International Journal of Engineering Sciences Paradigms and Researches (IJESPR)
Vol. 48, Special Issue, (TAME-2019, April 4-5, 2019)
(An Indexed, Referred and Impact Factor Journal approved by UGC- Journal No. 42581)
ISSN (Online): 2319-6564
www.ijesonline.com

A LITERATURE REVIEW ON MAINTENANCE PLANNING AND RESOURCE ALLOCATION

[1]Nitin Panwar, [1]Sanjeev Kumar

[1,2]Department of Mechanical Engineering, J.C Bose University of Science and Technology, Faridabad-121006
Email:[1]npanwar41@gmail.com

Abstract

Industrial plant maintenance is an area which has attracted significant attention of decision makers as it has enormous potential to be improved and also due to random failure within the industry it is difficult to identify an optimal maintenance policy. The purpose of this paper is to review past and current literature on maintenance planning method and resource allocation (men, machine, and material) to achieve an effective and robust maintenance system. Most of the analysis and methods suggested in the published literature were based on mathematical computation, artificial intelligence, simulation, critical analysis and multicriteria methodology.

Keywords- Maintenance Planning, Resource Allocation, multicriteria methodology

1. Introduction

In today's world, industries aim higher efficiency and maximum benefit for their survival in the violently focused worldwide economy. To accomplish this end, availability and dependability of gear in procedure must be kept up at the most astounding request to guarantee the conveyance of high quality item to clients on time. Unfortunately, this isn't the situation since failure is inescapable despite the fact that it tends to be limited by proper maintenance, review, appropriate training to the operators, inspiration and by teaching uplifting frame of mind in the labours. Due to this proper maintenance is getting tremendous consideration in contributing industries towards reducing the sudden failure of the system. According Swanson (2001) overall, maintenance can be defined as a grouping of all technical and administrative actions to maintain or restore the system into a full working state to perform a required function. According to Mobley (1990), 28% of total production cost is attributed to perform maintenance activities in the industry. Nevertheless, no matter how vast the amount of expenditure is, it is inconceivable for manufacturing industries to abandon maintenance. Thus it is necessary to adopt an appropriate and optimized maintenance policy in an industry to reduce the expenditure occurring due to failure of system, Tan and Raghwan (2007). Operational performances to improve profitability are:

a) Increase the manufacturing productivity by implementing new technology.
b) Increase the production capacity.
c) Plan the current capacity and manage to improve the system performance.
d) Managing the inventory right quantity at the right time.
e) Maintaining balance between the maintenance and process manpower requirement.

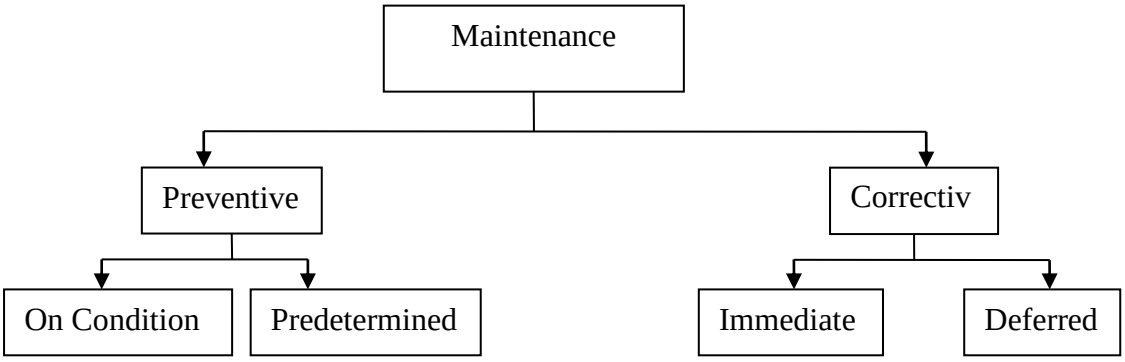
According to Xia et al. (2011) earlier, the sole aim of maintenance policy was to reduce the maintenance cost without considering other factors which were similarly essential included reliability. More often than not minimizing maintenance cost will restrain the reliability level to an inadmissible in useful. In this way, to acquire the best performance and the harmony between these aims, maintenance policies, maintenance costs, reliability measures, as well as other factors should be considered simultaneously.

2. Maintenance policy overview

Preventive maintenance (PM) is carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of the equipment. PM can be predetermined maintenance (i.e. scheduled maintenance) or condition based maintenance (CBM) (scheduled, on-request or continuous maintenance) which also include predictive maintenance. Corrective maintenance (CM) is maintenance carried out after fault recognition and intended to put the equipment into a state in which it can perform a required function. CM can be immediate (carried out without delay after a fault has been detected to avoid unacceptable consequences) or deferred (not

immediately carried out after a fault detection but is delayed according to given maintenance rules)

Fig:1 Classification of Maintenance Policy



3.Maintenance Planning Methods:

