Duracordix Rope and Netting Successful Cases

1.Deep-Sea ITMA Aquaculture Net Cage & Mooring System Project

1) Project Background & Engineering Challenges

With the saturation of nearshore aquaculture space and growing environmental pressures, a major offshore demonstration project was launched in the open, high-energy waters of South Central Vietnam. Utilizing the advanced **ITMA (Integrated Multi-Trophic Aquaculture) model**, this grid system was designed for the simultaneous, multi-level farming of high-value pelagic species like Golden Pompano and benthic species like Lobster.

However, operating in an open-ocean, high-energy marine environment presented severe structural and operational challenges:

- **Typhoon & Cyclonic Wave Loads:** The project location is frequently hit by seasonal typhoons, generating destructive waves exceeding 8–10 meters. Traditional nearshore wooden or low-grade cages deform, collapse, or suffer mesh tearing, leading to catastrophic mass fish escapes.

- **Severe Biofouling Aggression:** In warm, high-salinity deep-sea currents, marine organisms such as barnacles, mussels, and macroalgae rapidly colonize underwater netting. This biofouling clogs mesh openings, restricts water exchange, drops dissolved oxygen levels, and drastically increases the hydrodynamic drag on the entire system.

- **Mooring Stress Concentration:** The ITMA model requires a highly structured, dense grid formation of multiple circular cages. Traditional steel wire ropes or low-grade polypropylene (PP) ropes degrade quickly under continuous tidal pulling and multi-directional wave currents, risking localized mooring line snapping that can cause domino-effect cage drift.

2) The DURACORDIX High-Performance Offshore Solution

To meet the rigorous spatial and structural demands of the subsea farm, **DURACORDIX** engineered an **all-synthetic integrated fiber solution** ranging from structural grid positioning to advanced anti-escape enclosure barriers.

Core Product Configuration

- **High-Strength Matrix Mooring Lines:** The main anchor lines securing the floating HDPE circular cages utilize **Duracordix 12-strand and 24-strand heavy-duty mooring ropes**. Materialized from premium UHMWPE/HMPE fibers, these lines provide an exceptionally high Minimum Breaking Load (MBL) while retaining superb elastic cushioning to absorb sudden

wave impacts.

- **Anti-Escape Framework Netting:** The main cage body is constructed with Duracordix ultra-high molecular weight polyethylene (UHMWPE) and modified high-tenacity polyester knotless netting. The fiber features near-zero water absorption and a low specific gravity, keeping the net lightweight and structurally stable under heavy currents.

- **Advanced Abrasion Protection:** Customized **heavy-duty polyester chafe protection sleeves** (available in distinct high-visibility yellow or black) are pre-installed around the eye splices and fairlead contact points. This sacrifices the protective outer layer to block structural friction against the rigid HDPE cage pipes, preserving the core rope's integrity.

3) Operational Results & Return on Investment (ROI)

Since its deployment at the Vietnam deep-sea facility, the integrated DURACORDIX system has delivered remarkable survival safety and operational cost-efficiency:

- **100% Typhoon Survival (Excellent Storm Resistance):** Thanks to the high fatigue resistance and superior strength-to-weight ratio of the DURACORDIX mooring lines, the entire aquaculture grid successfully withheld direct hits from local category-grade typhoons. Structural deformation remained under **3%**, with zero net tearing and zero stock escape.

- **Biofouling Mitigation (Maintenance Interval Extended by 3x):** The smooth, advanced polymer fibers make it incredibly difficult for barnacles and marine algae to anchor down. The net cleaning cycle has been successfully extended from the traditional "once every two months" to **once every 6 to 12 months**, slashing ROV (Remotely Operated Vehicle) underwater cleaning expenses by **65%**.

- **Eco-Friendly ITMA Alignment (Zero Heavy Metal Contamination):** The pure, high-performance

synthetic materials contain zero toxic chemicals or heavy-metal anti-fouling copper coatings. This ensures a pristine, organic habitat perfect for Golden Pompano and benthic lobsters, while the lightweight mooring setup allows for an optimal fluid water exchange, lifting localized dissolved oxygen levels by **12%** and accelerating the overall harvesting cycle.

2.Deep-Water FPSO Positioning & Long-Term Mooring System Upgrade Project (West Africa)

1. Project Background & Engineering Challenges

Operating in an active deep-water oil and gas field in West Africa, a massive floating production storage and offloading (**FPSO**) unit required a comprehensive upgrade to its existing spread mooring system, alongside localized adjustments and re-dragging of its crude oil overflow pipelines. Due to the region's relentless exposure to powerful ocean swells and deep-water upwellings, both the FPSO hull and its interconnected oil transfer lines were subject to severe fatigue stress under continuous cyclic loading.

