

# A Brief Review on Causes of Failures and Unreliability of Some Systems

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## ABSTRACT:

Reliability of a unit or system is the probability that a failure may not occur in a given time interval. A failure is a partial or total loss or change in the initial properties of a system. There are different phases as well as modes of failures in life cycle of any system. The specific causes of failures of components or equipments of a system can be many. In this research article some of the causes of system failure together with different phases and modes have been discussed. Better understanding of failures, improved manufacturing techniques, careful planning and designing of new systems are some of approaches which can be tried to reduce the level of unreliability.

**Keywords:** Reliability, Failure, System, Unreliability.

## INTRODUCTION:

Today's competitive environment and increased dependency of people on technology have forced the industries to focus a lot on the highest performance of their systems while maintaining a low cost operation. Analysis of reliability of complex systems, enables us to find maximum out of minimum. The reliability of a unit is the probability that a failure may not occur in a given time interval. A failure is a partial or total loss or change in the initial properties of a system in such a way that the system's functioning totally stopped or seriously imbedded. There are different phases as well as modes of failures which are discussed in this article together with different causes of failures.

### 1.1 Phases of Failure:

An item may experience any of three phases of failure in its complete life cycle of operation.

**Initial failure:** In the beginning, due to defective design or manufacturing of a unit or system, a high rate of failure occurred. These are called initial failures or infant mortality. These failures can be eliminated by operating the item for several hours and replacing failed components with tested and good components.

**Random failure:** This type of failure occurred randomly and cannot be predicted. These are caused by sudden incidents, unacceptable stress which is beyond control as per specification of system. In this phase, we experience constant rate of failure per unit time.

**Wear Out failure:** At the final phase of operation, item is more likely to fail due to wear and tear and here again the failure rate increases rapidly with life of item. This phase is called wear out phase of failures. Though these failures cannot be eliminated completely, however, the effect of wear and tear can be postponed by proper maintenance of the item.

## 1.2 Modes of Failure:

The different modes of failure are as follows:

**Independent failures:** These types of failures happen independently without effects of any other failure.

**Secondary failures:** These types of failures occur due to failure of any other unit or component.

**Creeping failures:** These types of failures happen gradually with the passage of time. These can be observed by proper investigation.

**Catastrophic failures:** These types of failures occur suddenly and stop the working system with great loss sometimes.

**Common cause failures:** Where a system has many components and all components failed due to some common reason and highly effect the system reliability, these are called common cause failures.

**Power Failure/ Degradation:** Power generation is the essential part of an industry/organization for its continued functioning. If the power supply is not in proper form, then it leads to failure of the system, due to power failure/degradation. Power failure occurs due to short time failure of main grid, the unusual wiring problem, break down or melting of preventing/ sacrificial devices due to some fault in load or many other things.

## 1.3 Causes of Failure:

All failures have a cause and lack of understanding thereof is the primary cause of unreliability of a given system. Due to complexity of the system and its environment, some causes may be known and some may be unknown. A few of them are as follows:

- Poor designing of system or components
- Wrong manufacturing-techniques
- Lack of total knowledge and experience
- Complexity of system
- Complexity of Organizational rigidity and complexity
- Poor maintenance policies
- Human errors

### 1.3.1 Design and Production

Improper selection of material is main cause of poor designing. Some manufacturers do not invest more money on an improved design and modern techniques of manufacturing and testing, which is obvious reason of low reliability. Many production managers say “we have never had a failure-just a few malfunctions”. But fact is that any defect which can prevent successful accomplishment of a mission is a failure.

### 1.3.2 System Simplicity

A basic rule of reliability related to complexity is to keep the system as simple as is compatible with the performance requirements. A complex system presents problems in term of understanding and maintenance. Even an experienced designer is likely to commit mistakes during the design and development stage. Further reliability of a complex system depends on reliability of all of its components.

### 1.3.3 Communication and Coordination

Reliability of a system is concern to all areas such as raw material, parts, design, production test, quality control, shipment and storage, installation, operation and maintenance. It is essentially a birth-to-death

problem involving almost all areas. A well-organized management with an efficient system of communication is required to share the information and experiences about components. Sufficient opportunity should be available for the people concerned to discuss the causes of failures.

#### 1.3.4 Maintenance

The important period in the life cycle of a product or a system is its 'operation time' period. In spite of the designer's best efforts, no product can be perfect. It is likely to fail in its operating time which may be costly in terms of money, time or sometime dangerous in terms of safety. However, its life time can be increased and failures can be decreased using regular repair and maintenance. Maintenance, therefore, becomes an important consideration in the long term performance of the system or product. The famous maxim "Prevention is better than cure" applies to the products and systems as well. In many cases, preventive measures are possible and judiciously designed preventive maintenance policy can help to eliminate failures to a large extent and we can avoid any possible failure.

#### 1.3.5 Human Reliability

In spite of increased application of automation techniques in industries and other organizations, it is not possible to completely eliminate the human involvement in the operation and maintenance of systems. Failures due to human error may be different at various stages of product cycle, some of them are as follows:

- Lack of understanding of the system
- Lack of understanding of process
- Forgetfulness
- Carelessness
- Poor judge mental skills

#### CONCLUSION:

The question of reliability haunts everyone whether he is ultrahigh reliability space user or a low cost common consumer on the street. Failures are way of life in modern technological world and we are paying penalties therefor in terms of money, time and sometime even of lives. It does not mean that systems cannot be made more reliable. Better understanding of causes of failure, improved manufacturing techniques, proper selection of components and careful planning and designing of new systems are some approaches which can be tried to reduce the level of unreliability of systems.

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