“Ageing Plant and Life Extension”

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“Ageing Plant and Life Extension”
Presentation Outline

• Introduction
• Brief introduction to the offshore industry
• Presentation of HSE’s Key Programme 4 (KP4) - Ageing and life extension offshore
• Look at parallel ageing challenges elsewhere in the major hazard sectors
• Explore whether ageing and life extension can be issues for non-major hazard sectors
North Sea beginnings

- Offshore industry started 1960s
- Little safety regulation
- 1965, Sea Gem jack-up (self-elevating barge) collapse killed 13
Piper Alpha - 1988

- Removal of safety valve, with poor permit of work system
- Explosion, leading to a crude oil fire, fuelled by continuing production from adjacent platforms
- 167 died, 62 survived.
Piper Alpha Cullen Inquiry

- Identified causes of Piper Alpha fire
- Recommended transfer of responsibility of offshore safety to HSE – 1991
- Safety Case regime set up – new legislation 1992
- Review of legislation, and replacement by goal-setting requirements
UK Oil & Gas production facts

- 40 billion boe recovered, with approx 15-25 billion boe remaining
- 16th largest oil & gas producer in world.
- >350 fields and approx 280 offshore installations
- Supports 380,000 jobs
- Currently meets 70% of UK oil & gas demand, and still liable to meet 50% in 2020
- Oil price $34 Dec 07, $147 July 08, $40 Dec 09, $110+ now (Sept 12)
Offshore over 3-Day Injury Rate

Injury rate per 100,000 workers

0
200
400
600
800
1000
1200
1998/99
1999/00
2000/01
2001/02
2002/03
2003/04
2004/05
2005/06
2006/07
2007/08
2008/09
2009/10
2010/11
2011/12
Offshore Hydrocarbon Releases

No. of Releases

- Minor
- Major/Significant


Charts show releases trends from 2002/03 to 2011/12 with data for minor and major/significant releases.
Deepwater Horizon
Gulf of Mexico 22 April 2010: 11 killed
Release of 4.9 million barrels of oil (170 million gallons)
……and potential effect in the UK/Europe?

238 workers on the Elgin complex and Rowan Viking safely evacuated over next 13 hours.

Initial release around 2kg/sec (170 tonnes/day).

Top kill of Well G4 completed on 19 May.

Over the 52 days, estimate of 6172 tonnes of hydrocarbons released.
Background to Key Programme 4.

Ageing and life extension in the offshore industry
UKCS Installations (BERR)

146 installations
108 installations >25 years old
>25 years old

Year of first oil/gas

No of UKCS installations in production

Small steel jacket
Large steel jacket
Jackup
Concrete GBS
Semi-sub
FPSO
TLP
WHAT IS AGEING?

Evidence of degradation and damage

OR

Insufficient knowledge / information to know the extent of possible deterioration

Need to consider effects of:

- accumulating or accelerating damage
- modifications
- obsolescence
- changes of process & / or well conditions
- advances in knowledge and technology
- organisational issues / loss of corporate knowledge
The ageing/life extension conundrum….

- Traditional models of dwindling reserves & increasing O&M costs predict end of life
• 100 Installations inspected (40% of the total)

• Significant issues on the maintenance of safety critical systems:
  – Use of maintenance system
  – Use of ORAs
  – Role of technical authority
  – Sharing good practice
  – Use of verifiers
  – Use of KPIs by senior management
  – Maintenance backlog

• KP3 report:
  – Published October 2007
  – Findings accepted by Industry
• 20\textsuperscript{th} Anniversary of Piper Alpha
  – 6 July 2008
  – Secretary of State commissioned KP3 review

• Review performed by HSE
  – Good progress, considerable resource and effort
  – Improvements implemented but considerable work still required

• KP3 was about managing ‘here and now’ conditions
  .... but what about managing future conditions for further ageing and potential life extension?

Hence KP4!
Future reserves: up to 25 billion barrels of oil ⇒ 25+ years

Steady demand for oil and gas for foreseeable future

Over 50% of platforms have exceeded their design life

Findings of KP3: Asset Integrity (2004-2007) plus plateau of HCRs

Technological developments continue

- enhanced oil recovery etc.
- existing offshore infrastructure essential for some marginal field developments
- CO₂ sequestration, gas storage etc. opportunities

Safety management system requires consideration of:
- ‘Ageing’
- Implications of ‘life extension’
Key ageing/life extension issues

- Ageing/deterioration
  - External/internal corrosion
  - Structural degradation/failure (e.g. fatigue)
  - Backlogs of maintenance
- Changes in process conditions over time
- Cumulative effect of modifications
- Obsolescence
- Information capture/retention (IT + human!)
- Advances in knowledge/technology
- Improvements in good practice
- Anticipation of changes
What is Ageing?
RR509 (2006)

• The management of equipment begins with an awareness that ageing is not about how old the equipment is, but what is known about its condition, and the factors that influence the onset, evolution and thence mitigation of its degradation.

• Once the symptoms of ageing are understood, and detected from inspection, a decision can be made how to proceed. The options can include putting together a case to justify continued service, re-rating, repair, or scrapping the equipment.

• There are also managerial issues that should also be considered. The company culture and defined roles and responsibilities are important in relation to managing equipment.

• Ageing management is also affected by staff demographics, skills, training and competencies.