Traditional steel wire ropes and heavy anchor chain systems exhibited three fatal flaws when applied to this ultra-deepwater project:

- **Buoyancy Loss due to Excessive Deadweight:** At a water depth of 1,500 meters, the deadweight of metallic mooring lines multiplies exponentially. This significantly drains the effective deck payload capacity of both the FPSO and its supporting offshore supply vessels (OSVs).
- **Severe Marine Corrosion & High Maintenance Overhead:** Traditional metal cables corrode and experience localized wire snapping rapidly when exposed to salt spray and aggressive deep-sea microbial environments, compromising the safety factor required for continuous, long-term operations.
- **High Snap-Back Risks in Conventional Layouts:** During pipeline dragging and auxiliary mooring alignment executed by OSVs, any sudden catastrophic snapping of an overloaded metal cable releases devastating kinetic energy. This recoil poses a fatal threat to deck crew members.

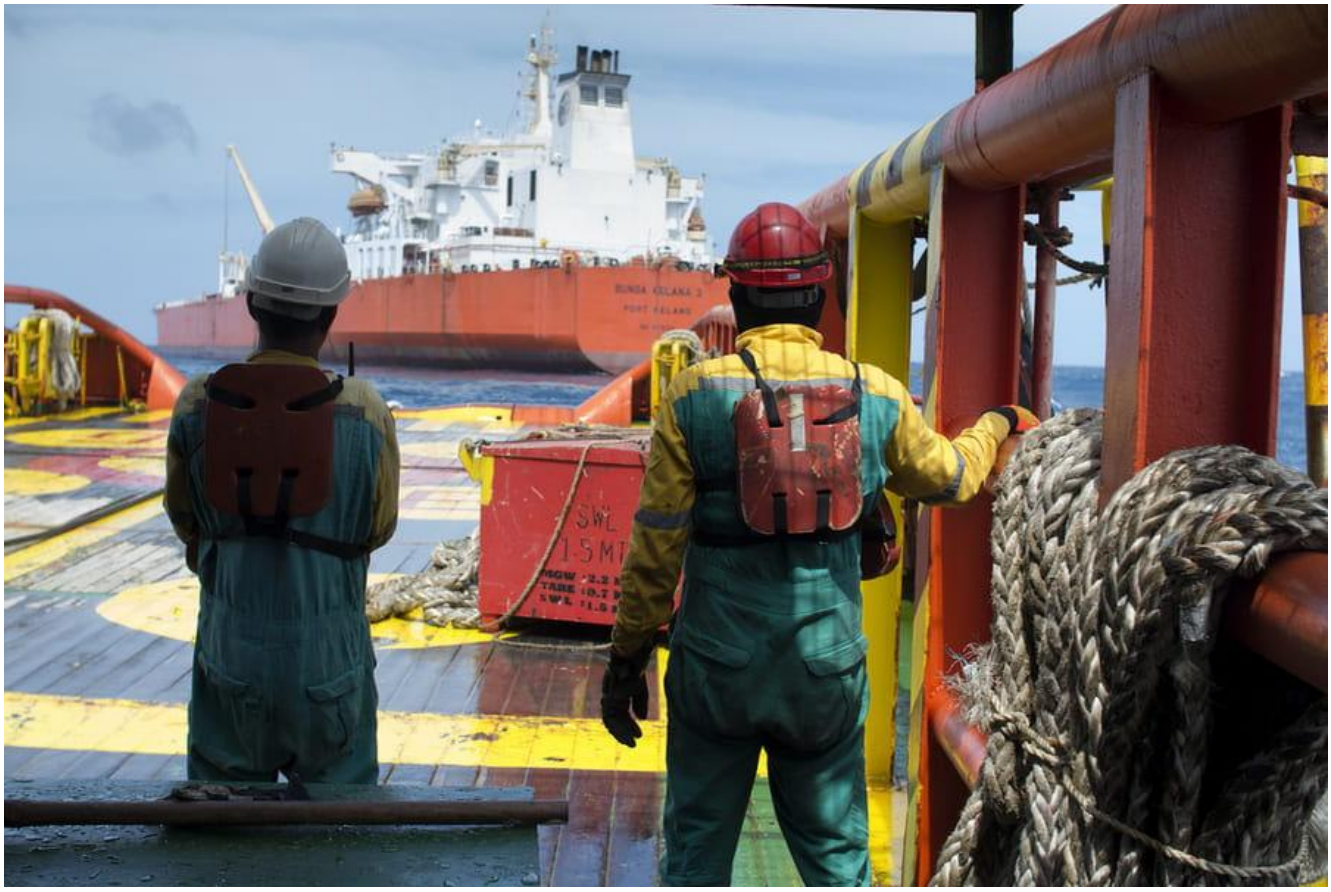
2. The DURACORDIX All-Synthetic Mooring Solution (The Solution)

