CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

6.1 Conclusions

From the present study following scientific conclusions have been drawn as listed below:

i. In static and empty bucket condition when only dead load is applied, it has been observed from analysis that stress concentration and damage was maximum, near the hitch elements and arc anchors. Further analysis reveals that the fatigue life and factor of safety was minimum near the hitch elements and arc anchors, which verifies the conclusions drawn on state of stress and factor of safety in empty bucket condition.

ii. In the loaded condition similar observation as in static conditions have been found but the magnitude of stress increased, and damage was found to further increased in the regions near the hitch element and arc anchors. On further analysis, it has been observed that, magnitude of fatigue life and factor of safety is reduced in the hitch elements and arc anchors.

iii. Under dynamic loading condition, the maximum Von Mises stress value was located near the teeth and the hitch elements of the bucket. Hence the probability of failure is maximum at these locations.

iv. The maximum Von Mises stress on the moving bucket condition was 216 MPa under the loading and boundary conditions. Though this maximum stress should not cause failure of the whole body of the bucket, any overfilling condition would induce fatigue or fractures at critical locations in the bucket.

v. The simulation outcome revealed that maximum Von Mises stress values on the bucket teeth, hitch element and arc anchors. Suggesting the maximum probability of failure at these locations. Furthermore, the factor of safety has been found to be minimum at the tip of the teeth and hitch element of the bucket.

vi. In both static and dynamic loading conditions, it has been observed from the analysis that the stress concentration was maximum near the hitch element, arc anchors and teeth which means that the hitch element, arc anchors and teeth are most prone to failure assemblies in a dragline bucket.

vii. The study has revealed optimum rake angle of (30^0 to 45^0) for different rock formation.

viii. The study revealed the relationship between bucket width and ground resistive force. With increase in bucket width ground resistive force have also been found to increase.

ix. The study also revealed the relationship between teeth depth and ground resistive force. With increase in teeth depth ground resistive force also increases and vice-versa.

x. The field logs also reveal real time damage in the various buckets. Maximum damage and distortion at the hitch elements, arc anchors and teeth of bucket was prominent in the real time images, as well. This again validates the findings of the study.

6.2 Limitations of the study

i. In the present research work, field data collection was very cumbersome process.

ii. Simulation becomes very complicated when bucket chain assembly was considered.

iii. The errors of the simulation results were not in the permissible limit.

6.3 Recommendations for future work

i. Estimation of the wear and tear of the side wall and mother plate of the bucket when overburden material is flowing in and out of the bucket.

ii. Simulation and evaluation of dragline bucket and chain assembly under the operating conditions.

iii. Performance evaluation of the dragline boom and pulleys.

iv. Impact of cyclic loading and unloading on dragline bucket and its assembly may be studied.