Tiberiu Seceleanu 2016-03-18

Intermittent / Permanent / Aging ? Failures and their impact

Panel at ERMAVSS 2016, Dresden, Germ

Clereco

Power and productivity for a better world™ ABB

A global leader in power and automation technologies

Leading market positions in main businesses

~140,000 employees

$42 billion In revenue (2013)

Present in +100 countries

Formed in 1988 merger of Swiss (BBC, 1891) and Swedish (ASEA, 1883) engineering companies

ABB

Power and productivity for a better world
ABB's vision

As one of the world's leading engineering companies, we help our customers to use electrical power efficiently, to increase industrial productivity and to lower environmental impact in a sustainable way.

Power and automation are all around us
You will find ABB technology…

orbiting the earth and working beneath it,

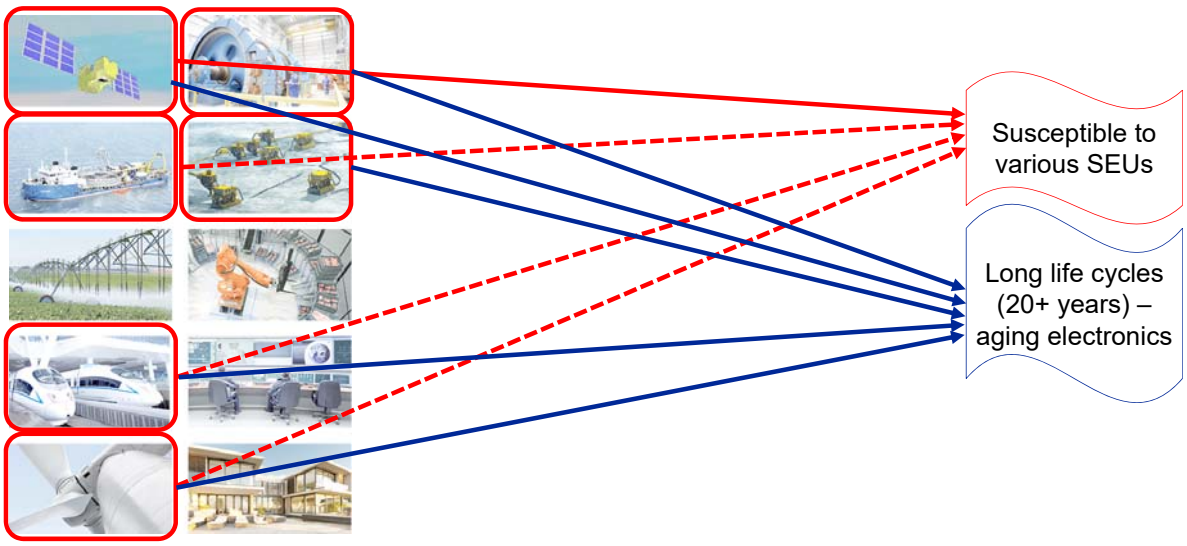
crossing oceans and on the sea bed,

in the fields that grow our crops and packing the food we eat,

on the trains we ride and in the facilities that process our water,

in the plants that generate our power and in our homes, offices and factories

Power and automation are all around us
You will find ABB technology…



"Which class of failures poses the most serious threat to today's large integrated circuits when they are deployed in the field?"
"Pick one and defend your position"

- Not very clear if identification of cause is precise, or which comes first, etc.
- Most probably (many of the) effects masked by already existing (due to other reasons) redundant architecture
- Other parts of the systems (electrical, mechanics, isolation, lubricants, etc) more visible as failure causes.
- Other aspects leading to failures, mostly addressed:
  - initial component quality
  - transportation / installation
- **Cosmic radiation / intermittent** →seldom
  - Observable though in high altitude installations
- **Aging** (high temperature, high humidity, vibration, chemical pollution, etc)
  - Plans usually already in place for replacement

Treatment

- **Maintenance**
  - Monitoring
  - Planned changes
- Typical changes:
  - CPU's
  - Air filters
  - Back-up batteries
  - Forced cooling/Fans
  - Power supply units
  - Relay contacts

Analysis

Common myths:

