Quality & Product Quality

2000. 11. 17

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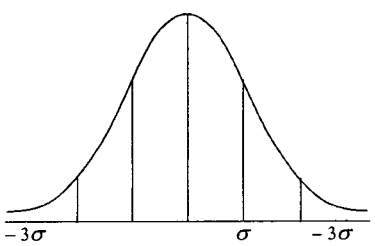
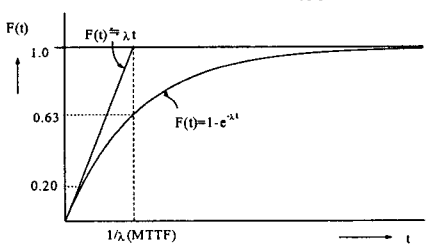
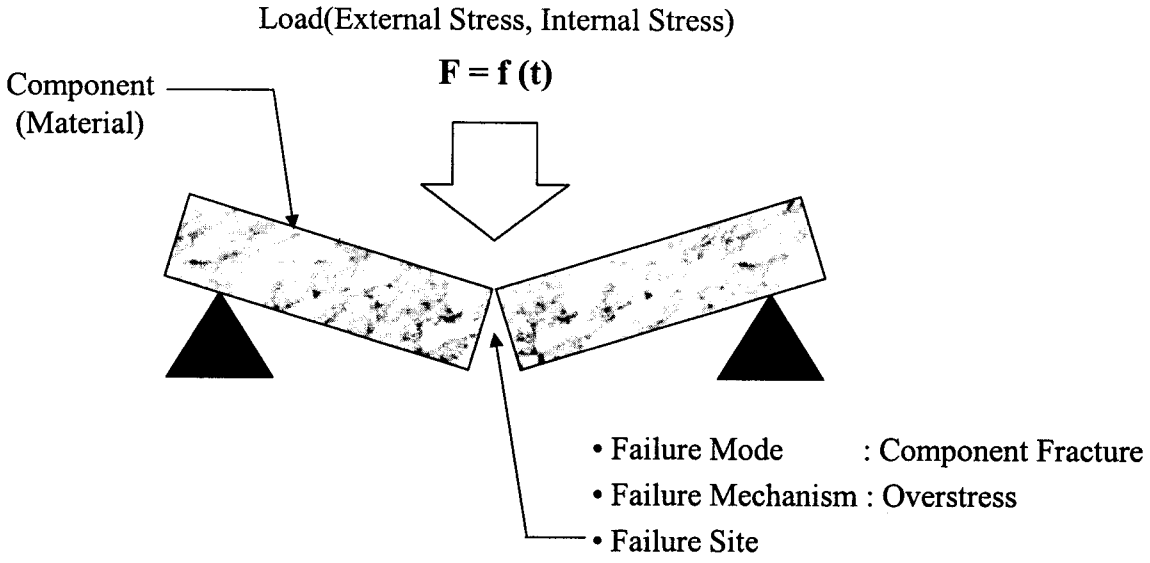
Quality Management & Reliability Lab

