



**Norway – examples of  
inspection findings  
related to ageing**

MJV Malta April 2019

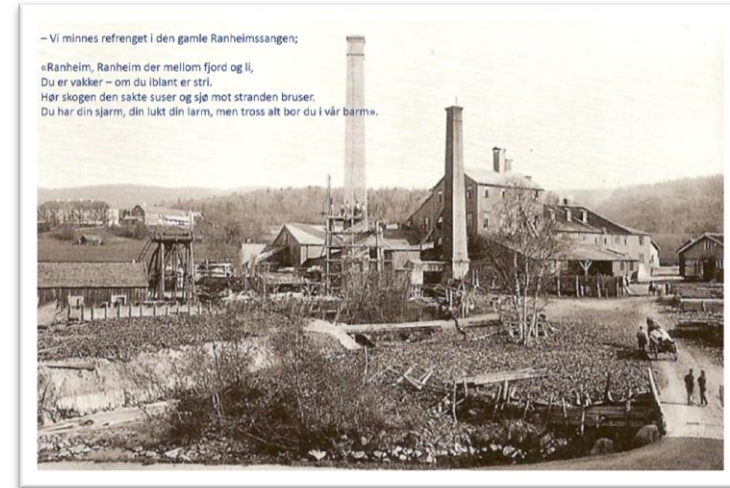
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# Norway and ageing plants

- Norway has many old industrial sites, and some «newer» ones that are getting older.
- Tankfarms for fuel storage one of our concerns
  - many old and badly maintained plants have been sold by large international companies to small local companies with less understanding of the importance of maintenance and less money to use for maintenance
- If maintained well and modernized - age may be no issue?
  - always challenging to keep old equipment and technology in a good condition
  - spare parts can be challenging
- Therefore maintenance and ageing has been and will continue to be focused in our inspections.

**This 134 year old papermill is still operating – lower tier site**



# Old plants compared to newer

- Do we find more deviations related to maintenance in the older plants?
- Our «newer plants» are also getting older....
  - They are more complex than the older plants, more advanced equipment, and in general more that can fail.
  - Have they not been well enough maintained from the start??
- Some examples related to ageing follows.



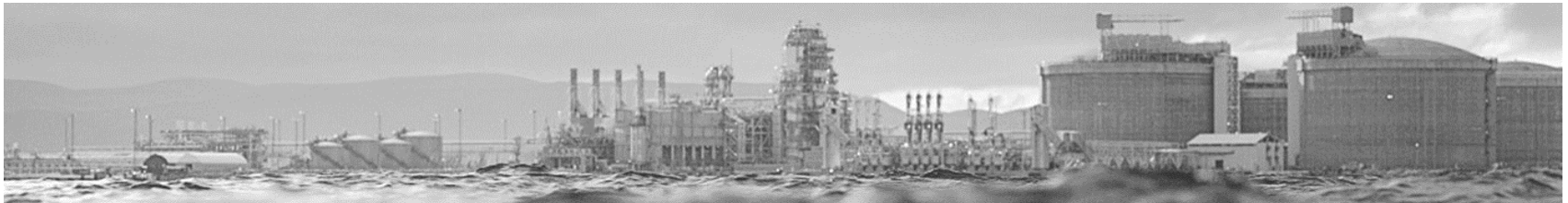
# Example 1 – ageing of newer plants

- Large LNG production plant located in the north with difficult weather conditions – one of our «newer» plants – operational from 2007.
- Closed down 11. march 2019 for corrective maintenance on safety valves.
- 190 valves without heat tracing and thermal insulation
  - originally these valves had heat tracing and thermal insulation
  - over the years removed but not reinstalled
- Now identified as a safety critical situation
- This week being investigated by the Norwegian Petroleum Safety Authority (PSA)



# Example 1 Have we recognized this in our inspections?

- 2010 PSA identified: a large backlog regarding maintenance of safety critical equipment, including PSV's and inadequate training and understanding of the importance of safety critical barriers.
- 2011 PSA: lack of robustness regarding major accident prevention activities, training of personell.
- 2014 Norwegian Environment Agency: – no findings. Safe operation, maintenance and condition monitoring were obligatory Seveso inspection themes this year -
- 2015 - 2016 – PSA: – no findings. In 2015 robust barriers were one of the inspection themes.
- 2017 PSA: concluded that the maintenance system is inadequate, testing and maintenance of safety critical equipment (important barriers) is inadequate, inadequate system for follow up of nonconformities related to maintenance backlogs for safety critical equipment