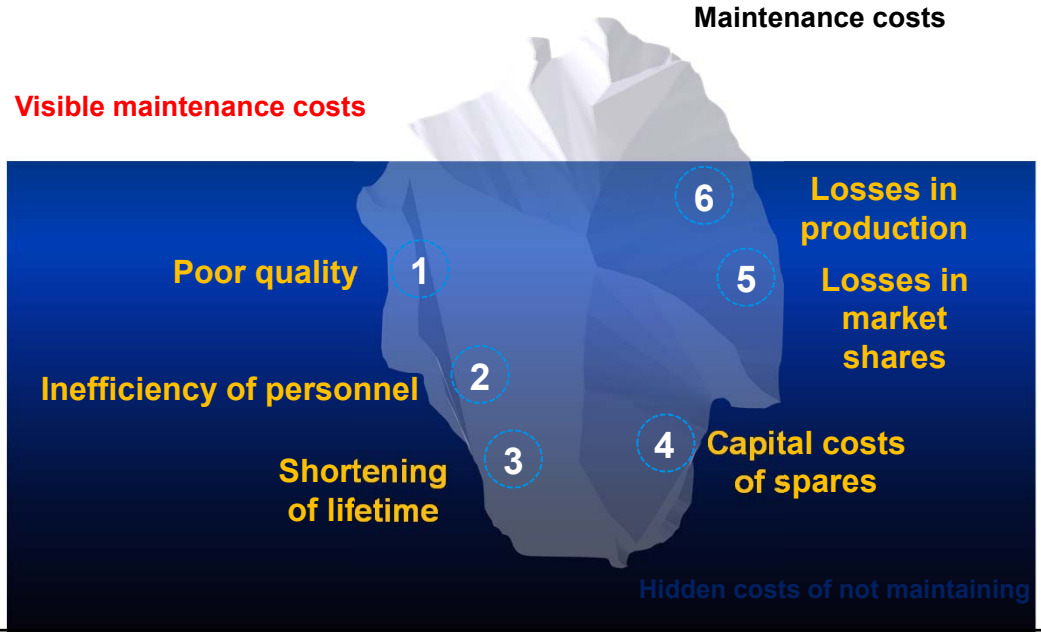
- Aging related problems can be predicted by periodical testing.
- Industrial electronics are maintenance-free.
- Preventive maintenance is just dusting off
- It's better to replace components and modules when they fail.

Proven facts:

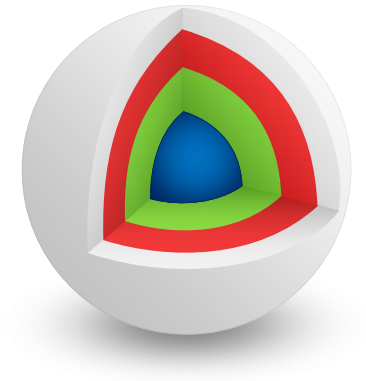
- The risk for aging related problems with electronic components increases after several years of operation.
- Operational conditions have also an effect on the failure rate.
- It is difficult or impossible to give reliable forecast for the remaining lifetime of a component. Periodical testing do not measure component aging.
- Maintenance costs are usually a fraction of the costs of not maintaining. Costs from unplanned failures are usually many times bigger than direct maintenance costs.

Concept

Maintenance costs are only the tip of the iceberg



Intermittent / Permanent / Aging ?

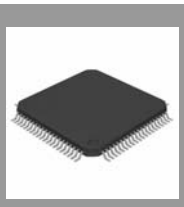


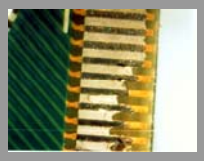
Maintenance

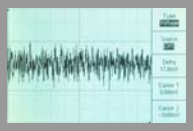
Permanent

Aging

Intermittent







Effects of aging
(otherwise "**going well**"):

- Drifting analog devices (goes unnoticed)
- Brittle plastics in connectors and fronts.
- Corrosion in connector surfaces
- Ripple in voltage levels due to dry out of electrolytic capacitors.
- Overall small changes in resistance, impedance, current and voltages will make your control system less accurate.
- Data timing / consistency
- …

Power and productivity
for a better world™