CHAPTER 5
CONCLUSION & RECOMMENDATION

The excess of non-condensable gases' load over the jet ejector capacity or ejector's process gas load will change the operating parameters of the jet ejector due to the choking effect. As a consequence, the condenser's performance will deteriorate. Thus, the efficiency of the steam power plant, as a whole, will reduce considerably. In such cases, modeling the ejector mathematically is the suggested method to analyze this phenomenon and validate it as a suggested solution.

5.1 SUMMARY OF THE ASSUMPTIONS AND THE VALIDATION PROCESS

The necessary and the relevant assumptions were retrieved from the literature review that has been conducted. The study has involved the study of four boundary conditions; total system, steam chest region, mixing chamber and diffuser. The total system was represented by the ideal reversible compressible flow. While, the other system boundaries were modeled accordingly with respect of the flow regimes. This is to include the shock loss in the mixing chamber and to represent as accurate as possible the system. The assumptions for the other boundaries are tabulated in table 5.1 below. The assumptions were chosen accordingly following a series of repetitive loops until the validation of the mathematical model is achieved.

TABLE 5.1 ASSUMPTIONS FOR THE BOUNDARY CONDITIONS

Boundary Region	Assumptions
1. Steam chest region	1. The flow of the steam in the nozzle shall be considered as a compressible flow stream in a converging-diverging nozzle. 2. The steam and the NCGs flow to be isentropic and adiabatic. 3. The flow of the NCGs inside the ejector shall be assumed to be compressible flow. 4. The walls of the ejector are frictionless and the slippage is zero. 5. For simplification, the area of steam jet ejector will be enclosed inside the area of the NCG inlet. 6. The system shall be assumed having zero leakage.
2.Mixing Chamber	1. The mixing process in the steam jet ejector is highly irreversible. Pressure, temperature and the velocity plays crucial role in the formation of entropy. 2. Steam and NCGs are fully mixed to avoid backpressure within the diffuser. 3. Mach number at the mixing chamber to be subsonic. 4. The system shall be assumed having zero leakage.
3. Diffuser	1. Fluid coming out of the mixing chamber is uniform.

	2. The diffuser will be modeled as isentropic. 3. The system shall be assumed having zero leakage.

Using a relevant case study provided by Croll Reynolds Company, the developed mathematical model was validated. The mean deviation for the efficiency is equal to 1.6425 % while the entrainment ratio's mean deviation is equal to 3.9775%. Thus, the calculated mean deviation is less than 5 %. This means that the results are acceptable.

5.2 SUMMARY OF THE PARAMETRIC STUDY

A parametric analysis has been conducted to suggest the optimum operating conditions at the ejector's maximum capacity. The following results have been deduced.

The efficiency of the ejector will reach its maximum when the compression ratio and the driving pressure are kept within a range of 0.5 to 1.5 and 4.5 to 8 respectively. A noticeable change in the compression ratio from a value of 0.5 to 1.5 will decrease the area ratio almost with 83% as opposed to the efficiency with 33 %. At low compression ratio, the area ratio will increase, thus a larger ejector size shall be needed.

In case of driving pressure increases, a larger size of ejector is required. But, the efficiency won't be affected. More over, an optimum temperature ratio of a slight fraction over unity appears to exist for fixed inlet and exit pressure. Thus, to have a maximum efficiency we need to maintain an equal temperature between the steam and non-condensable gases.

5.3 RECOMMENDATIONS & FURTHER STUDIES

Due to the confidentiality, it was not an easy task to retrieve data regarding the jet ejector. Even more, it is very expensive to setup an experimental study of a jet ejector. Thus, the approach that has been used in this study was a computer-simulation based. Thus, it is recommended to apply the theory experimentally. Further studies are required to formulate the jet ejector into a two dimensional model involving the entropy. Another point of study is to compare the usage of a vacuum oil-ring pump as a replacement of the third stage ejector. Nevertheless, the project was able to meet its desired objectives given the time and the financial constraint. This project will give a new footstep in the operation and maintenance of the jet ejector and to avoid the hassle of the plant shutting down expenses.

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