CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The main conclusions based on the present work are as follows:

- There were two types of oxide particles formed on the surface of the carbon steel, a fine grain particle, mainly magnetite (Fe_3O_4), and a crystalline particle – magnetite (Fe_3O_4) or ilmanite ($FeTiO_3$) depending on the presence of titanium
- The presence of titanium (Ti) or nickel (Ni) in the system from the external source can affect the formation of the oxide film. If the solution contains a significant amount of titanium, ilmanite ($FeTiO_3$) can be formed as the crystalline particle on the surface – instead of magnetite (Fe_3O_4). For the solution contained a significant amount of Ni, it can substitute in magnetite by replacing an iron (Fe) atom in oxide structure, which affect on the oxide properties.
- A longer exposure time results in a thicker oxide film for both the static and flow experiments (0-m/s and 5-m/s coolant, respectively).
- From the high velocity coolant samples (10-m/s and 20-m/s coolant) it appeared that the high velocity coolant can erode the oxide film on the surface reducing its ultimate thickness.
- An FAC Model developed at CNER gave significantly different values of oxide film thickness compared to the results from experiments at low coolant velocities. However, results from both experiments and the FAC model showed the same trend of oxide thickness with coolant velocity and time of exposure.

6.2 Recommendations

- In order to compare the results between static and flow experiments the same system condition should be considered, for example, using other types of autoclaves which do not contain titanium.
- Longer exposure time is required to determine the ultimate oxide film thickness for low coolant velocities.