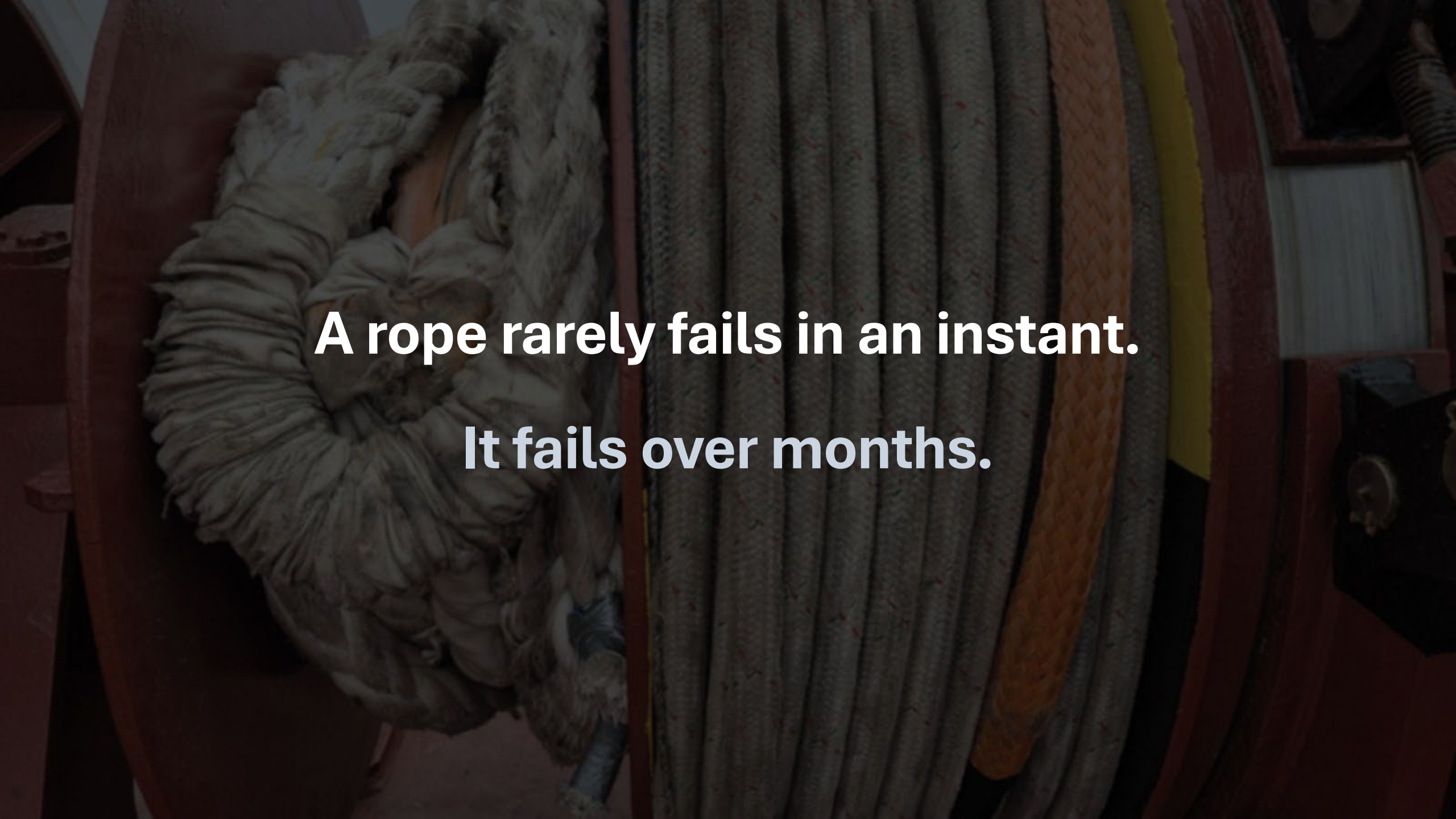

A rope rarely fails in an instant.
It fails over months.

