absorption chillers can utilize waste heat emitted to the environment from suitable sources to provide refrigeration and air conditioning effects but, the usability of these systems must be carefully studied. Emission gases from diesel engines used in factories, ships and thermal power plants provide a suitable platform for carrying out energy technology performance assessments that can be expanded to include single-effect H_2O -LiBr absorption coolers.

There are several programs used to analyze absorption cooling systems to study effects of sources used to run the generator in this cycle. The program used in this thesis is the EES program, this program contains the properties of the solutions used in this system, the program allows the designer to write and enter codes and equations that enable him/her to study his/her system according to his/her conditions. The EES program is not specialized to study absorption cooling systems only. For this reason the system designer or researcher is forced to restrict it to equations and codes that limits it in a specific range to obtain results, and here the analyst may face some obstacles if he/she wants to study a case in the system outside the range of inputs. For example, the temperatures emitted from the engines used to operate the generator could reach 190°C , the benefit of which is 120°C . This is due to limited capacity of the selected generator.

By looking at the performance analysis of absorption cooling systems, there are more specialized programs in absorption cooling cycles, and certainly the results will be

more accurate, such as ABSYS and TRNSYS, which can be used in the same system and compare their results with the current program.

The EES program model was used to analyze the lithium-bromide-water absorption cooling cycle that depends on the waste thermal energy of diesel engine for the purpose of cooling a building area in the engine workplace. The model contains the thermodynamic properties of various working fluids, and it is used to find the performance of the absorption cooling cycle. The results show that the cycle performance is dependent on a number of variables including: the temperatures of absorber, condenser, generator, and evaporator, the mass flow rate of the LiBr and the effectiveness of the solution heat exchanger. According to the simulation results, it is concluded that:

- When the generator temperature is increased, the COP is decreased. This is because the increase in generator temperature lowers LiBr-water concentration. Also, the temperature increase of the generator increases the cooling capacity.
- The increase in the absorber temperature reduces the COP as well as the cooling capacity. This is due to a decrease in the concentration of the solution. The absorption rate could be raised by increasing the solution concentration. The higher the concentration, the greater the absorption rate.
- The COP and cooling capacity improves when the evaporator temperature increases.
- The increase in effectiveness of heat exchangers causes an increase of system COP.

5-2 Recommendations

To further improve this research (thesis), some suggestions may make progress in the field of study, which will be addressed later, perhaps by other researchers, and they are:

- If all the heat emitted from the diesel engine is utilized to generate the absorption cooling cycle it will give a higher cooling capacity which can cool a larger space, so I suggest using a double effect absorption cooling cycle.
- The EES software is used to analyze the results in this study, and there are other programs that are also used in the analysis of absorption cooling systems whose results may be better. I suggest using them with the same results obtained, such as the ABSIM software and TRNSYS program.
- There are variables that are often studied in such a model of absorption cooling system that I have not dealt with in detail, so I suggest studying the effect of changing the concentration of the solution with the temperatures of the different components and knowing the extent of its impact on the coefficient of performance on system.