• Keeping documentary information and records throughout equipment life is important.
Key Programme 4 (KP4) on Offshore Ageing and Life Extension

- **AIM:**
  To ensure that the risks to asset integrity associated with ageing and life extension are controlled effectively:

- Doing work now, for improved integrity management/safety in the future
- Seeking industry recognition of the importance of Ageing and LE
  - Key element of the asset integrity management (AIM) system
  - Senior management involvement
- Integration into corporate safety culture
  - e.g. corporate policy, safety cases, thorough reviews
- Development of long-term asset integrity plans
KP4

• Launch in July 2010
• Significant stakeholder work to raise overall awareness and stimulate industry-wide work, especially guidance and good practice
• 15 Duty Holder inspections to date (September 2012)
  – Inspection of Asset Integrity Management (AIM) systems - not installation specific
  – Primarily onshore with offshore sampling - broad range of topic areas
  – Focus on Safety Case Thorough Review
  – Used KP4 topic based templates (including traffic lights) (POPMAR model)
  – Process = kick off, onshore, offshore, close out
• Primary source of information on ageing offshore installations
• www.hse.gov.uk/offshore/ageing.htm
• To provide information on:
  – Press releases
  – Inspection findings
  – Operational issues
  – Standards, technical / guidance documents
  – R&D
  – Industry meetings
  – Relevant websites (e.g. PSA, EI)
Managed by Oil and Gas UK under STEP CHANGE

90 members, operators, ICPs, designers, contractors, plus HSE

Purpose

- share good practice
- identify key elements in ageing processes
- develop guidance

O&G UK work group developed “Guidance on the Management of Ageing and Life Extension for UKCS Oil and Gas Installations” in April 2012 – see http://www.oilandgasuk.co.uk
Overview of KP4 progress so far

- KP4 Interim Report due October 2012
- Offshore industry has responded well to KP4 – ageing/life extension now firmly “on the map”
  - Good practices being captured by O&GUK
- Good evidence of Duty Holder senior management have responded positively
  - Recognised as a business issue
  - ALE policies/procedures developed
  - KP4 task groups created
  - Some allocating personnel with specific ALE responsibilities.
  - KPI “dashboards” for ALE
KP4 good practices

- Greater emphasis on quality and monitoring of Operational Risk Assessments (ORAs) for degraded plant
- Auditing of defined life repairs
- Undertaking ALE gap analysis
- Obsolescence Reviews
- “Life of field” structural integrity condition assessments
- Extensive fabric maintenance – most visible!!
BUT………..

• Existing work loads are very high, meaning taking time out to consider ALE issues is difficult.

• Fabric maintenance still a challenge, with widespread concerns over CUI.

• Need for better appreciation of ‘Ageing’ and planning for Life Extension, and day-to-day management - further integration into mainstream asset management

• Auditing and verification needs to be improved for ALE

• Work will be needed to implement industry good ALE practices.

• Offshore environment will remain a challenge….
However, is ageing/life extension a health and safety issue elsewhere?
Onshore major hazard industry

- External research 2008/09 – RR823 Plant Ageing Study
- Review of European incident databases 1980 - 2006, showed ageing caused:
  - 28% of loss of containment incidents with MA potential
  - 50% of events arising from technical plant failure incidents led to
    - 11 deaths
    - 183 serious injuries
    - €170M economic losses
UK Competent Authority (HSE/EA) Strategic Priority on Ageing Plant

- 2011: 74% of sites failing to meet expectations
  - Across the 5 mechanical topics
    - Performance at 25% of sites is assessed as unacceptably
      - Significant improvement needed urgently
    - Performance at 49% of sites is assessed as only partially compliant
      - Legally enforceable improvements are required
    - Performance at 26% of sites is assessed as acceptable
      - Minimum legal requirements met
    - Findings from the CA’s intervention programme on ageing plant do not provide much comfort!

- 2012: Slight improvement - 70% of sites still failing expectations

Ageing plant management remains a significant challenge for process industries
But what about non-major hazard sites?

• Current economic environment means everyone has to squeeze their assets, with inevitable “life extension”:
  • “let’s put off that car park maintenance until the lease runs out”
  • “that boiler will run for another couple of winters, won’t it?”
  • “do you really mean that lifting strop is too old – surely we can still use it”
  • “we can’t afford to replace that database – can’t we keep on running the old system?”
  • “now you tell me the ventilation plant can’t cope with the new production line!”
• Ageing now, and in the future, will be a key issue in all sites

• Consider the range of ageing/life extension issues in your environment
  • Obsolescence – “kit”, “software” and workforce
  • Damage and deterioration
  • Equipment approaching end of life
  • Cumulative effects of modifications
  • Improvements in technology
  • Standards/legislative/societal changes
But not just a “Safety thing”

- Ageing and life extension issues are intricately tied up with commercial and economic issues.
- Sometimes ageing safety risks is too remote, too far in future, or difficult to quantify.
- Don’t rely solely on complex technical arguments, instead introduce business risk concepts - present ageing risks to senior leaders as commercial, reputational and financial risks (as well as safety!).
- Provide real and focused evidence and data that highlights where systems have or will deteriorated in a format that can be readily understood by senior managers – and include the potential consequences.
- Seek independence in engineering decisions associated with ageing/life extension.
Ageing and Life Extension Leadership

- Know your assets
- Be an Intelligent Customer
- Ensure that the leadership understands and recognises the significance of ageing challenges - send senior managers onto Process Safety Leadership training?
- Recognise existing problems and have plans to correct
- Develop long term strategies for each site, with a clear vision of the future
  - Enables engineering teams to propose appropriate investment options
Ageing and life extension – you can choose which “Richards”

Do a Cliff....

....or do a Keith!
Questions?