

UITPUTTING AARDE

**IK ZOU OOK
MOE WORDEN
VAN 24/7
GRONDSTOFFEN
LEVEREN**

Loesje



Reliability of RoHS compliant products

Hoe test je de Reliability van RoHS compliant producten

- 1) Belang van RoHS en Reliability
- 2) Testmethoden en resultaten
- 3) Faalmoden en aandachtspunten

Tonalite B.V.



- Tonalite B.V. is a new company located in the Netherlands.
- Tonalite is a product & design company in the area of wireless wearable products.
- Tonalite builds on 55 years of experience.
- Tonalite has a highly experienced and skilled team working in this area for the last decades.
- Tonalite covers the complete “product development life cycle”.
- Tonalite invests in knowledge and understanding.



Harry Roossien

- SonyEricsson: Reliability Engineer, Manager Test & Verification, System Engineer
- Tonalite (2010): System Designer Reliability and Verifications
- PLOT: Chairman and member of CEEES → www.plot.nl (FHI)
- Training: FMECA & QFD, Reliability and Environmental Testing
- Study: Management Sciences – Branding/Brand Constellations

Creatief
Probleemveroorzaker

Products



1) Importance of Reliability



- degradation – product quality
- waste – life time
- power consumption

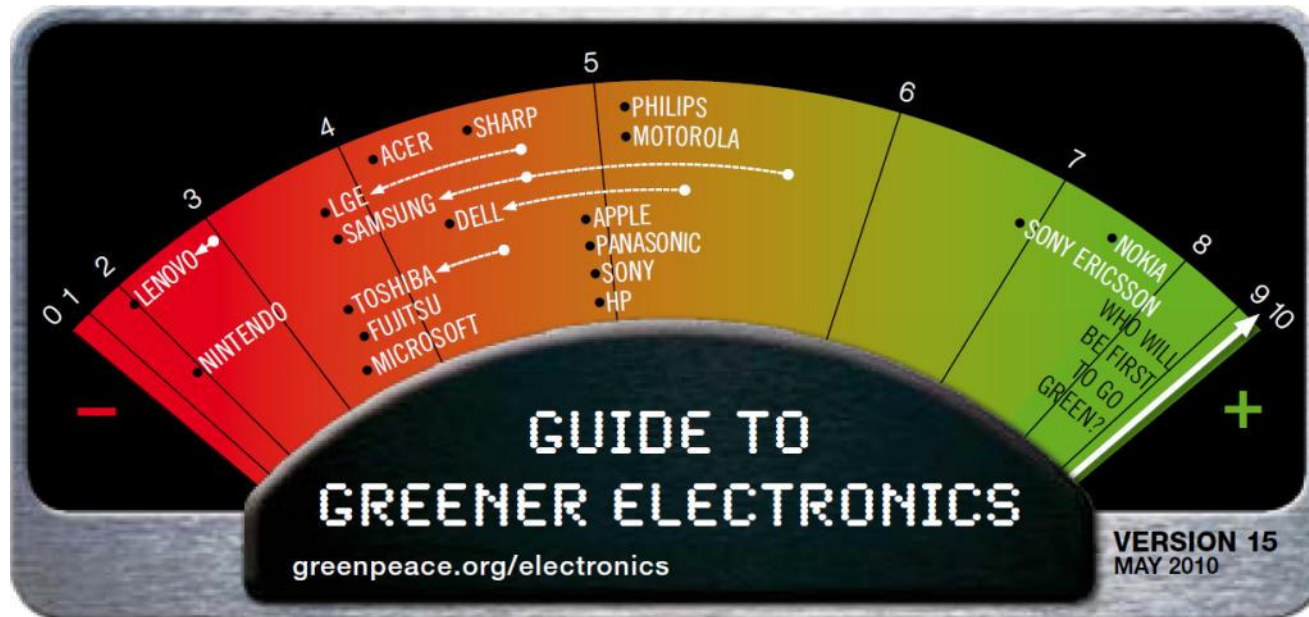
L 285/10	EN	Official Journal of the European Union	31.10.2009
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DIRECTIVES

DIRECTIVE 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 21 October 2009
establishing a framework for the setting of ecodesign requirements for energy-related products
(recast)
(Text with EEA relevance)

Ecodesign directive

- sustainable development – improvement of energy efficiency to assure energy supply
- prevent unfair competition, harm to health, social/sociëty and economics (administration)
- reduce power consumption in stand-by and/or off-situation to its minimum for good operation of the product.
- provide relevant information about materials and energy consumption
- **art. 15.5.a: no significant negative effect for product operation**



Groups

- Chemicals:
 - Precautionary Principle – Chemicals Management – Timeline for PVC & BFR phaseout – Timeline for add. substances phaseout – PVC free and/or BFR free models
- E-waste:
 - Individual producer responsibility – Voluntary take-back – Information to individual customers – Amounts recycles – **Use of recycled plastic content**
- Energy :
 - Global GHG emissions reduction support – Carbon Footprint disclosure – Own GHG emissions reduction commitment – Amount of renewable energy used – Energy efficiency of new models



1. Kosten en tijd (besparingen)
 - Life Time Costs, efficiency en projectvertragingen
2. Merknaam en consumentenvertrouwen
 - eerste keus, herhalingsaankopen
3. Beschikbaarheid
 - betrouwbaarheid, onderhoud/reparaties,
 - contractvoorwaarden
4. Onderscheidend vermogen
 - kwaliteitsnivo en –perceptie
 - value for money → Kwantificering en bewijs
5. Inzicht en begrip
 - Physics of Failure, Root Cause Analysis → voorspellen



**Inzicht en begrip in
omgevingstesten en faalmechanismes
leidt tot kostenbesparingen,
brand loyalty en directe verbetering van
reliability & concurrentiepositie!**

