Landesanstalt für Umwelt
Baden-Württemberg

Ageing – What is it?

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Examples of Ageing

http://www.veronissima.com/immagini/wine-tours-bertani-ageing-cellar.jpg

http://www.cheesemaking.com/images/recipes/Wood4Aging/pic02.jpg

Ageing ….

- The change in performance over time

- For process safety this affects:
  - Plant
  - Processes
  - People

Dealing with Ageing

- Ageing cannot be prevented or eliminated completely
  - the rate of ageing can sometimes be reduced
- Ageing needs to be managed
  - Measures need to be taken to respond to ageing, e.g. inspection, repair or replacement
- Ageing needs a systems based approach

Plant

- Mechanical systems
  - Tanks, pipes, pumps, valves
  - Not only metallic systems also plastics, composites and glass
- Civil engineered systems
  - Concrete bunds, bridges, supports, waste water systems, road and railways, quays

Plant (2)

- Electrical systems
  - Cable, insulation, switches, contacts, lamps, motors, transformers, electrical heating
- Electronic systems
  - Embrittlement of circuit boards, hardening of solder joints, increase in faults in semi-conductors and data systems

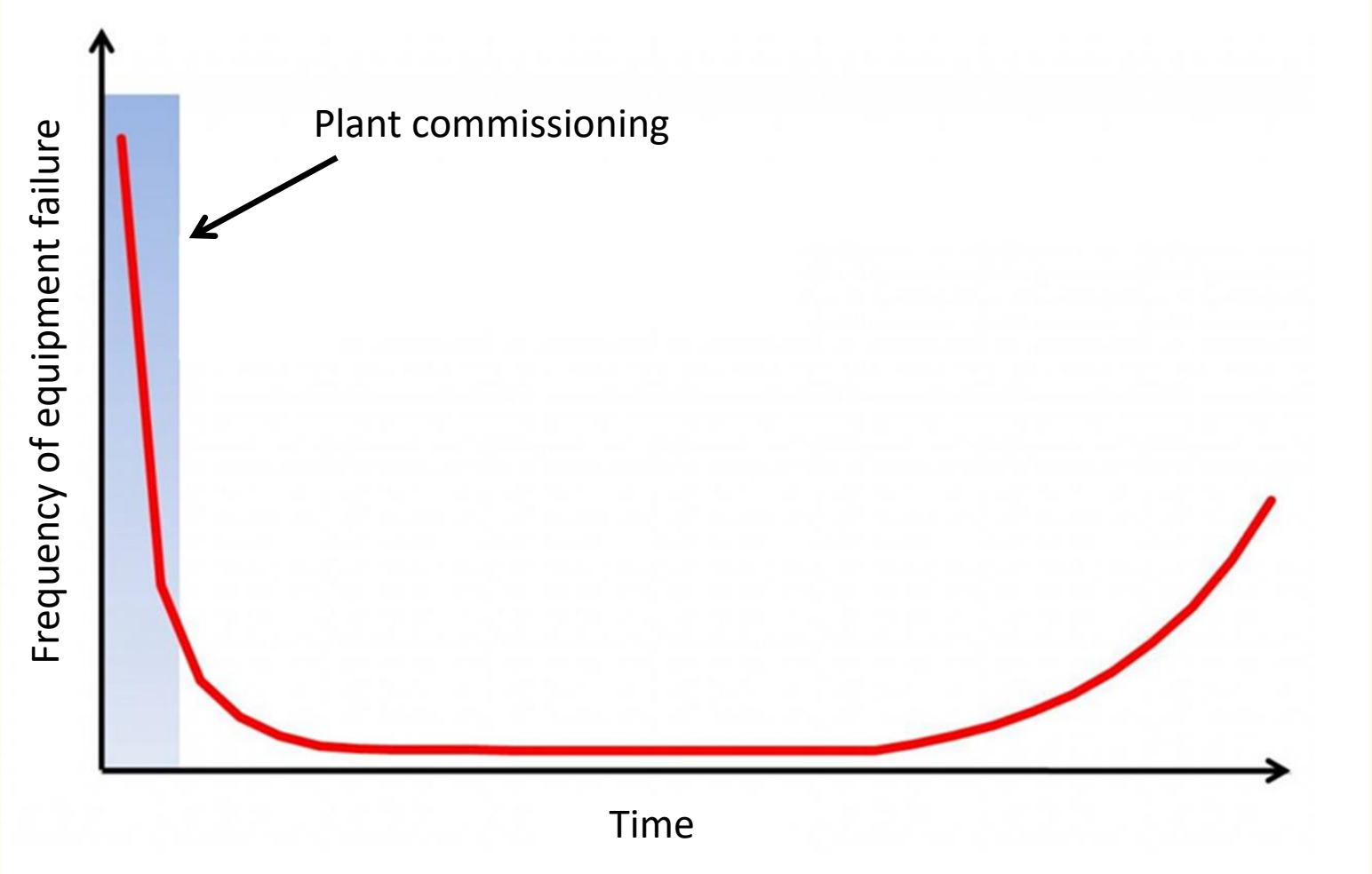
Processes

- Procedures
  - up-to-date, based on current knowledge, based on current activities and expectations
- Documentation
  - plans, drawings, P+I, SOPs, Safety Data Sheets, distribution lists.
- Communication
  - Telephone, Fax, E-Mail, Inter- / Intranet, 2-way radio
- Software
  - obsolescence, updates, security

People

- Age of work-force
- Physical ability
- Knowledge
- Competence / Skills
- Distribution of people throughout the company (geographical and organisational)
- Retirement, loss of knowledge

Bath-tub curve



Tools to support the management of ageing

- Design specifications
- Operating procedures
- Inspection documentation and maintenance records
- Management of change process
- Systematic hazard identification and risk assessment (processes and results)
- Training and information exchange (learning organisation)
- Workforce involvement

When should ageing be a concern?

- At the design stage:
  - What is the expected operating life, under which conditions?
- At the commissioning stage:
  - Has the system been constructed to design?
  - Which changes will have an influence on the operating life-span?

When should ageing be a concern? (2)

- At the operating stage:
  - Is the system operated to design?
  - What deviations will affect the life-span? (shift behaviour)
  - Is inspection, maintenance, repair and replacement carried out on time and in accordance with the design criteria?
  - What is learnt from inspection and maintenance results? How is this acted upon?

When should ageing be a concern? (3)

- NOW
  - Does an expected operational life-span exist for the systems on site?
  - How have the systems been operated in the past (as designed, deviations, no records!)?
  - What is the current status of the systems (as expected, with deviation, no records!)?
  - What is the expected remaining life-span for the systems? Is life-span extension considered? How should this be achieved?

Ageing is continual

- Ageing is a phenomena which occurs in all systems as time passes.
- Problems occur when ageing is ignored.
- Impacts can be significant.

Thank you for your attention?

Questions?