Mooring Rope Reliability

From hidden damage to better decisions

Bulk carrier mooring | ARCSOPT 2026 | Perth, 22 October 2026

Protect the core · Know the condition · Keep the history

Stephen Hong
Director | DSR CORP.



Mooring safety is a system problem.

RightShip inspection findings, 2022–2025: mooring is not only a people issue — plant and process matter too.

11,390

mooring-related findings
across 7,057 RISQ inspections



REGULATION · 1 JANUARY 2024
SOLAS II-1/3-8 and MSC.1/Circ.1620: every ship inspects, maintains and keeps records for every line.

TERMINALS · DBCT, APRIL 2024
Line management plan, certificates on board, 3-monthly inspections, test evidence beyond 5 years.

Sources: RightShip Safety Insights – Mooring Safety (RISQ findings, Jan 2022 – Jan 2025; findings, not incident causes); IMO SOLAS II-1/3-8, MSC.1/Circ.1620; DBCT requirements, Update Three, Apr 2024.

Iron ore belongs in the hold. Inside a rope, it becomes an abrasive.

The damage you see may not be the damage that matters.

01 Ingress
ore dust works in between the strands

02 Abrasion
particles grind fibres under every load cycle

03 Hidden strength loss
while the jacket can still look fine



Field example, no jacket: iron ore dust between the strands.

DESIGN RESPONSE · JACKET, THEN FILTER



The jacket takes the wear, but fine dust still gets through



Fine particles stopped at the filter

Sources: DSR field samples (no jacket; ore-carrier jacket rope, opened 2018; Shah Deniz 2 filter-equipped rope). The filter rope is proven offshore and in ore-carrier service (next slide).

What we have measured so far.

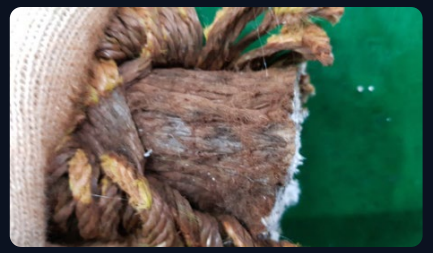
Residual strength after service, as % of SD MBL — three separate field cases.



No jacket — iron-ore trade

Bare rope, ore-carrier spring line — 2009 to 2017

30.1%



Jacket only — iron-ore trade

Jacket rope, Korea – W. Australia ore trade — 2012 to 2018

51.9%



Jacket + filter — iron-ore trade

Jacketed and filtered rope, ore carrier — 2018 to 2025

98.2%

75% — MEG4 recommended retirement threshold

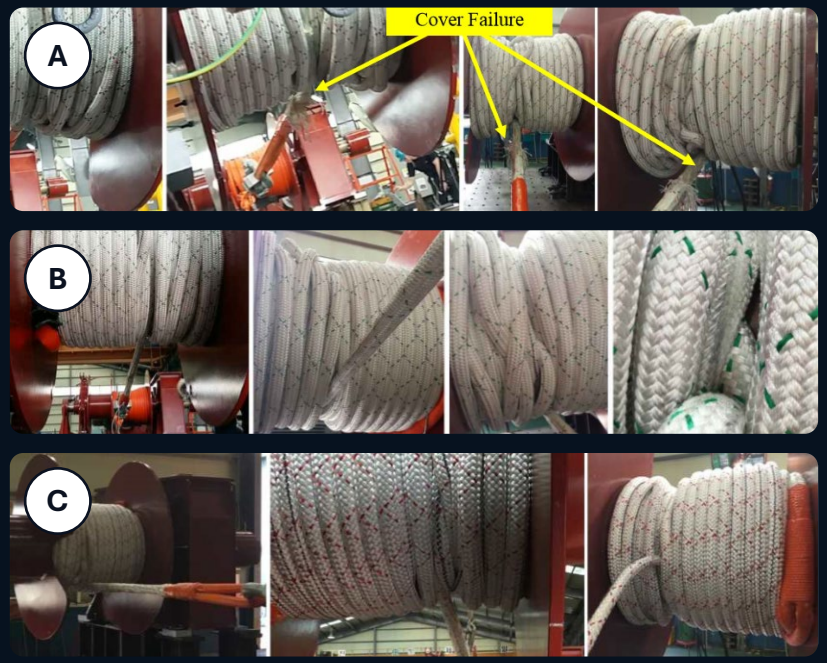
Different ropes and ships — not a like-for-like comparison.