Importance of Reliability

Insights and control

- Quality and Reliability as pre-condition/commonality

- Beyond Leadfree Soldering
- Sustainability – Ecodesign
- Social responsibility



- Outsourcing & New failmodes

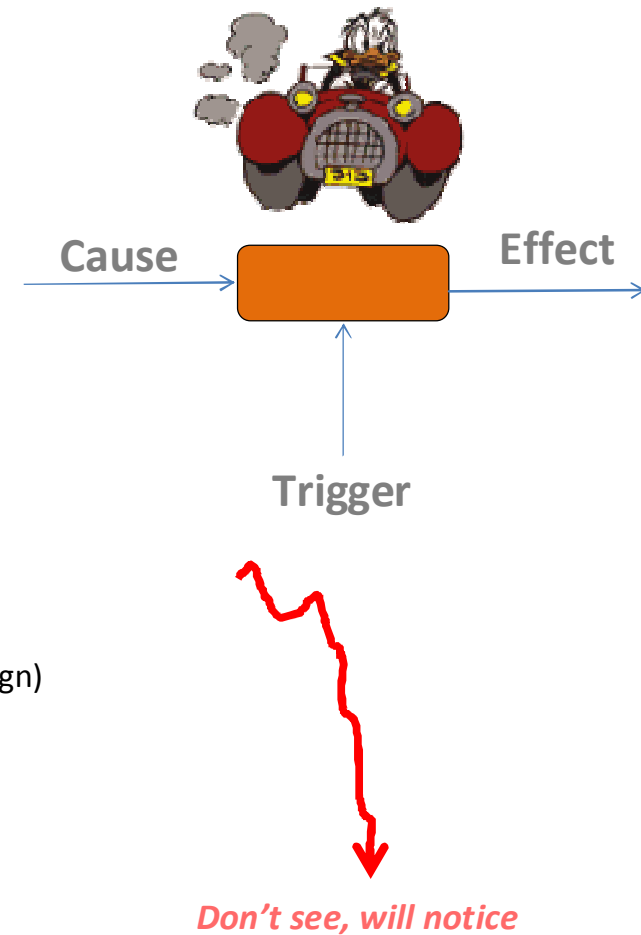
- dynamic world (technologies, attitudes, test methods, requirements, fail modes etc.)

- Failmode & Failure: Not visible, however noticeable

- shortened life time (degradation)
- unexpected behavior (failure where you hadn't before)
- increased tolerances (poor fit, relaxation, higher stress)
- unknown failure modes (new materials as substitute in existing design)

- Endangered Brand Perception, Resources and Economics

- field return, recall
- embargo, employees leaving, substitutes, suppliers



2) Test methods and results



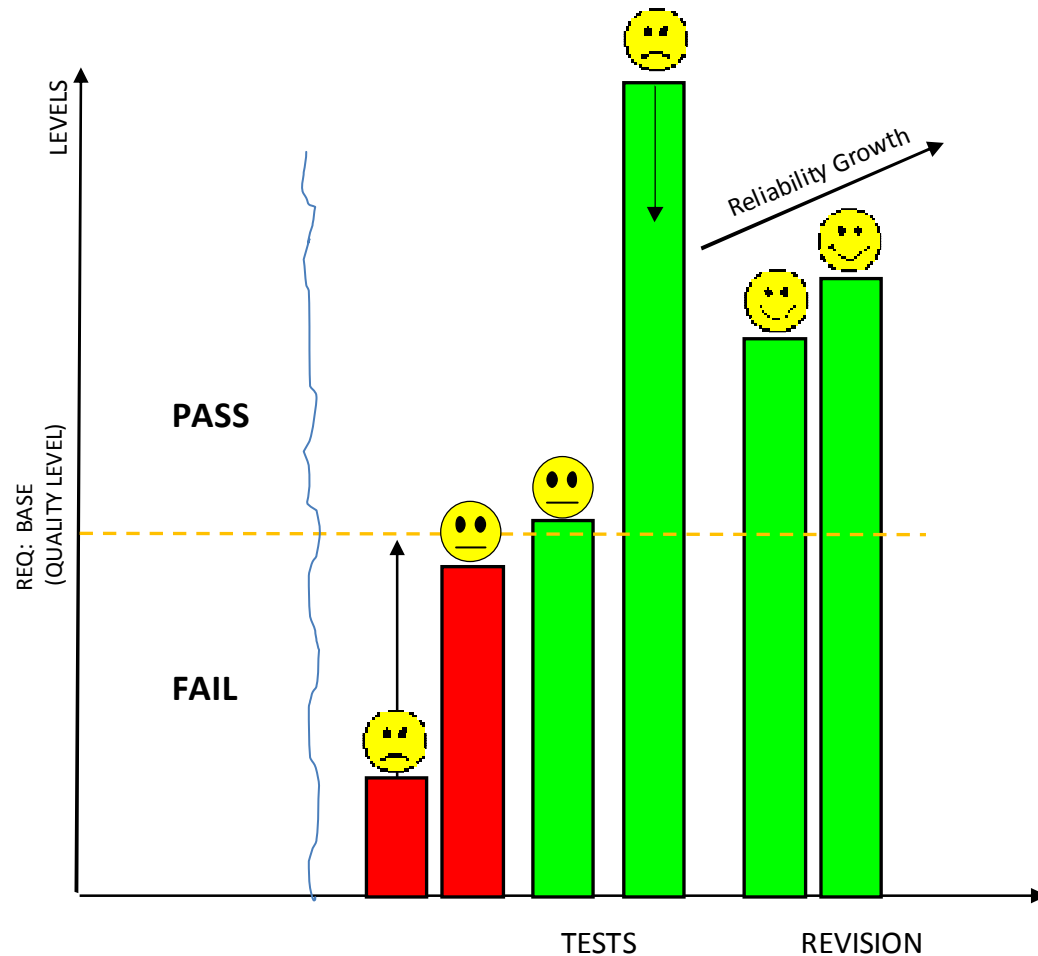
Test methods

- Meeting requirements - Pass/Fail towards Robustness levels for insight & risk assessment
- Failure levels – Monitoring & insight

