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Comparison of Reliability and Maintainability for a System in terms of Failure

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In the recent years, the lot of discussions are there for reliability and maintainability concepts. Some are in favour of reliability and others are in favour of maintainability, both basically tends to the system with less number of failures. A more reliable system will have less possibility of failure and also a system with good maintainability will be in working for a long period of time. But there are some systems in which maintainability is not having so much importance i.e. missiles and rocket propulsion. Also in general many industry applications have maintainability as the prime concern. So the competition between reliability and maintainability is for these industry applications.

Keyword—Reliability, Maintainability, Failure, Availability, System Performance.

I. INTRODCTION

There are two main terms of maintainability and reliability of prime concern, both tends to availability. A more reliable system will be having very rarely failures and so needed less maintainability but if its maintainability is poor whenever the system fail, it will take long time to repair and the system will not be available for long time. So both effects the availability of the system and so the performance of the system will be affected badly.

Maintainability is the ease with which a product can be maintained in order to:

- Isolate defects or their cause,
- Correct defects or their cause,
- Repair or replace faulty or worn-out components without having to replace still working parts,
- Prevent unexpected breakdowns,
- Maximize a product's useful life,
- Maximize efficiency, reliability, and safety,
- Meet new requirements,
- Make future maintenance easier, or
- Cope with a changed environment.

Reliability deals with the estimation, prevention and management of high levels of "lifetime" engineering uncertainty and risks of failure. Although stochastic parameters define and affect reliability, according to some expert on reliability is not (solely) achieved by mathematics and statistics. You cannot really find a root cause (needed to effectively prevent failures) by only looking at statistics. "Nearly all teaching and literature on the subject emphasize these aspects, and ignore the reality that the ranges of uncertainty involved largely invalidate quantitative methods for prediction and measurement.

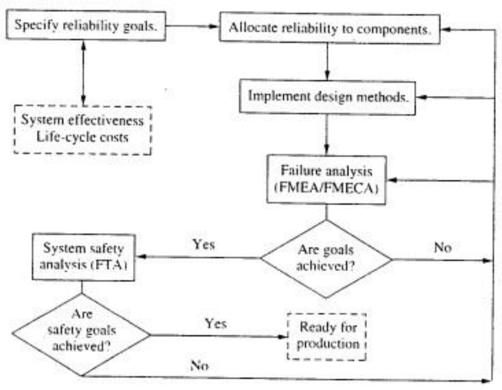

Figure 1: Reliability Cycle

II. TYPE OF MAINTAINANCES

BREAKDOWN MAINTAINANCE

In this type of maintenance, when the failure is to be happen and then the repair of that thing is done. So this is called breakdown maintenance. In this case the system is allowed to run undisturbed till the complete failure. This type of maintenance is not used in Chemical and Process industries because the pollution hazard may be there and a very high reliability is needed there.

CORRECTIVE MAINTAINANCE

This type of maintenance needed the repair of that part of the system which is responsible for the failure of whole system. The main aim of this maintenance is to restore the system to the working position in shortest possible period of time.

PREVENTIVE MAINTAINANCE

Preventive maintenance is one in which the components are changed before the failure so that the system will be in continuous operation. This is the most popular maintenance among the all and Cost is also a factor for the scheduling of preventive maintenance.

III. RELIABILITY

The reliability can be designed in many ways and one of the most important design techniques is redundancy. This means that if one part of the system fails, there is an alternate success path, such as a backup system. The reason why this is the ultimate design choice is related to the fact that high confidence reliability evidence for new parts / items is often not available or extremely expensive to obtain. By creating redundancy, together with a high level of failure monitoring and the avoidance of common cause failures, even a system with relative bad single channel (part) reliability, can be made highly reliable (mission reliability) on system level. No testing of reliability has to be required for this. Furthermore, by using redundancy and the use of dissimilar design and manufacturing processes (different suppliers) for the single independent channels, less sensitivity for quality issues (early childhood failures) is created and very high levels of reliability can be achieved at all moments of the development cycles (early life times and long term). Redundancy can also be applied in systems engineering by double checking requirements, data, designs, calculations, software and tests to overcome systematic failures.

MTBF (Mean Time between Failures)

To calculate the reliability of a service in MTBF, you can subtract the total downtime from the available time in hours. You can then divide the result by the number of breaks.

Reliability in term of (MTBF) = (Available Time-Total down Time)/ Number of Breaks

MTBSI (Mean Time between Service Incidents)

To calculate the reliability of a service in MTBSI, you can divide the available time in hours by the number of breaks in service availability.

Reliability in term of (MTBF) = (Availability)/ Number of Breaks

IV. CONCLUSION

Reliability and maintainability are very much interlinked for many applications and for these applications, we can say these are the two sides of a coin. Reliability is a product's or system's ability to perform a specific function, and may be given as design reliability or operational reliability. Maintainability is determined by the ease with which the product or system can be repaired or maintained. Both these concepts have equal importance for a system to have less number of failures depending upon the application on which we are working.

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