Sources: DSR residual-strength tests on field-retrieved samples (bare and jacketed ropes from other manufacturers, 2017 and 2018; DSR jacketed with filtered, 2025); OCIMF Mooring Equipment Guidelines, 4th ed. (MEG4).

We tested jackets where they work hardest: on the winch.

Full-scale winch · 40 mm rope, 114 t MBL · repeated loading · three jacket constructions

Same winch, same test — head to head



A · Cover failure at 25 t (≈22% of MBL)
The loaded line cut in and tore the cover.

B · No cover failure up to 45 t (≈39% of MBL)
Adopted. It also held in a second winch test.

C · Also held up to 45 t
B rated better on winch behaviour, operator feedback and flexibility.

A jacket chosen by how it behaves on the winch — not by one break number.

Source: DSR full-scale winch cut-in test, 40 mm samples (one 12-strand reference, three jacket constructions). Jacket ropes with a filtered layer.

Then the proving ground: a working ore carrier

M/V STELLAR VENTURE · Ore carrier, built 2014 · 16 mooring lines inspected, June 2024

13 / 13

DSR lines rated good

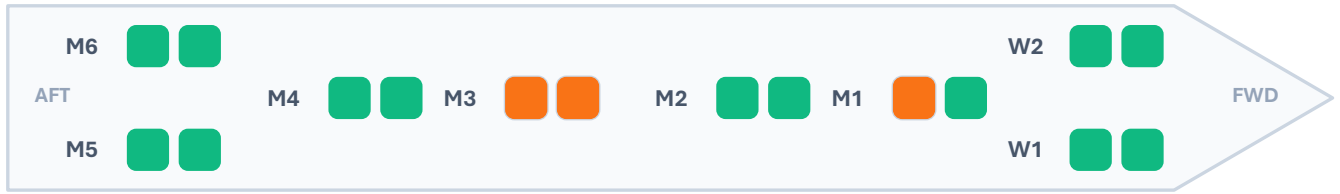
Based on visual inspection

0 / 3

Other makes rated good

2 with severe jacket–core separation

WHERE THE 16 LINES SIT ON BOARD



DSR lines — jacket inspection on board

- ✓ No visible diameter reduction
- ✓ No friction melting
- ✓ No axial compression or kink bands
- ! Some uneven wear — not severe

SAME SHIP · SAME TRADE — AND WE KEPT COMING BACK

2017

DSR jacketed HMPE lines supplied, with an earlier jacket; crew briefed on use.

2021

Cut-in damage found on the jacket. 7 coils re-jacketed with construction B from the winch test.

2024

Every DSR jacket in good condition. By then the ship's winches had also been changed.

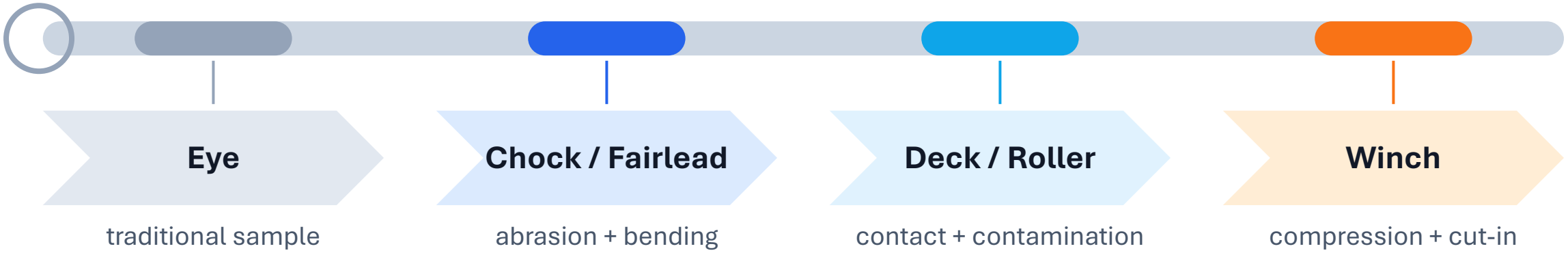
Source: DSR on-board inspection report, M/V STELLAR VENTURE, 20 June 2024. Jacketed and filtered ropes; visual inspection by DSR; no residual-strength test; line ages not compared.

