

MARINE
TECHNICAL
LIMITS

ADURA

Risk-Based Integrity Management: From Strategy to Execution

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Marine Technical Limits



The Real Problem

Integrity is a Problem of Uncertainty



Longer Asset Lives

Many assets now operate beyond original field-life expectations.



Growing Uncertainty

Degradation is slow, uneven and invisible. Inspection provides snapshots, not understanding.



Cost Pressure

Inspection access, offshore execution, and shutdown costs continue to rise.



Life Extension Expectations

Operators require evidence-based decisions on continued service.



We are making long-term decisions with incomplete knowledge

The Shift Required

Why traditional approaches fail

Inspection \neq Understanding

TRADITIONAL APPROACH

-  Fixed intervals
-  Generic scope
-  Broad coverage
-  Reactive to findings
-  Limited traceability

REALITY

-  Variable risk
-  Critical areas not targeted
-  Inspection effort not optimised



We inspect extensively, but not effectively

Case Study: PENGUINS FPSO



THE ASSET



Circular hull form
with distinctive
structural behaviour



North Sea metocean
environment



New-built asset entering
long-term service



THE CHALLENGE



Align design
assumptions with
operational reality



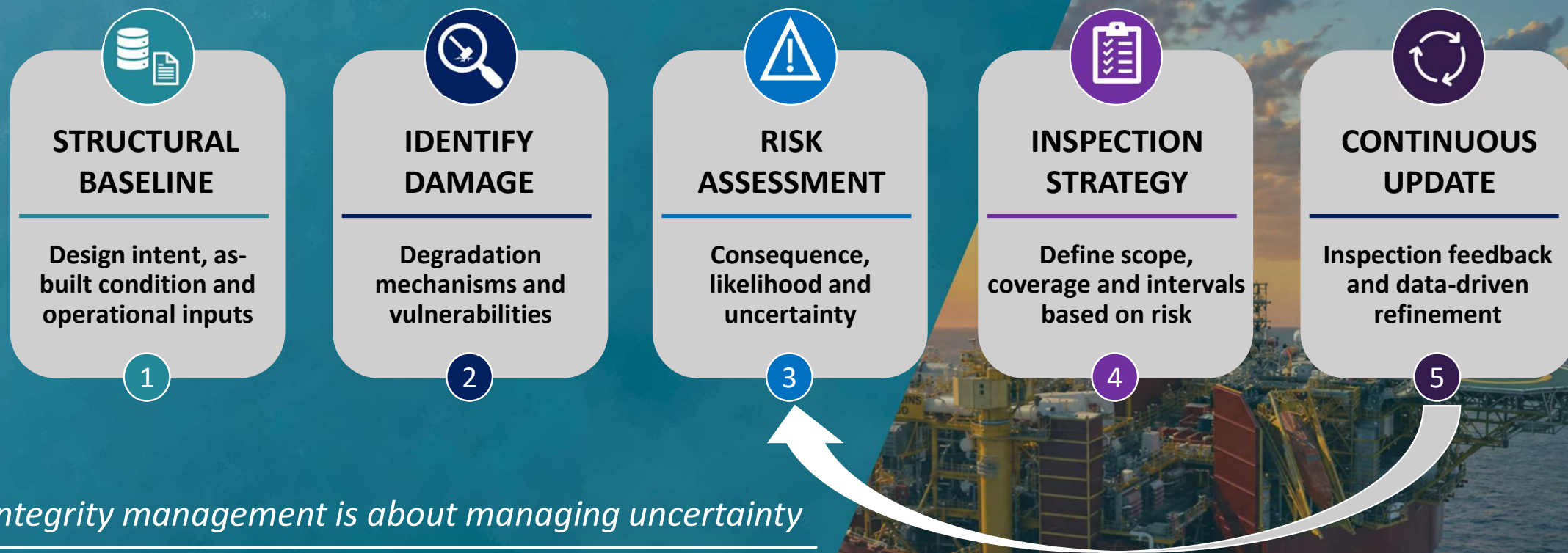
Manage uncertainty
from the outset



Avoid defaulting to
time-based inspection



The RBIM Framework



- Focus on what matters
- Accept uncertainty
- Reduce it where needed

Inspection does not make structures safe; it reduces uncertainty

Engineering the Risk

Assess structural risk and uncertainty to prioritise inspection where it matters

1. DAMAGE DRIVERS

What can go wrong?