TESTING REPORT

PARTS : VANGUARD WATCH DATE : 15/8/2006
 VENDOR : _____ QTY : 3 SET / EACH
 REF. : _____ PAGE : 1 OF 1

TESTING DESCRIPTION	REF. To DRS	SPECIFICATION	SAMPLE NO.			STATUS
			1	2	3	
Heat Test	REQ-504		A	A	A	Completed
Cold Test	REQ-505		A	A	A	Completed
Heat Test (Non operational)	REQ-506		A	A	A	Completed
Cold Test (Non operational)	REQ-507		A	A	A	Completed
Temperature Humidity Test	REQ-547		A	A	A	Completed
UV Light Test	REQ-511		A	A	A	Completed
Key operation before & after 30k cycle	REQ-516		A	A	A	Completed
Shaking Test	REQ-532		A	A	A	Completed
Traction & Torsion Test	REQ-525 REQ-526		A	A	A	Completed
Pressure Intensity (static) Test Accessory	REQ-527		A	A	A	Completed
Crystal Hardness Test	REQ-528		A	A	A	Completed
Traction Test	REQ-529		A	A	A	Completed
Artificial Sweat Test	REQ-548		A	A	A	Completed



Test methods and failmodes



- Test methods:
 - ROSE (Robustness Specification for Environmental Tests)
 - HALT (Highly Accelerated Life Testing)
 - MEOST (Multiple Environmental OverStress Testing)

Analysis methods

- Virtual Testing (FEM)

- CEEES publication

Reliability For A Mature Product From the Beginning Of Usefull life,

The different types of test and their impact on Product Reliability.



Adobe Acrobat
Document



CEEES Technical Advisory Board Reliability & ESS

-Reliability- For a Mature Product From the Beginning of Useful life

The Different Type Of Tests And Their
Impact On Product Reliability

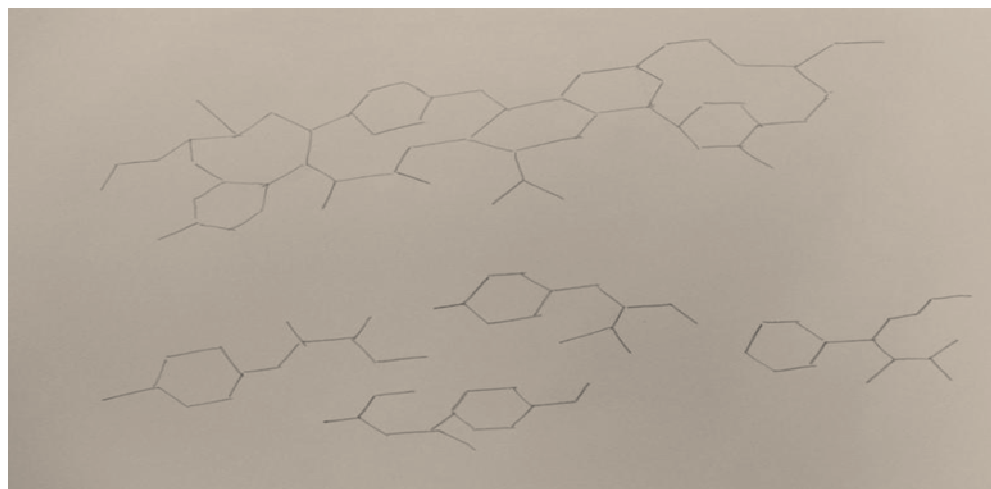
Publication N° 9 - 2009 -

ISSN 1104-6341

CEEES "The different type of tests and their impact on Product Reliability"

Example 1

- **Failmodes crucial**
- Recycling of plastics
- Molecule structures
- Anticipation