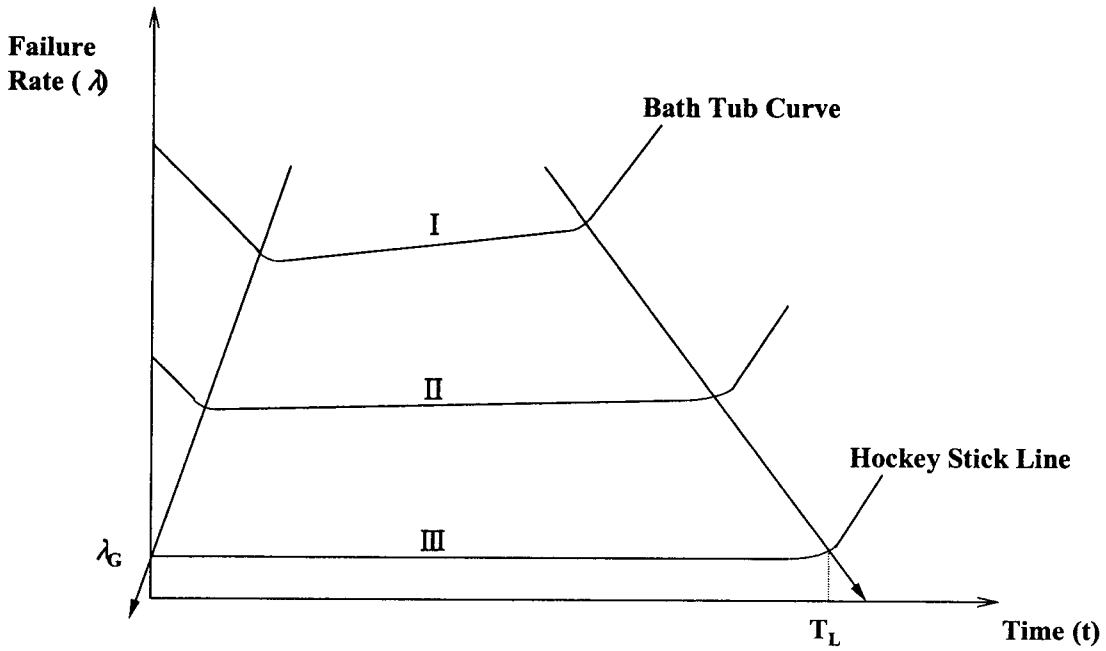
Quality defect & Reliability defect

	Quality Defect	Reliability Defect
Concept	Present Quality	Future Quality / Failure
Dimension	None	1/hour
Unit	% ppm	%/year, 0.01%/hour Fit(1×10^{-9}/hour)
Probability Function	Normal Distribution $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ 	Exponential Distribution $F(t) = 1 - R(t) = 1 - e^{-\lambda t}$ $\fallingdotseq \lambda t$ 

Failure Mechanics



Bath Tub Curve & Hockey Stick Line



Ambiguities of Quality and Reliability

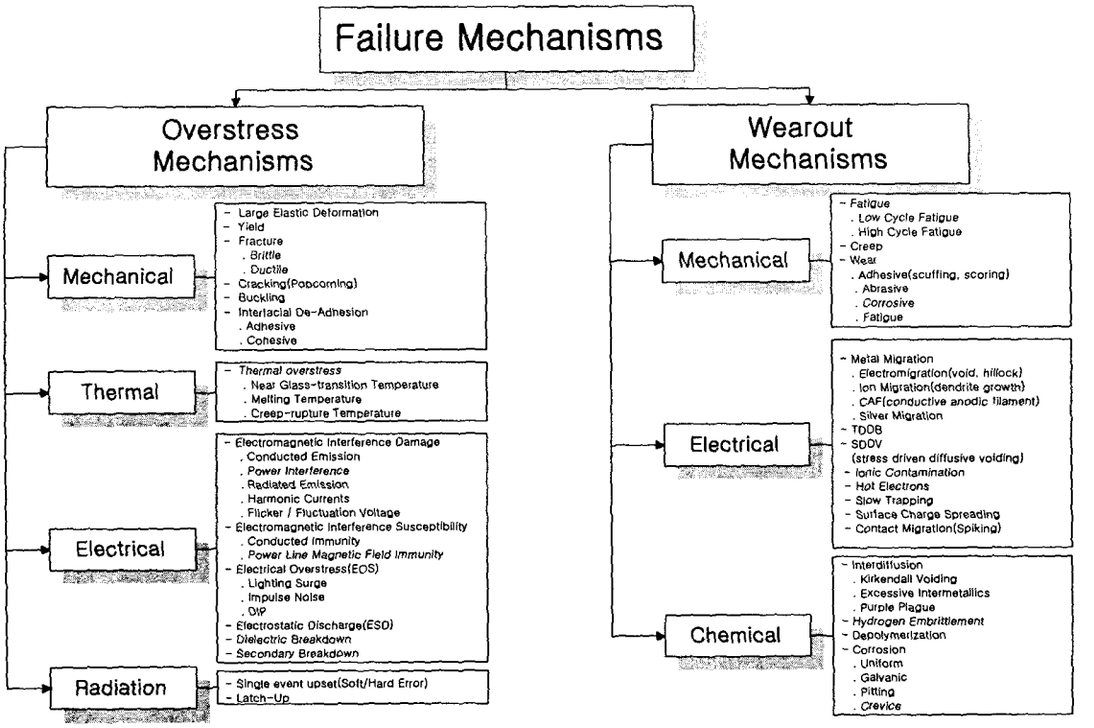
Meaning of Quality	Quality (Present Quality)	Reliability (Future Quality)	
		Reliability	Durability
Concept	Conformance to Specification	Alteration of Specification for High Reliability	
		Failure Rate	Product Life
Recommended Units	Percent ppm	Percent / Year Percent / Hour	Year
Frequently Used probability density function	Normal Distribution Function	Exponential Distribution Function	-