Is this rope still fit for service?

Preventing damage is only half the job.
At some point, every operator has to decide: keep it in service, repair, turn over or retire.

A good-looking jacket does not prove a healthy core.

IMO says so (MSC.1/Circ.1620). On the LNG carrier Zarga in 2015, the jacket kept the crew from inspecting the load-bearing core.



Where you test matters.

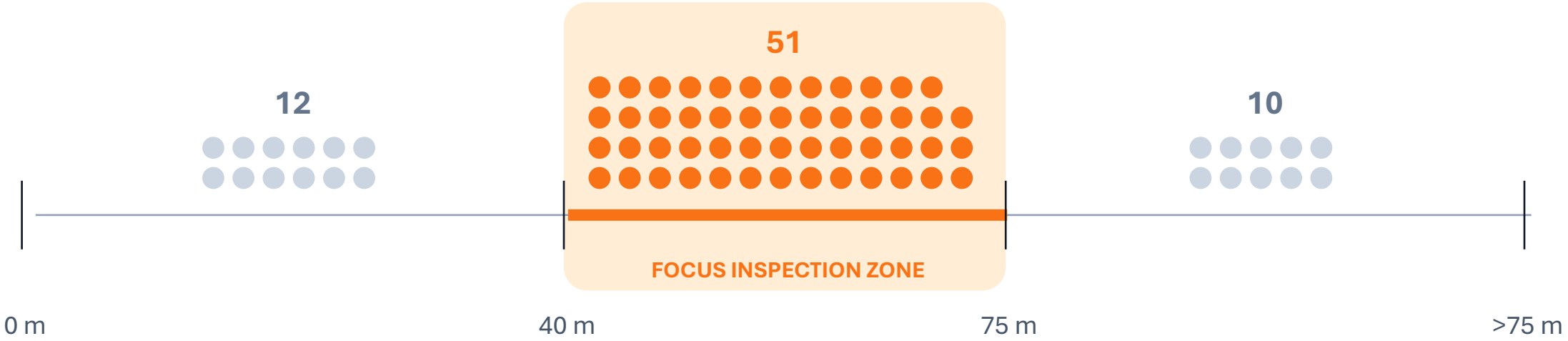
On ore carriers, residual strength varied widely between samples from the same vessel.

Sources: IMO MSC.1/Circ.1620 §4.1.3; UK MAIB Report 13/2017 (Zarga, 2 March 2015); DSR field inspection methodology.

Damage has an address.

70%

of recorded cover damage sat 40–75 m from the rope end.
Damage follows contact: the chock, the roller and the winch.