Fatigue

Detail-driven, not fully modelled



Corrosion

Environment, coatings and fluids



Overloading

Global and local operational variability

2. RISK ASSESSMENT

Three dimensions of risk



Likelihood

- Analysis
- Experience
- Build quality
- Intended operation



Consequence

Safety, environmental, commercial, operational



Confidence

- Uncertainty in knowledge
- Data gaps
- Inspection limitations
- Model uncertainty

Risk =
f (Likelihood, Consequence,
Uncertainty/Confidence)



Initial risk

Baseline risk with current knowledge



Identify mitigations

Analysis, build quality, operational controls



Evaluate residual risk

Updated risk reflecting mitigations

3. WHAT INFORMS RISK

Multiple inputs supported by engineering judgement



Design Analysis

FEA, class rules, load analysis



Inspection insight

Historical findings, condition data, NDT results



Engineering judgement

Experience, context and professional assessment

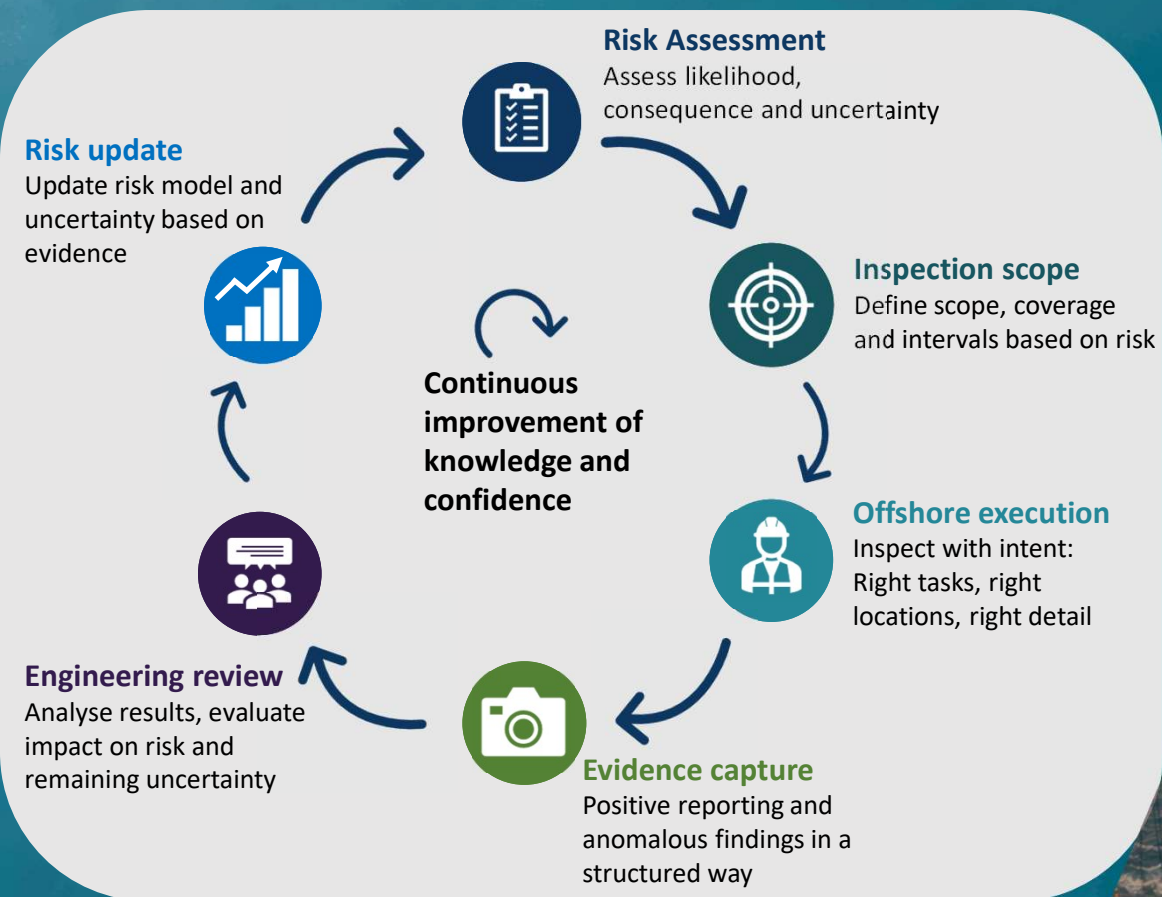


Risk is not calculated, it is assessed



Closed-Loop Integrity Management

RBIM works as a closed loop – each cycle builds knowledge and confidence



WHERE THE LOOP BREAKS



Risk not translated into tasks
High risk areas not identified or scoped



Inspectors lack context
No understanding of why, what to look for, or structural significance