Method	Refrences	Application	Optimality
Proportional Hazard Method (PHM)	Zuashkiani et al, 2009	steel and mining industry	Cost
	Jafari et al, 2018	Mining	cost
	Lam et al,2015	transmission systems from a mining company	cost
	Tian et al 2012	food processing plant	Reliability and maintenance cost
Markov chains and Monte Carlo	Wilson and McMillan (2014)	offshore wind	Reliability and maintenance cost
Semi Markov chain	Zhong, C., &Jin, H(2014)	Numerical Problem	Mean time to failure
	Kharoufeh et al.(2010)	aircraft engine turbine blade	Reliability
Hidden Markov model	Zhou et al. (2010)	Tank reactor	Mean time to failure
Failure Mode and Effect Analysis (FMEA)	Sachdeva et al. (2008)	Paper Mill	
	Cicek et al.(2010)	Marine Engineering	Cost
AHP	Bahadir and Bahadir, (2015)	e-textile	
fuzzy TOPSIS	Zhou & Lu (2012)	Spinning Mill	

4. Resource Allocation

The main objective of maximum profit of an industry can be achieved by optimal utilization of resources (manpower, machines, money, material, spare part, equipment and tools. Cheng and Li (2001) identified key information using AHP and then performed resource allocation for a construction project. Garg et al. (2010) optimized the redundancy allocation in pharmaceutical plant. Kumar et al. (2010) using heuristics methods solved redundancy allocation in complex system.

5. Conclusion

Based on the literature reviewed it has been identified that many maintenance planning model have been developed to solve the maintenance issue. But it has been found that developed maintenance model are yet unfit to completely cover the gap between scholastic research and the industrial as the industrial environment is very complexed and dependent on various factors which are not fully analysedso in future effort should be made to reduce this gap if not completely possible to eliminate. Furthermore it has been concluded that very little work has been done regarding allocation of resources in industries.

Refrences:

1. Bahadir, M. C., &Bahadir, S. K. (2015). Selection of appropriate e-textile structure manufacturing process prior to sensor integration using AHP. The International Journal of Advanced Manufacturing Technology, 76(9-12), 1719-1730.
2. Cheng, E. W., & Li, H. (2001). Information priority-setting for better resource allocation using analytic hierarchy process (AHP). *Information Management & Computer Security*, *9*(2), 61-70.
3. Cicek, K., Turan, H. H., Topcu, Y. I., &Searslan, M. N. (2010, March). Risk-based preventive maintenance planning using Failure Mode and Effect Analysis (FMEA) for marine engine systems. In *2010 Second International Conference on Engineering System Management and Applications* (pp. 1-6). IEEE.
4. Garg, D., Kumar, K., &Pahuja, G. L. (2010). Redundancy-allocation in pharmaceutical plant. *International Journal of Engineering Science and Technology*, *2*(5), 1088-1097
5. Jafari, L., Naderkhani, F., &Makis, V. (2018). Joint optimization of maintenance policy and inspection interval for a multi-unit series system using proportional hazards model. *Journal of the Operational Research Society*, *69*(1), 36-48.
6. Kharoufeh, J. P., Solo, C. J., &Ulukus, M. Y. (2010). Semi-Markov models for degradation-based reliability. *IIE Transactions*, *42*(8), 599-612.
7. Kumar, P., Chaturvedi, D. K., &Pahuja, G. L. (2010). Heuristic methods for solving redundancy allocation in complex systems. *International Journal of Reliability and Safety*, *4*(2-3), 285-298.
8. Lam, J. Y. J., &Banjevic, D. (2015). A myopic policy for optimal inspection scheduling for condition based maintenance. *Reliability Engineering & System Safety*, *144*, 1-11.
9. Mobley RK (1990) An Introduction to predictive maintenance, New York: Van Nostrand Reinhold
10. Sachdeva, A., Kumar, D., & Kumar, P. (2008). A methodology to determine maintenance criticality using AHP. International Journal of Productivity and Quality Management, 3(4), 396-412.
11. Swanson L (2001) Linking maintenance strategies to performance. Int J Prod Econ 709(3):237–244
12. Tan MT, Raghavan N (2007) Root cause analysis based maintenance policy. Int J Quality ReliabManag 24(2):203–228
13. Tian, Z., Lin, D., & Wu, B. (2012). Condition based maintenance optimization considering multiple objectives. *Journal of Intelligent Manufacturing*, *23*(2), 333-340.
14. Wilson, G., & McMillan, D. (2014). Assessing wind farm reliability using weather dependent failure rates. In *Journal of Physics: Conference Series* (Vol. 524, No. 1, p. 012181). IOP Publishing.
15. Xia T, Xi L, Lee J, Zhou X (2011) Optimal CBPM policy considering maintenance effects and environmental

condition. Int J AdvManufTechnol 56:1181–1193

16. Zhong, C., &Jin, H. (2014). A novel optimal preventive maintenance policy for a cold standby system based on semi-Markov theory. *European Journal of Operational Research*, *232*(2), 405-411.
17. Zhou, X., & Lu, M. (2012). Risk evaluation of dynamic alliance based on fuzzy analytic network process and fuzzy TOPSIS. Journal of Service Science and Management, 5(03), 230.
18. Zhou, Z. J., Hu, C. H., Xu, D. L., Chen, M. Y., & Zhou, D. H. (2010). A model for real-time failure prognosis based on hidden Markov model and belief rule base. *European Journal of Operational Research*, *207*(1), 269-283
19. Zuashkiani, A., Banjevic, D., & Jardine, A. K. (2009). Estimating parameters of proportional hazards model based on expert knowledge and statistical data. *Journal of the Operational Research Society*, *60*(12), 1621-1636.