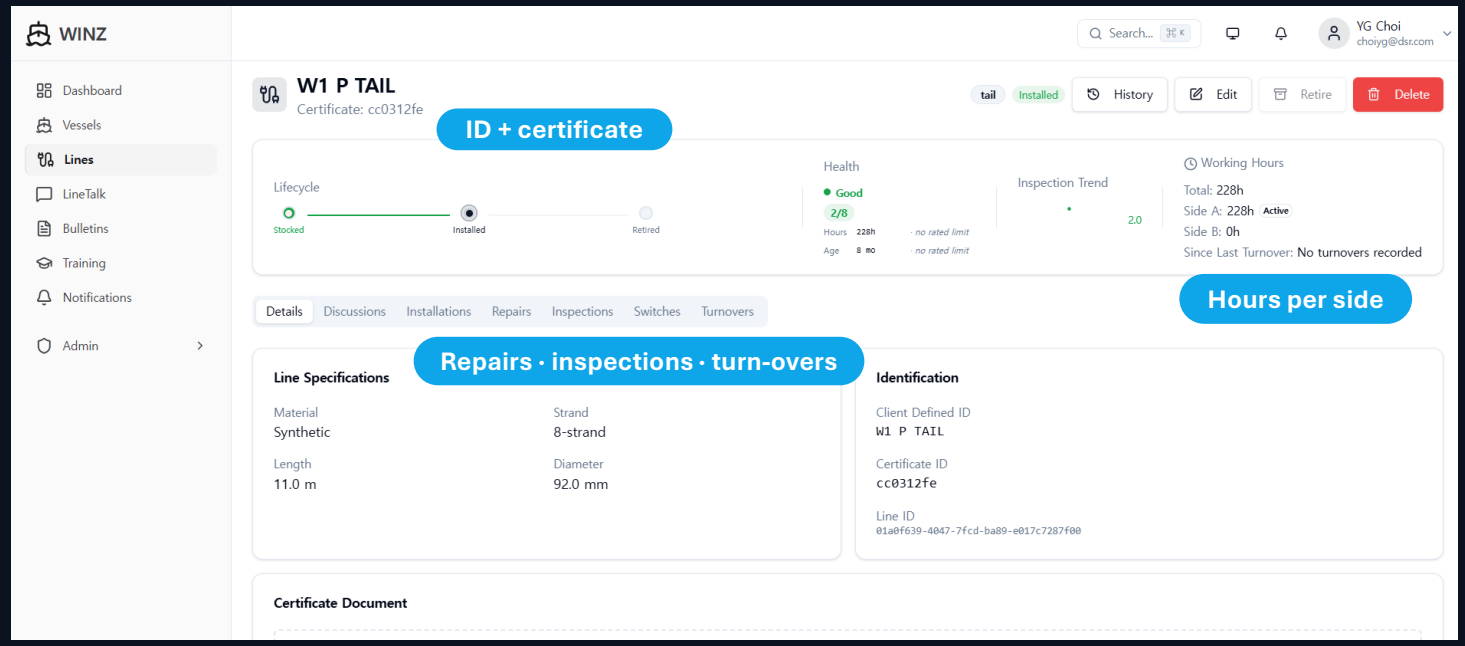
Inspect where the damage lives:
the 40–75 m zone needs focused inspection and management.

Source: LNG-carrier cover-damage records (FLEX LNG): 73 damage — 12 at 0–40 m, 51 at 40–75 m, 10 beyond 75 m; 37 FWD / 36 AFT.

WINZ doesn't replace judgement.

It gives judgement a memory.

Focused inspection only works if the records survive crew changes. One line, one ID, one history.





Every line carries its own ID.

LINES
certificate · hours · turn-overs

DAMAGE
position on the rope, with photos

REPAIRS
what was done, and where

LINETALK
crew ↔ expert support

Sources: DSR WINZ product page and user manual; RightShip Zero Harm Innovation Partners Program. WINZ keeps traceable history; it does not replace engineering judgement.

Three parts, four takeaways.

Why the layers, the jacket design, the record and the memory belong together.

PROTECT · LAYERS

Jacket, then filter

Bare rope lets ore dust in.

A jacket takes the wear.

A filter keeps the fine particles out.

PROTECT · DESIGN

A jacket built for the winch

Construction B, chosen on a full-scale winch: no cover failure up to 45 t.

KNOW · RECORD

Damage has an address

Log every damage by its position on the rope — then test and protect where the damage lives.

KEEP · MEMORY

WINZ keeps the history

One ID per line: certificate, hours, damage positions and repairs in one place.

In short

A rope is delivered on day one. Reliability has to hold in year three, year five and beyond.

Evidence: slides 4–10 of this presentation.

D|S|R

Protect the core.

Know the condition.

Keep the history.

Better evidence. Better decisions. Before failure.

Thank you

Take the details with you.

MARITIME CATALOGUE

Synthetic fibre ropes



Optimal Rope Solution — mooring, tug and towing lines. 14 pages, PDF.

PRODUCT DATA

Forcetra Stopper



HMPE mooring-line stopper — design, strength test and field test. 7 pages, PDF.

Scan with your phone camera. The codes open each PDF in Google Drive — no sign-in needed.