











overall efficiencies are very less and represented as 48.34%, 45.15% which indicates that there is lack of team work.

## 5. RECOMMENDATIONS

Underground mine production is influenced by wide variety of parameters. There was a need in all the time for improvement of production levels and its consequences. The following measures required to be adopted to enhance LHD performance.

- It is recommended that the availability of the machines will be improved by reducing the downtimes through strict adherence of preventive maintenance schedules.
- Machine breakdowns are minimized or reduced by conducting daily maintenance practices before starting of the machine and by ensuring suitable requirements of skilled operators.
- Better organization of men and machinery by the management will increase the team endeavor.
- In-active hours or machine idle hours of the equipment are reduced or minimized by start the machine or operation to its work face without any time delay. To perform this operation skilled machine crew and well maintained equipment are essential.
- Efficient working of the machine can be obtained by increasing the available machine hours in a planned shift. Machine availability and its percentage utilization are increased by an approximate value of 25% through adoption of shift overlapping.

## 6. CONCLUSION

Percentage availability and capacity utilization studies are helpful to measure the performance of equipment in any mining industry. These studies can also provide the necessary recommendations to mining industry for further improvement. From the above studies various phases have been considered to improve the machine availability and utilization percentage of LHDs. As a result of this the production and productivities are improved and its corresponding performance of the

equipment is increased. If the above measures are well practiced, underground mining methods are assured to produce required levels of production and to meet the power requirement of the country.

## REFERENCES

- [1] Arputharaj (2015). Studies on availability and utilisation of mining equipment-an overview. *Journal Impact Factor* 6.3: 14-21.
- [2] Arputharaj, Michael M. (2015). Effect of equipment utilisation on Economics of mining project- a case study. *Journal Impact Factor* 6.3: 07-13.
- [3] Dhillon BS. (2008). Mining equipment reliability, maintainability and safety. Springer series in reliability engineering. 1614-7839-Verlag London Limited, London.
- [4] Mishra DP, Mamtesh Sugla, Prasun Singha. (2013). Productivity improvement in underground coal mines-a case study. *Journal of Sustainable Mining* 12: 48-53.
- [5] Fan. (2015). Reliability analysis and failure prediction of construction equipment with time series models. *Journal of Advanced Management Science* 3.3.
- [6] Kumar U, Klefsjö B, Granholm S. (1989). Reliability investigation for a fleet of LHD machines in a Swedish mine. *Journal of Reliability Engineering and System Safety* 26(4): 341-361.
- [7] Sarkar SB., Mukherjee SK. (2004). Reliability modeling and performance analyses of an LHD system in mining. *The Journal of The South African Institute of Mining and Metallurgy*.
- [8] Sankha S, Dey UK. (2015). A critical study on availability and capacity utilization of side discharge loaders for performance assessment. *IJRET: International Journal of Research in Engineering and Technology* 04(07).
- [9] Peng SH, Nick V. (2014). Maintainability analysis of underground mining equipment using genetic algorithms: case studies with an LHD vehicle. Hindawi Publishing Corporation *Journal of Mining*. Article ID 528414: 10.
- [10] Singh BP, Tiwari. (1984). Application of reliability and availability to underground mine transport. *Journal of Mines, Metals, & Fuels*.