To comply with the highly stringent deep-water regulatory mandates of the oil and gas field (fully adhering to **OCIMF MEG4** standards), the **DURACORDIX** engineering team developed a customized, integrated all-synthetic fiber solution for both **FPSO MOORING** and heavy-duty towing operations.

Core Product Configuration

- **Main Load-Bearing Mooring Lines:** The framework relies on Duracordix 96mm / 112mm double-braided Ultra-High Molecular Weight Polyethylene (UHMWPE/HMPE) high-performance mooring lines. These lines feature fiber molecular chains optimized via thermal pre-stretching to meet deep-sea low-creep requirements.

- **Abrasion Protection (Chafe Sleeves):** Addressing intense friction and rapid thermal build-up at fairleads and bitts, DURACORDIX engineered heavy-duty polyester chafe sleeves tailored exclusively for the sliding contact points. This sacrificial defense layer prevents wear while maintaining the lightweight advantage of the core line.
- **End Terminations:** The lines are outfitted with resin-poured sockets calibrated in-factory for 100% breaking strength retention, paired with large-diameter, DNV-certified subsea wide-body shackles to guarantee an optimal bending radius ratio



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3. Extreme Off-Road Recovery & High-Performance UHMWPE Winch Rope Project

1. Project Background & Recovery Challenges

During an off-road expedition and emergency rescue operation located in a humid tropical rainforest and muddy mountainous terrain, a heavy-duty 4x4 vehicle became severely bogged down and high-centered in a deep mud pit after its tires completely lost traction. The operational site was exceptionally hostile—the slick, heavy mud created massive, continuous dragging resistance, putting the vehicle's self-recovery and mutual-rescue winching systems under an incredibly rigorous test.

Traditional steel wire winch ropes expose catastrophic vulnerabilities under such extreme off-road recovery scenarios:

- **Fatal Snap-Back Hazards:** Under the high resistance of mud-pit dragging, traditional steel wire lines are highly susceptible to overloading and snapping. The tremendous kinetic energy released during a failure creates a violent snap-back effect that can smash through windshields or strike operators, causing fatal personnel injuries or devastating vehicle destruction.
- **Abrasive Mud Infusion & Internal Wear:** The gaps between the strands of a steel wire rope easily trap hard mud particles and grit. During repetitive winching and high-load cycling, these trapped particulates cause severe internal self-abrasion, leading to rapid rope degradation and premature failure.
- **Heavy and Hazardous Handling:** Steel cables are excessively heavy and prone to developing sharp barbs or splinters after extended use. In an urgent, muddy rescue setting, these barbs can easily puncture an operator's protective gloves and hands.