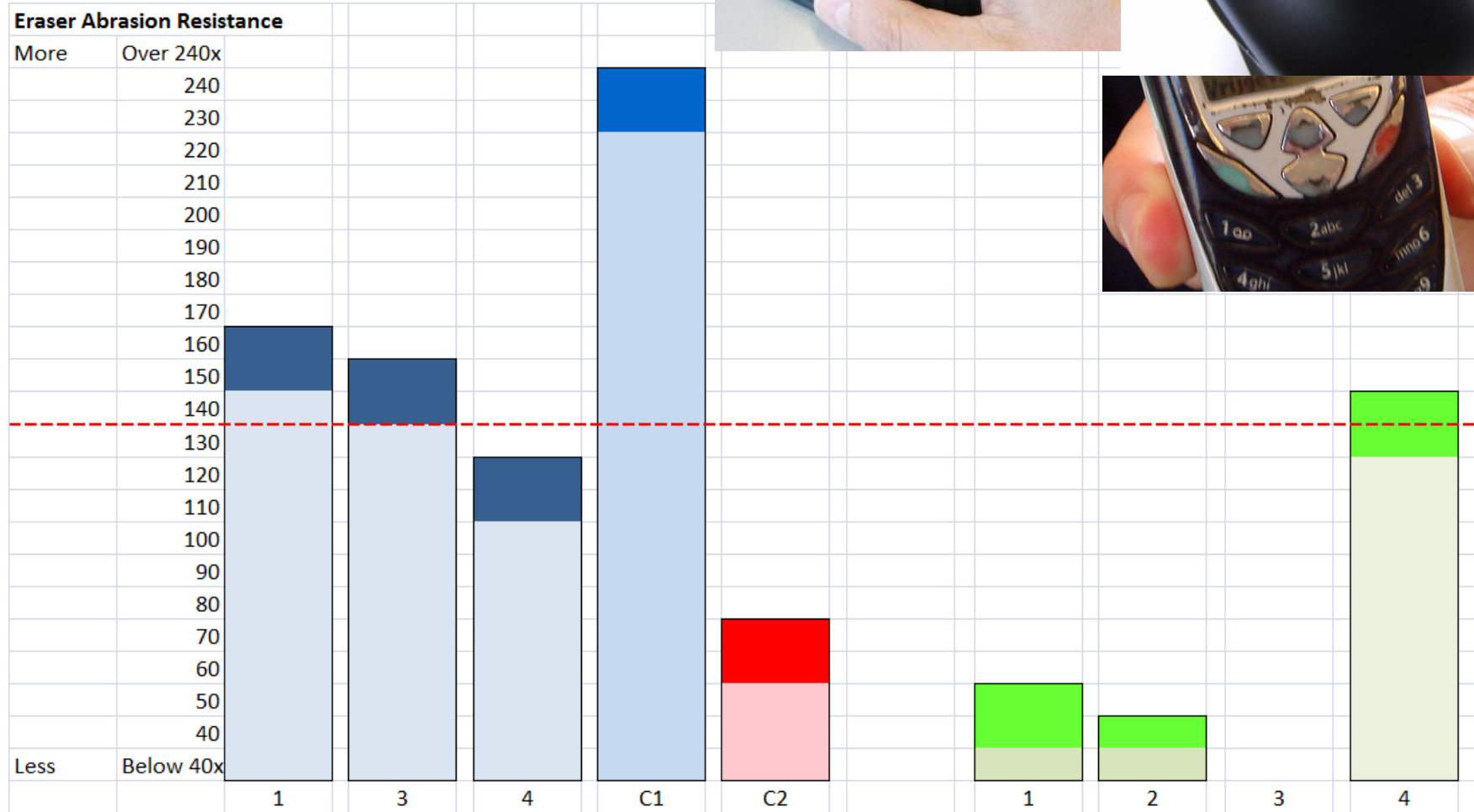
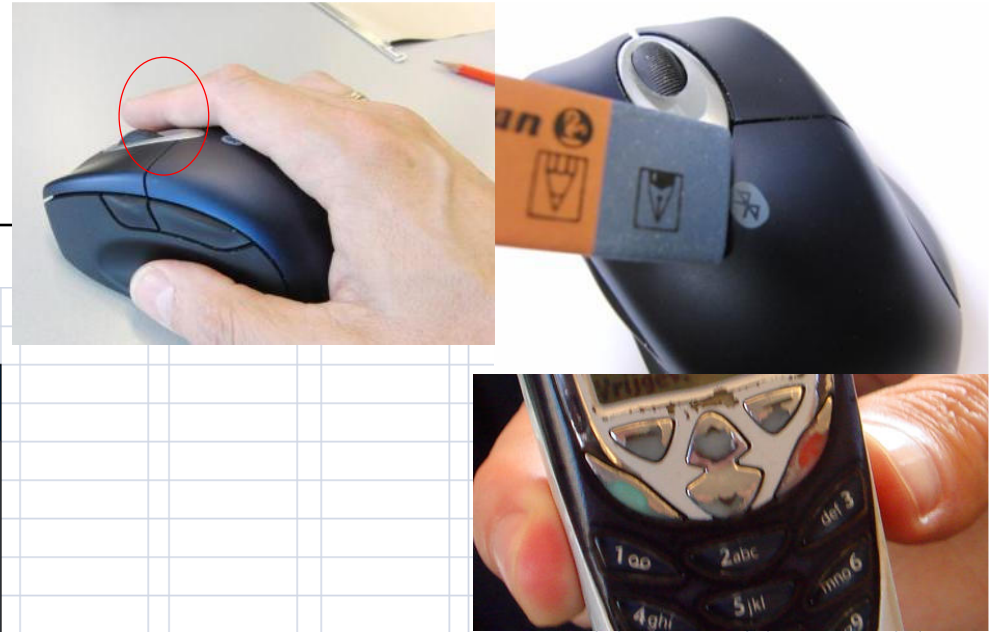
Pencil Hardness