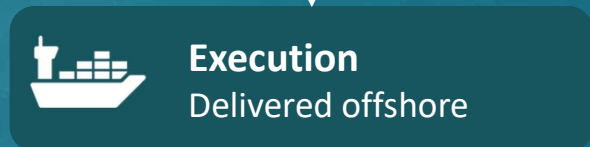
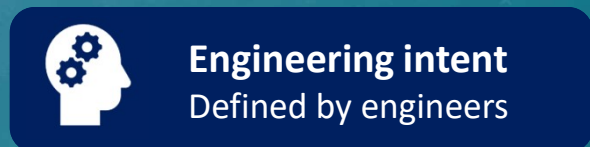
Reporting by exception
Focus on defects, rather than conditions and trends



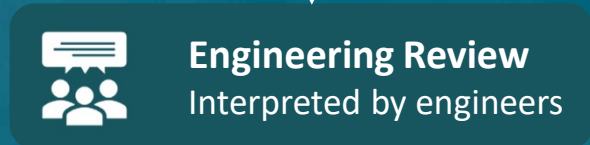
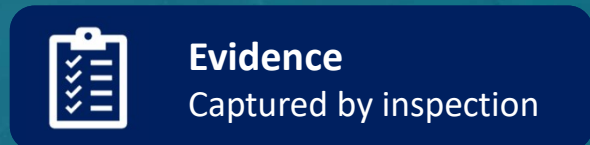
Evidence loses traceability
Data not linked back to risk and decisions

Inspection reduces uncertainty only if it updates the risk picture

Engineering intent is often lost between onshore planning and offshore execution



PYXIS preserves the link



Risk is translated into clear inspection tasks



Inspection produces structured, usable evidence



Evidence remains traceable back to risk



Execution only adds value if it preserves the engineering intent

The RBIM + P Y | S Advantage

Combining a risk-based strategy with structured digital execution enables a more focused and efficient inspection regime.

EXECUTION ADVANTAGES



Risk-defined inspection scope

Effort aligned with risk and structural significance.



Targeted inspection effort

Focus on what matters most, not what is easiest to inspect.



Structured evidence capture

Consistent high-quality data with context and traceability.



Faster engineering review cycles

Near real-time visibility enables timely assessment of findings.



Improved traceability of decisions

Decisions are supported by linked evidence through the full integrity cycle.

PENGUINS FPSO – POTENTIAL SCOPE REDUCTION

SPACE CATEGORY	CLASS SCOPE (ROUTINE)	RBIM SCOPE (ISIP)	REDUCTION
Cargo Tanks	15	8	47% ↓
Ballast Tanks	19	9	53% ↓
Void Spaces	2	1	50% ↓
Machinery Spaces	9	4	56% ↓
TOTAL	45	22	51% ↓

Reduced inspection scope while maintaining coverage and traceability



Value Over Asset Life

RBIM delivers value by building confidence over the life of the asset



EARLY LIFE

Establish the baseline



Validate design assumptions



Confirm expected behaviour



Establish baseline condition & confidence

Better understanding earlier

MID LIFE

Understand and manage change



Identify degradation trends



Review risk and refine inspection scope



Reduce uncertainty and improve confidence

Smarter decisions throughout life

LATE LIFE

Enable informed decisions



Support repair and intervention decisions



Justify continued safe operation



Enable life extension with confidence

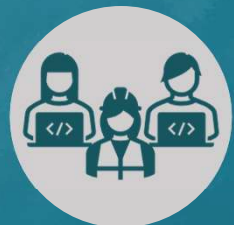
Safer decisions through late life

Confidence is built from consistent, traceable evidence

Closing Remarks



RBIM is an engineering philosophy,
not a digital product



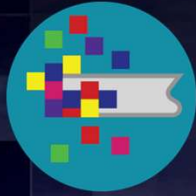
Execution discipline
determines whether RBIM delivers value



Digital systems enable RBIM
only when they preserve engineering
judgement



Confidence enables life extension, not assumption



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