How to Improve the Reliability

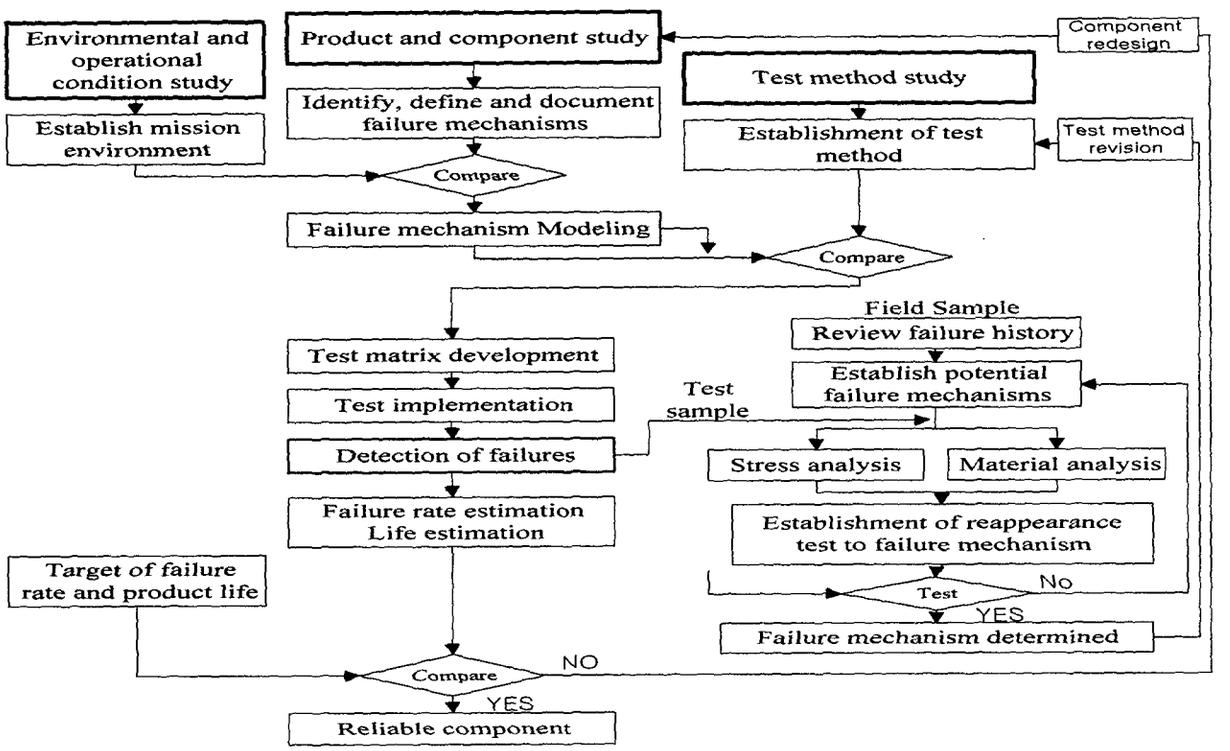
1) Identify the failure mode through testing over time

2) Analyze failures and determine the failure mechanism

3) Design changes according to the results and confirm the validity and the side effects of design change



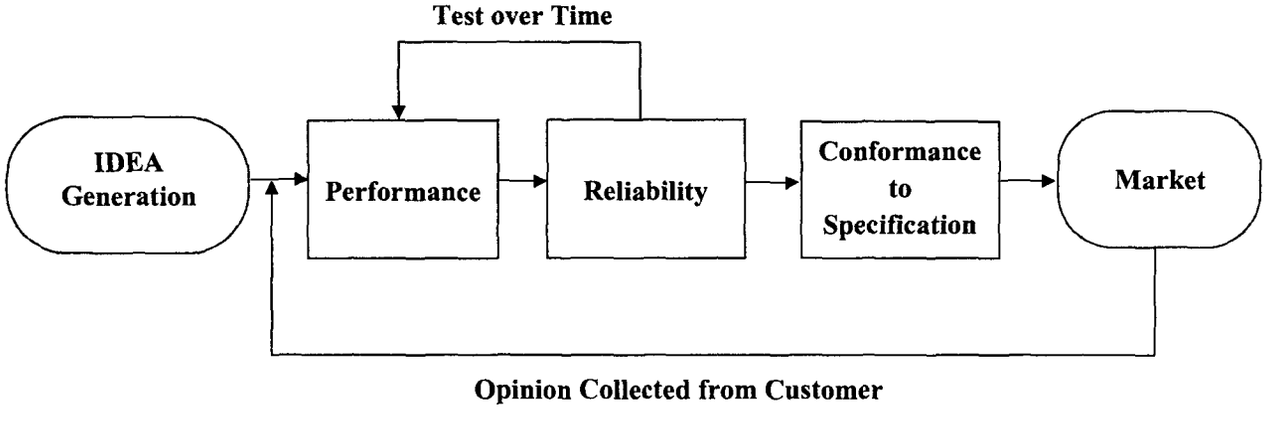
How to solve reliability problems in advance of product release



Reliability Failure and Quality Defect

Category	Failure / Reliability	Defect / Quality
Approach	Vertical approach Identifying root cause	Horizontal approach Inspection and screening
People	Team members Related developer & failure analyzer	All members Manufacturing employees
Who's in charge	R&D part chief (R&D team manager)	Factory director (Q.A team manager)
Procedure	Find failure mode & failure site Analyze failure Determine failure mechanism Assess failure rate and product life Propose alternatives	Enumerate of quality characteristics Confirm process capability(Cp) Decide the kind of inspection - sampling, all or double Determine inspection position
Results	Alter design and manufacturing specifications	Rearrange quality inspection system Train inspector

Quality Integrity of Product



Product Quality ; Creating The First Class Product