2. The DURACORDIX High-Performance Synthetic Solution (The Solution)

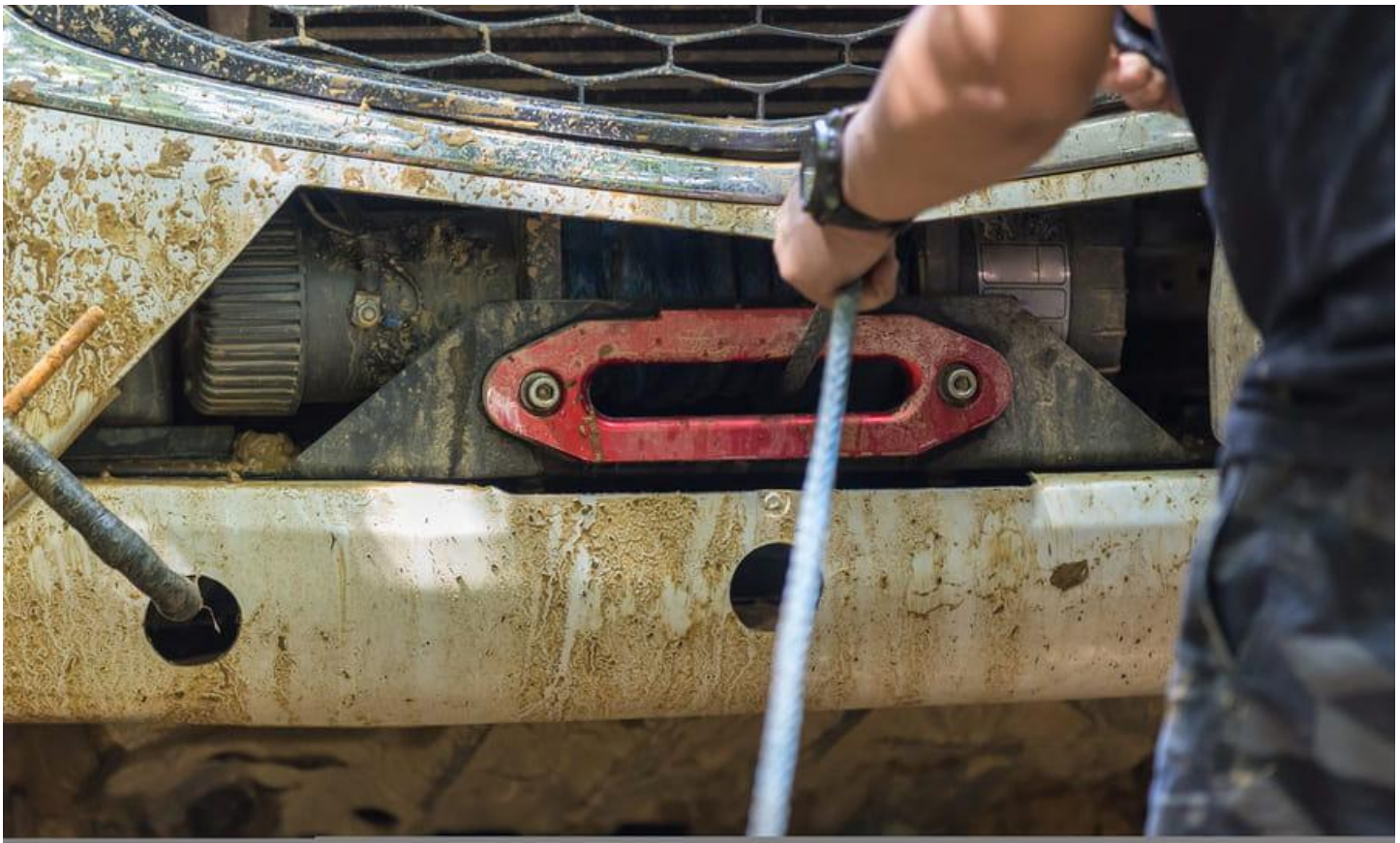
Engineered for the ultimate pursuit of lightweight performance and absolute field safety in off-road recovery, **DURACORDIX** equipped the vehicle with a high-performance **Ultra-High Molecular Weight Polyethylene (UHMWPE) synthetic winch rope system** to completely replace the traditional steel wire rope.

Core Product Configuration

- **Main Load-Bearing Recovery Line:** The system utilizes a **Duracordix 12-strand tightly braided UHMWPE synthetic winch rope**. While maintaining an ultra-compact diameter, it delivers a breaking strength that far exceeds equivalent steel cables, coupled with an exceptionally low elongation at break (approximately 3.5%).

- **Chafe Protection & Terminations:** A tightly woven abrasion-resistant sleeve is custom-fitted to the front end of the winch rope, specifically designed to withstand sharp friction from mud, silt, and jagged ground rocks. The terminal end features a high-strength spliced eye that is fully compatible with various heavy-duty off-road shackles and hooks.

- **Fairlead Compatibility:** The synthetic line is perfectly matched with an anodized red aluminum **Hawse Fairlead**. Its smooth, radiused edges drastically minimize frictional wear and heat buildup when pulling at oblique or off-angle directions.



3. Operational Results & Return on Investment (ROI)

By fully upgrading to the DURACORDIX high-performance synthetic winch rope, the off-road recovery operation achieved outstanding field results:

- **Zero Snap-Back Risk for Absolute Safety:** Even under extreme overloads resulting in a structural break, the DURACORDIX UHMWPE fibers do not store kinetic energy due to their unique physical properties. Upon failure, the line simply drops harmlessly to the ground, **completely eliminating the fatal threat of snap-back recoils** and providing an ironclad safety barrier for rescue personnel.

- **Ultra-Lightweight for Fast Single-Operator Deployment:** At identical strength thresholds, the DURACORDIX synthetic rope weighs **only about 1/8th of a traditional steel cable** and naturally floats on water. This allows an operator to easily pull the line single-handedly through knee-deep mud or raging torrents to secure a distant anchor point, boosting overall rescue efficiency by **300%**.