Failmode = scratching / hardness

Don't see, will notice

Eraser Abrasion



Failmode = abrasion / hardness

Don't see, will notice

Free Fall



Failmode = breakage due to stress concentrations

Don't see, will notice

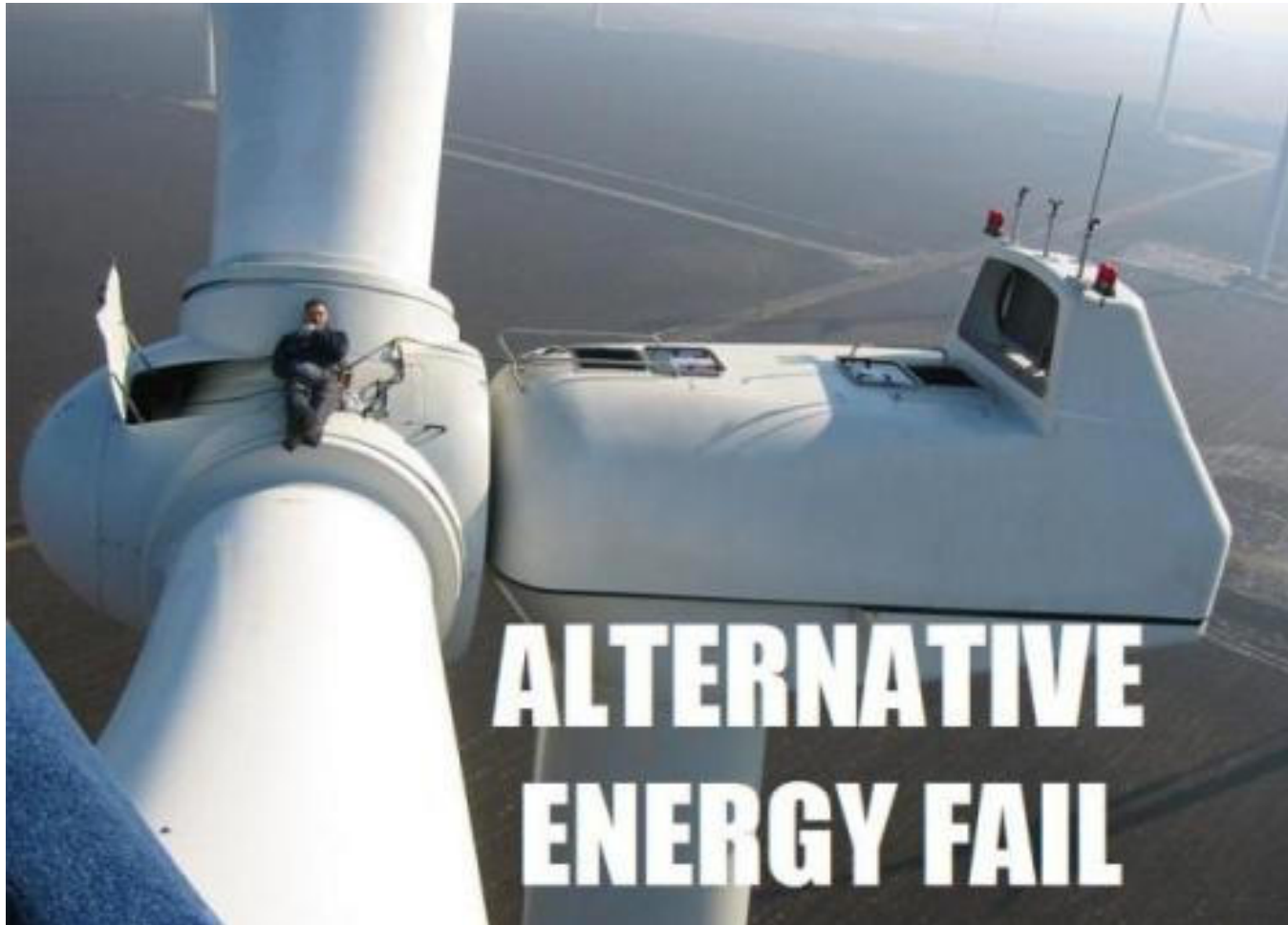
Free Fall – Low Temperature