## Example 2 – aging that has caused incidents and accidents

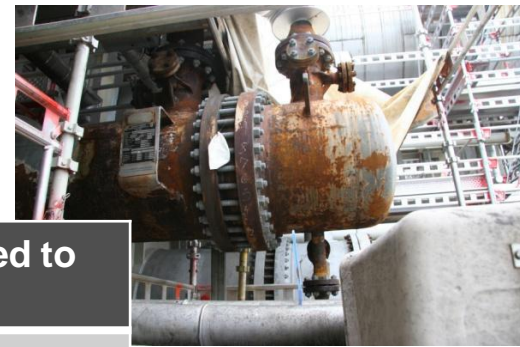
- Large process plant built in 1975
- Extended and modernized several times. Old and new parts of plant closely integrated.
- Many signs of ageing that is not under control
  - In our inspections
  - Incidents and accidents



## Example 2 – Inspection results related to ageing

Year	Inspection result
2004	Large corrosion damages resulting in release of SO <sub>2</sub> .
2007	Lack of control with corrective and preventive maintenance - large backlogs, lack of identification of all safety critical equipment, lack of control with spare parts.
2010	Improvement still needed regarding maintenance back logs, many incidents caused by this.
2015	Large backlog on corrective maintenance.
2017	Lack of risk evaluation and use of historical data in connection with postponed preventive maintenance on safety critical PSVs, and wrong categorization of critical ESD-valves.

## Example 2 – Some accidents related to ageing



Year	What happened	How is this related to ageing?
2008	Control over a reactor and the regenerator was lost after loss of control with six critical slide valves failed after loss of power supply. The situation developed into a critical condition, which under slightly different circumstances could have resulted in fire, evacuation and loss of human lives. Estimated cost 1 mill Euro.	Ageing/ weakening of components in the 20 year old power supply
2010	During maintenance a corroded thermowell was replaced with a thermowell in a wrong pressure rating, and during start up the new thermowell loosened and flew 30 meters due to high pressure. Operator was injured, hydrocarbon leakage both from reactor and heat exchanger.	Corrosion. Use of old and wrong spare part. Lack of control with spare parts. Lack of competency.
2012	Steam leakage that could have caused a major accident.	Corrosion under thermal insulation
2016	Gas leakage during maintenance – under manual operation of a valve the connecting pipe cracked.	



## Example 3 – inspection results related to ageing

- Gas processing plant – in production since 1985
- Extended several times – old and new parts of the plant fully integrated

Year	Inspection result
2007	Lack of control of preventive maintenance, comments regarding backlogs, lack of risk ranging of equipment and risk evaluation regarding possible consequences of this
2013	Lack of follow up of identified technical weaknesses
2016	Insufficient maintenance of heat tracing and Ex-equipment



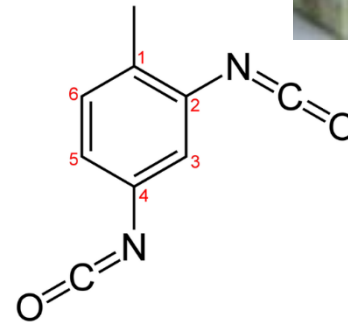
## Example 3 – accident related to ageing 2016

- Gas leakage in a 140 bar system. A manometer on the pipeline (10mm, 400 bar pressure class) broke.
- Breakage of the manometer was caused by fatigue fracture, caused by corroded mechanical support.
- approximately 22 tonnes of gas was released
- There was no maintenance programme for manometers and connected instrumentation. Not identified as critical equipment.
- In the follow up after this accident, similar equipment with similar weaknesses has been identified.



# Example 4 – When everything is ageing

- Established 1952. Lower tier company, production of foam mattresses.
  - Chemicals involved: TDI (toluen diisocyanate). Classified as “very toxic” and LPG.
- Ageing plant and equipment – dangerous for workforce
  - A number of work related accidents and problems in this company.
- Ageing owner
  - Unwilling to change
  - Unable to adapt to «modern times»
  - Too difficult to follow regulations
- Ageing employees



## Example 4 – Inspection results from different Seveso authorities

Year	Inspection result
2006	Lack of emergency preparedness.
2007 & 2009	In general <u>no follow up</u> of obligations according to the Norwegian Seveso regulation.
2011	Lack of risk identification, no maintenance plans, serious work environment issues (asbestos, mold, dry rot, general decay etc...) - forced temporary closure
2013	Poor SMS, lack of risk identification, no emergency preparedness ... etc
2014 – 2018	Close follow up by several authorities every year - things are getting worse every year. <ul style="list-style-type: none"><li>• January 2015 we receive plan for final closure by 30. april 2015.</li><li>• June 2015 company again decides to work with improvements instead of closing down.</li></ul>



## Example 4 – Follow up of inspections

You may ask:

Did the authorities do nothing after these inspections in order to change the situation?

- DSB notice of closure in October 2014
- DSB issues a fine related to lack of follow up after inspection 2015.
- Labor Inspectorate issues a fine 4. June 2015
  - company lawyer sends letter claiming procedural error and fine is withdrawn.
- DSB calls in owner for high level meeting 2015
- ..... fines are paid....more inspections....

The Norwegian Seveso authorities have now established a joint procedure for early identification, evaluation and follow up of difficult cases.



**Closed -  
2018**

**Thank you!**