- **Excellent Silt and Abrasion Resistance:** The high-density, 12-strand self-locking braid design makes it incredibly difficult for abrasive silt and mud particles to penetrate into the core of the rope. When paired with the aluminum Hawse fairlead, frictional heat generation is kept at an absolute minimum, preserving the line's structural integrity over the long term and extending its operational lifespan by **2.5 times** compared to standard utility fiber ropes.

4. Harbor Tugboat Assist & High-Performance UHMWPE Towline Project

1. Project Background & Operational Challenges

Within a major international shipping hub and trade port, dozens of ultra-large container vessels, bulk carriers, and oil tankers enter and exit daily. Because these massive cargo ships possess extremely limited maneuverability when navigating narrow harbor channels or approaching berthing docks, they rely heavily on high-horsepower harbor tugboats to push, pull, and precisely assist with line handling.

In this round-the-clock, high-frequency, and high-load offshore collaborative environment, harbor tugboat operations face critical engineering challenges:

- **Extreme Dynamic Peak Loads:** When a massive cargo ship drifts due to sudden ocean swells, crosswinds, or complex tidal currents, the towline connecting the tugboat and the large vessel snaps taut instantly. Traditional cables frequently suffer catastrophic failure under these violent, localized peak tensions.
- **Severe Friction & High Heat Fusion:** As the towline is continuously spooled, paid out, and subjected to lateral pulling over the tug's main winch drum, fairleads, and the cargo ship's bitts, it undergoes intense mechanical and physical friction. This rapid friction generates extreme heat, which can easily cause surface fiber melting (heat fusion) and severe localized abrasion.
- **Hull Structural Damage & Heavy Labor Bottlenecks:** Previously, heavy steel wire ropes required multiple deckhands to exert immense physical effort just to handle and pass the lines. Furthermore, heavy steel cables continuously scraped the hulls of both the cargo ships and the tugboats, stripping away anti-corrosion marine coatings and accelerating steel plate rust.
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2. The DURACORDIX All-Synthetic Harbor Towing Solution (The Solution)

To address the strict maritime compliance mandates for **ultra-high breaking strength, exceptional shock absorption, and extreme lightweight properties** in high-frequency harbor operations, **DURACORDIX** developed a customized, all-synthetic offshore towing upgrade system.

Core Product Configuration

- **Heavy-Duty Marine Towing Line:** The core of the system relies on a **Duracordix 12-strand / 24-strand double-braided UHMWPE/HMPE high-performance main towline**. Optimized via industry-leading thermal molecular chain pre-stretching, this main line delivers a higher breaking strength than an equivalent steel wire rope while retaining superb kinetic energy absorption and cushioning reserves.
- **Sacrificial Flexible Chafe Sleeve:** To combat intense friction at the fairleads, **DURACORDIX heavy-duty thickened polyester chafe sleeves** are pre-installed at the highest-frequency contact zones. This sacrificial layer blocks sharp physical edge cutting without compromising the core line's ultra-lightweight and floating characteristics.
- **Premium Spliced Terminations:** The rope ends feature class-certified eye splices combining machine precision with expert manual craftsmanship to guarantee 100% strength retention. Finished with a soft protective leather lining, they fit seamlessly onto various types of tugboat main winches and cargo ship bitts.

3. Operational Results & Return on Investment (ROI)

By fully upgrading harbor tug lines to DURACORDIX high-performance synthetic fiber towlines, the port authorities and marine logistics operators achieved outstanding field results:

40% Increase in Berthing Efficiency: Because the DURACORDIX UHMWPE towline weighs only about 1/8th of a traditional steel wire rope and absorbs zero water, deckhands and line handlers can easily manage rope passing and shackle hookups single-handedly. This has cut line-handling time by more than 25 minutes per berthing operation.

Unrivaled Dynamic Shock Resistance: The optimized braiding matrix grants the line an exceptional fatigue lifespan when facing abrupt, heavy jerking forces caused by adverse harbor swells. Since the upgrade, the tugboat operations have established a flawless safety record of 15 consecutive months with zero snapped lines and zero rope slippage.

Reduced Fuel Consumption & Carbon Emissions: The ultra-light rope minimizes the deadweight on the tug's bow and reduces hydrodynamic drag caused by line sagging during towing operations. Data tracking shows this upgrade has helped tugboats save nearly 6% in fuel costs during high-frequency harbor maneuvering, aligning perfectly with the green, low-carbon port initiatives set by the International Maritime Organization (IMO).