

Failure Patterns

The six basic failure profiles help you understand the patterns of failure risk.



Curve A: Traditional View (2%)

Constant or gradually-increasing failure probability over time followed by a more pronounced wear-out region is typical in single-piece and simple items such as tires, compressor blades, brake pads, and structural members.



Curve B: Bathtub (4%)

This wear pattern shows failure rates are highest when the equipment is new and again when the equipment is used beyond a certain age, with a constant rate in between. There can be high infant mortality due to human error. An example would be an impeller in a high solids slurry pump.



Curve C: Fatigue Failure (5%)

Consistent wear-out over time. Some equipment, such as a turbine engine, displays a gradually increasing failure probability with no identifiable wear-out age. This wear pattern may also apply to single-piece and simple items, such as insulation on wire.



Curve D: Best New or Break In (7%)

This type has a low failure probability when the equipment is new or just overhauled, followed by a quick failure rate increase to a constant level. Once adjusted, the failure rate stays constant. An example is a new roller chain; the chain must run several revolutions to overcome mechanical interference. After that, it runs smoother and goes into random failure.



Curve E: Constant Random (14%)

As likely to fail 10 years from now as today. This failure curve represents equipment with a relatively constant rate of failure at all ages. Random failures are typically brought on by excessive stress on the device. The occurrence of these failures does not follow a pattern, but instead occurs randomly over time. (The failures are generally well understood, i.e., random does not mean unpredictable.) Stress factors are the result of a variety of causes, such as abnormal process conditions, the presence of an adverse microenvironment (e.g., corrosion produced by chemical impurities or metallurgy), or normal device wear and tear.



Curve F: Worst New or Infant Mortality (68%)

Complex equipment, such as electronic equipment, typically has a high initial failure rate followed by a constant or slowly increasing failure probability.