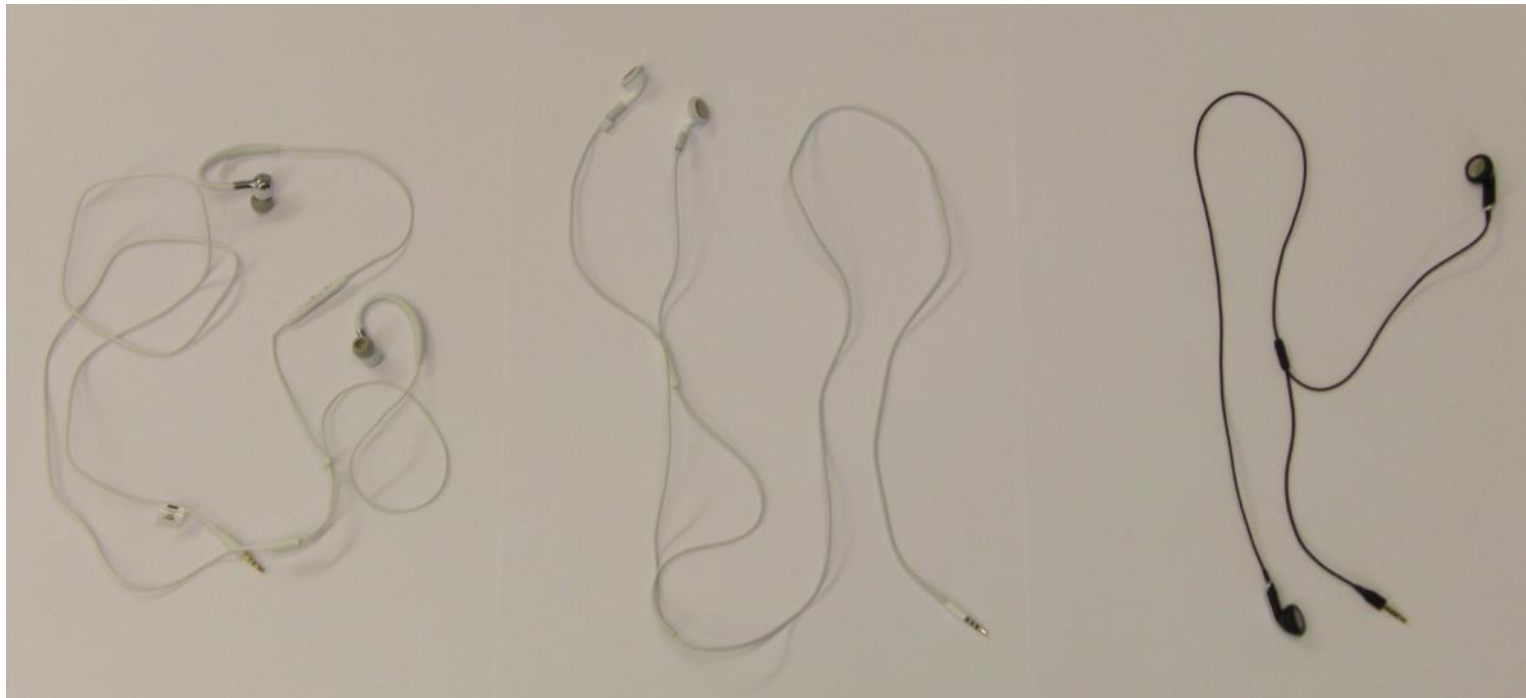
Failmode = brittle breakage

Don't see, will notice

Trust your fail modes - Reliability

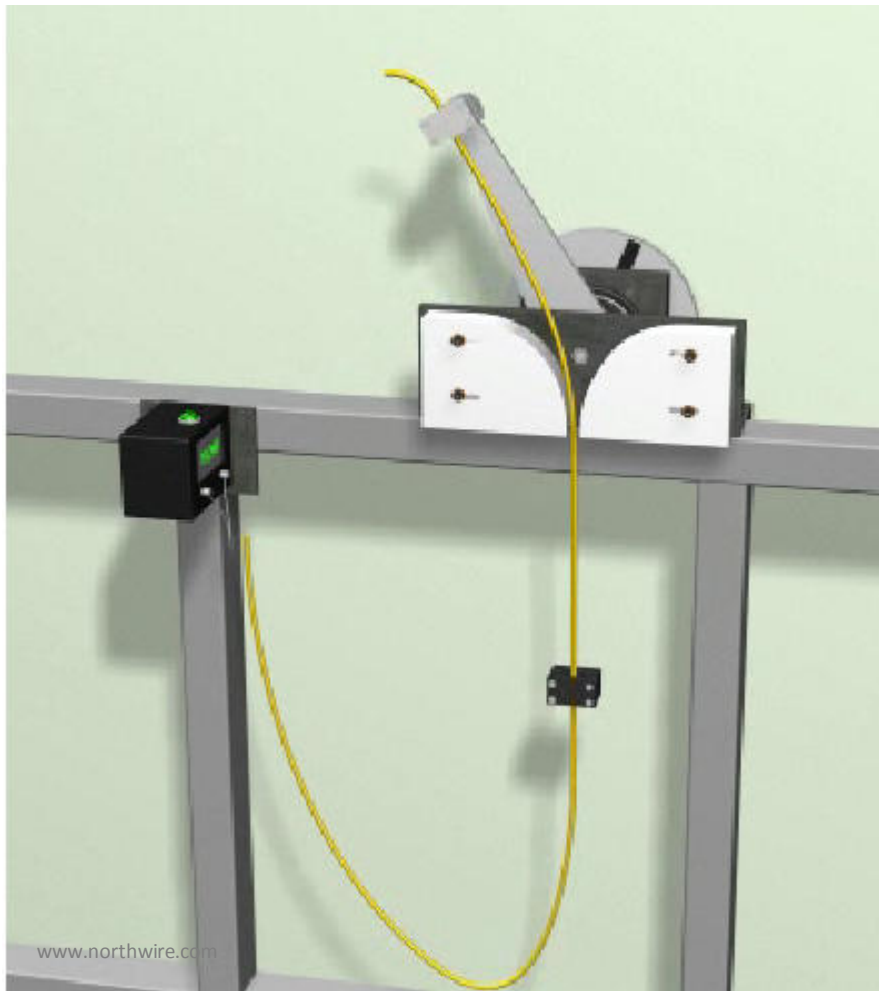


Fail Modes – PVC free

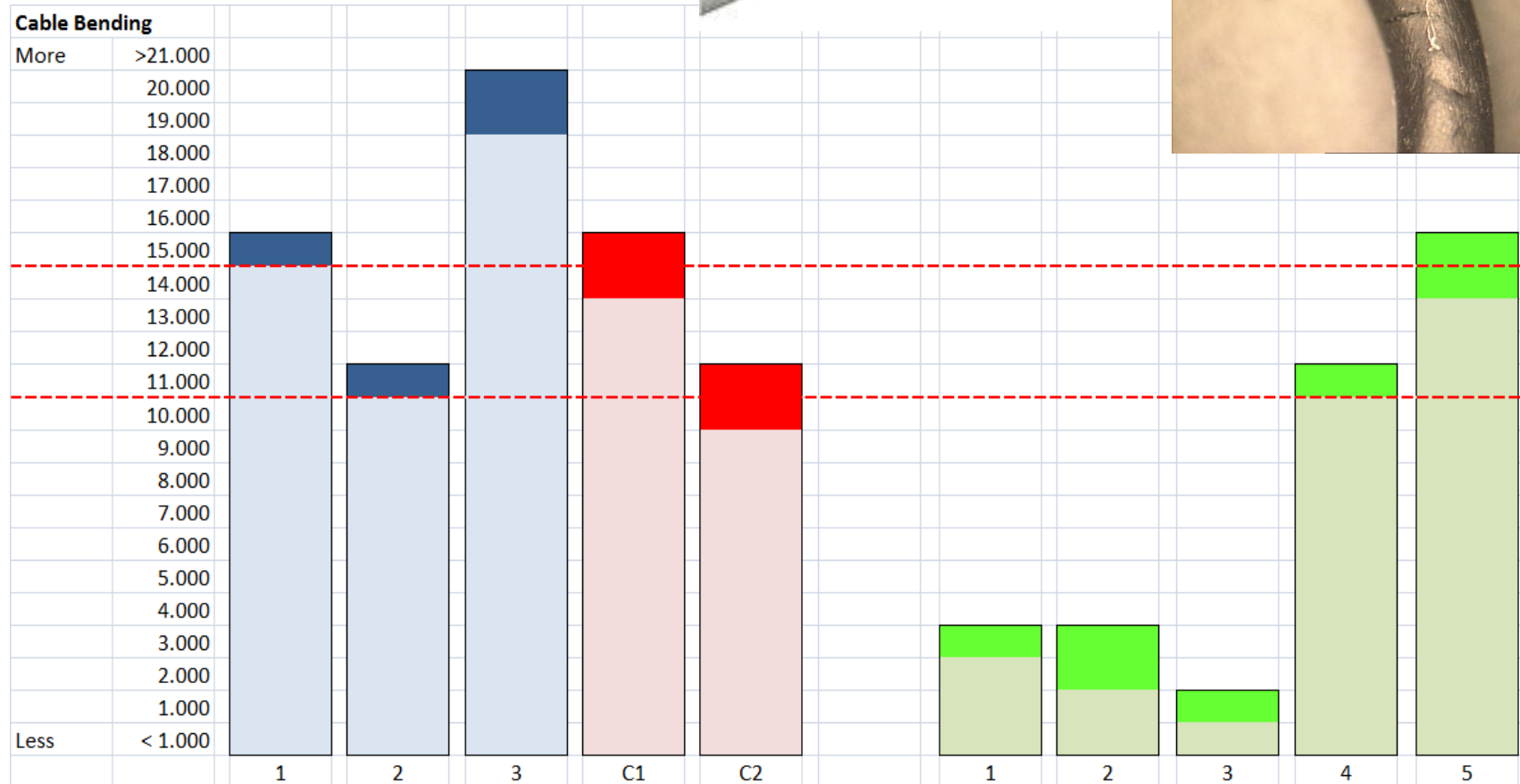
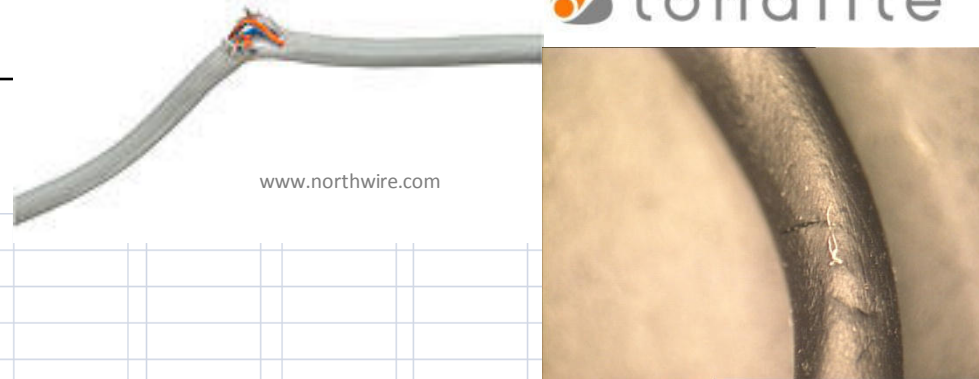


