
Contents

Foreword by Laurent Denis	ix
Foreword by Serge Zaninotti	xiii
Acknowledgements	xv
Introduction	xvii
Chapter 1. Sampling in Manufacturing	1
1.1. Cost aspects	2
1.2. Considering the distribution of defects.	7
1.3. Considering the test coverage.	10
Chapter 2. Compliance Test	13
Chapter 3. Non-Regression Tests	17
3.1. Non-regression on a physical quantity	17
3.2. Non-regression depending on time	20
Chapter 4. Zero-Failure Reliability Demonstration	23
4.1. Purpose of zero-failure tests	23
4.2. Theoretical principle.	23
4.2.1. Non-maintained products.	24
4.2.2. Maintained products	29
4.2.3. Estimation of parameter β	32
4.2.4. Physical laws of failure.	35
4.3. Optimization of test costs	42

4.4. Specific cases	48
4.4.1. Imposed number of parts	48
4.4.2. Imposed testing time	48
4.4.3. Imposed testing time and number of parts	49
4.4.4. A test was already conducted and the demonstrated reliability should be estimated	50
4.4.5. One test was already conducted and failure to demonstrate reliability must be known	51
4.4.6. Two tests were conducted	51
4.4.7. A second test is conducted	60
4.4.8. Reliability objective is a failure rate.	69
4.4.9. Reliability data are available from the manufacturer	71
4.4.10. Demonstration of reliability at the product level	74
4.4.11. Taking into account a complex life profile	76
Chapter 5. Reliability Management	79
5.1. Context	79
5.2. Physical architecture division.	80
5.3. Classification of subsets.	81
5.4. Allocation of initial reliability	81
5.5. Estimation of the reliability of subsets	82
5.5.1. Consistency with the experience feedback	85
5.5.2. Estimation of the power of the test	85
5.5.3. Simulation algorithm	85
5.6. Optimal allocation of the reliability of subsets	90
5.7. Illustration	90
5.8. Definition of design rules	103
5.9. Construction of a global predicted reliability model with several manufacturers	107
Chapter 6. Confirmation of Maturity	115
6.1. Internal data from equipment manufacturer	115
6.2. System manufacturer data.	117
6.2.1. Original fit removal rate or “zero hour returns”	117
6.3. End-customer data.	121
6.3.1. Burn-in effectiveness	121
6.3.2. First failure analysis	121
6.3.3. Method based on failure analysis	124
6.3.4. Observed reliability.	124
6.3.5. Estimation of the forecasting number of catastrophic failures	128

6.4. Burn-in optimization	134
6.4.1. Distribution of failures observed during HASS cycles	134
6.4.2. Verification of the degradation of the manufacturing process	136
List of Notations	139
List of Definitions	141
List of Acronyms	147
References	151
Index	155