Wires

- flexibility – relaxation
- bending performance



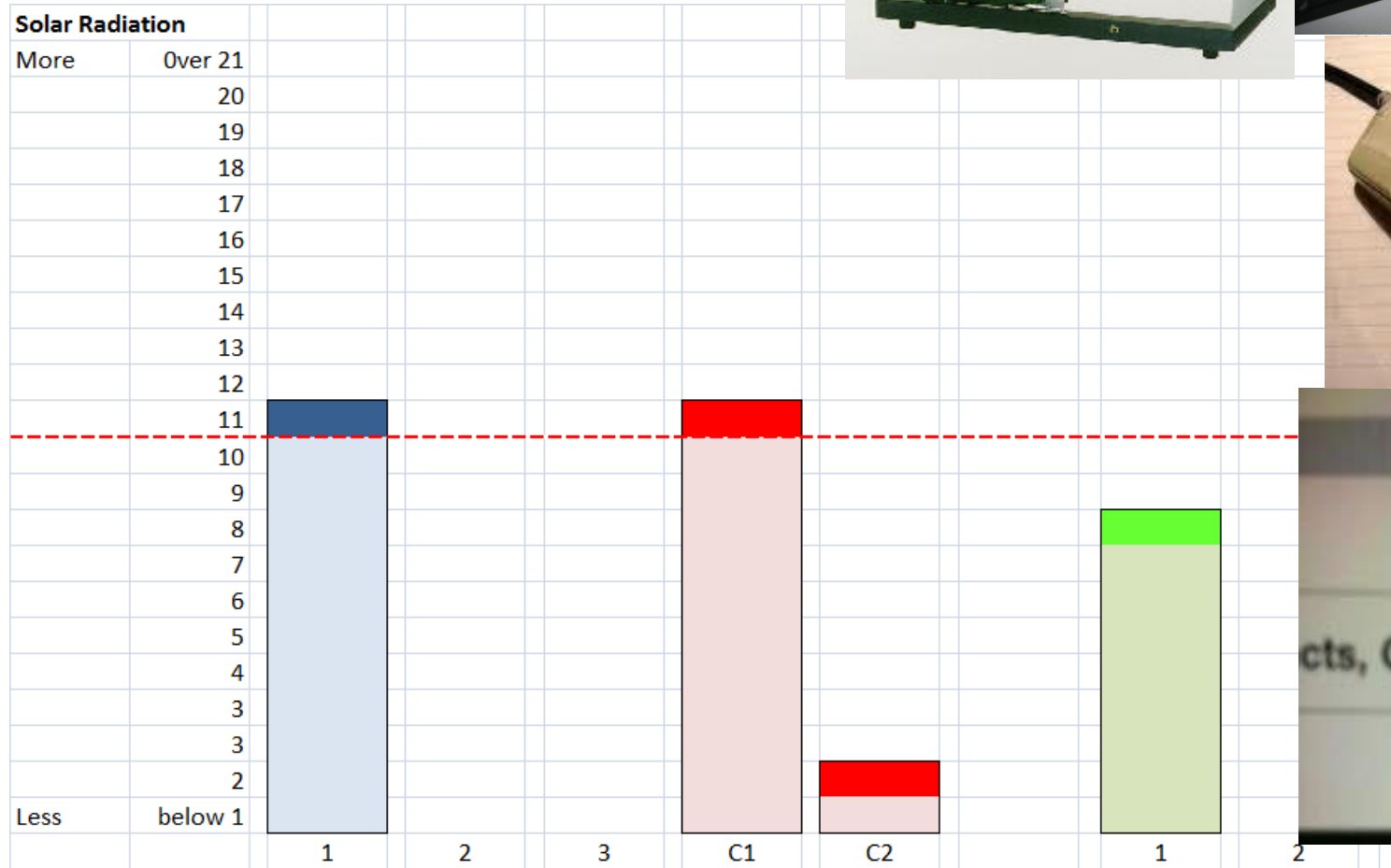
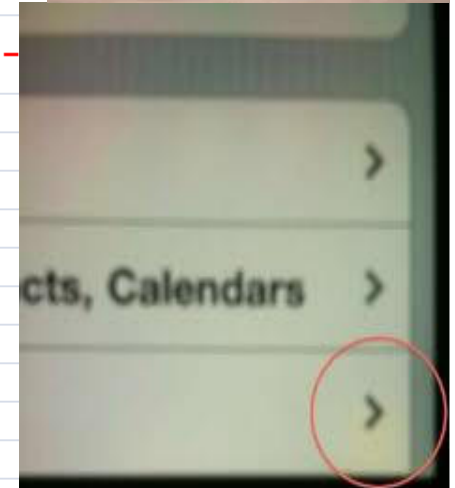
Cable Bending



Failmode = breakage *

Don't see, will notice

Solar Radiation



Failmode = discoloration + degradation

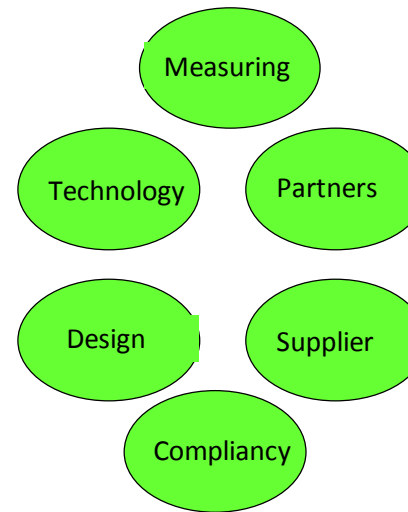
Don't see, will notice

3) Fail modes and tips



- Different stakeholders and reasons
- Importance of quality and reliability
- Testmethodology & tests
- (Hidden & New) Failmodes

Don't see, will notice



Fail Modes and Tests



Fail Mode	Test	Fail Mode	Test
Stability of dimensions	Thermal shock test	Internal stresses	Stress Cracking test Thermal Shock test 85/85 test Rotated drop test
Creep effects, crazes and cracks	Thermal shock test Condensation test Rotated free fall test Drop test	Crackelé effect	Stress Cracking test Thermal shock test
Stability of mechanical load resistance	Bending tests Twist test Pull/pressure intensity test	Reduced resistance to fluids, cosmetics etc.	Human perspiration test Coca Cola test Cosmetics test Salt mist test
Relaxation effects	Thermal shock test Ageing test	Reduced abrasion resistance	Eraser test ABREX test Abrasion tumbling test
Fixation to charger, necklace etc.	Thermal shock test Durability test	Color Changes	Solar radiation test Damp heat test
Life time reduction	Ageing test (test plan)	Release of paint layers and coatings	Cross cut test Peel off test
Moisture resistance	Damp heat test 85/85 test Condensation test	Reduced bending and strain relief	Cable bend test Pull test
Water and dust resistance	IP-tests Rain tests Dust tests Abrasion tumbling test	Corrosion contacts	Salt mist test Mixed gas test
Porosity	Humidity test Bending test Solar radiation test	Battery leakage	Battery leakage test (program) Shock test High temperature test
Reduced flammability	UL flammability tests		

Tests and Evaluation



Nr.	Test	Conditions (example)
1	drop test	H=variable (1.0-2.0 meter)
2	rotated free fall test	D=50 cm, N=variable
3	bending and twist tests	N=variable
4	ageing test	60°C, 10 days
5	Salt mist test and mixed gas test	T=24 hr
6	85/85 test and condensation test	T=48 hr
7	Thermal shock test	-35°C to +85°C, n=variable
8	Pull/pressure intensity test	F=variable (f.e. 50N)
9	IP rain/water test	IPx2
10	Stress cracking test, Olive oil test	T=variable
11	Human perspiration test and cosmetics/coca cola tests	pH=variable
12	Eraser, ABREX and abrasion tumbling test	N=variable
13	Solar radiation test	T=variable
S1	Cable bend test (specific)	N=variable

Nr.	Monitoring
1	Stability of plastics (ductility, deformation)
2	Visual appearance (crackelé, porosity, corrosion, color, cracks)
3	Mechanical durability (strength, bending, E-modii)

Don't see, will notice

- Different stakeholders and reasons
- Importance of quality and reliability
- Test methodology & tests
- (Hidden) Failmodes

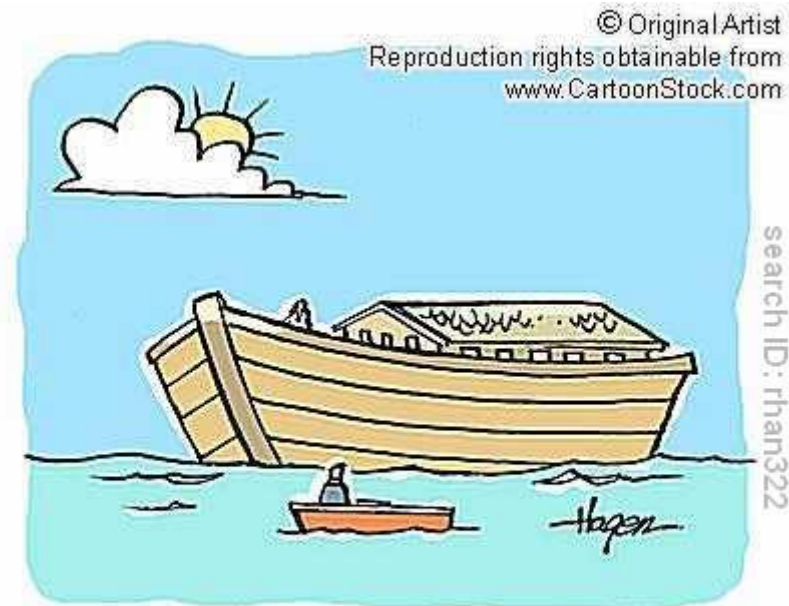
- Not only materials
 - total design (disciplines)
 - interactions
 - and environment (LCA, VoC)

Reliability – tests

- select right test
- evaluate right fail mode
- monitoring

Importance of Reliability w.r.t. Sustainability

Prove and Insight – and Sustaining (better products)



GOOD NEWS, YOUR SERVER IS STILL UP!



Don't see, will notice

Differences not visible, but noticeable

what & how will you discover?

Success and thanks for your attention and feedback!

Harry.Roossien@tonalite.com

More information:

- www.tonalite.com
- www.plot.nl