



INERTRA™

Executive Overview

Patent Licensing: Interface Architecture for Operational Reliability

A business-oriented introduction to INERTRA™ patent-protected mechanical architectures and their operational cost relevance in high-vibration, cyclic load, and biomechanical environments. Covers portfolio summary, industry application, and licensing process. For qualified counterparty executive and program leadership review.

PATENTS:

US 9,422,969 B2 · US 8,398,349 B2 · US 8,226,158 B1

Issued U.S. patents · Inventor and owner of record: Allen Forrest Jackson · Licensed through Ireland Design Company, LLC

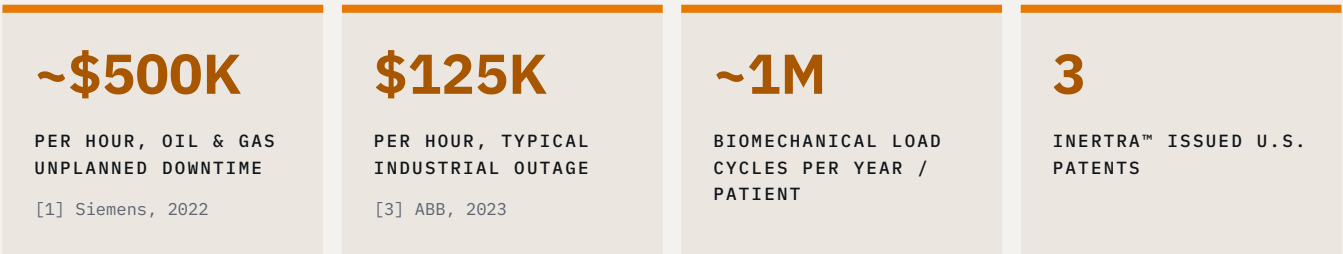
INTENDED AUDIENCE:

Operations Leadership · Program Management · Executive Teams · Business Development

01 • THE BUSINESS PROBLEM

Interface Failure Has a P&L Line.

Every industrial system with a bolted interface operating under sustained vibration or cyclic load carries an embedded cost variable. It appears across service schedules, warranty reserves, inspection overhead, downtime exposure, and lifecycle maintenance intensity. The root cause is mechanical: conventional fastening approaches are friction-dependent and preload-sensitive. In dynamic environments, both degrade.



Downtime figures are all-cause benchmarks, not specific to fastener loosening. Sources on page 5.

How Operations Sees the Problem

Downtime Cost	Oil & gas: almost \$500K per hour of unplanned downtime [1]. Heavy industry: about \$59M per year for a large plant [2]. Cross-sector: close to \$125K per hour for a typical industrial business [3]. Fastener loosening is one contributor to these totals.
Maintenance Intensity	Retorque campaigns, scheduled inspections driven by interface behavior, and field service variability all trace back to a single architecture decision made at program inception.
Warranty Exposure	Interface-driven field failures generate warranty claims, service escalations, and reputational cost that can exceed the engineering cost of solving the problem at the design stage.
Regulatory Risk	In medical (FDA 510(k)/PMA, ISO 13485), defense (MIL-SPEC), and rail (FRA) environments, interface integrity is a qualification and compliance variable, not just a reliability metric.

A Licensing Solution. Not a Product.

Ireland Design Company, LLC (IDC) is a U.S. patent licensing entity. It does not manufacture or distribute products. INERTRA™ is an architecture framework: a patent-protected approach to mechanical interface design, available to qualified OEM and integration partners through a structured field-of-use license.

For executive audiences: the value is not a component. The value is reducing a recurring cost variable embedded in your current service model before it appears in the field.

NO MANUFACTURING DEPENDENCY

IDC licenses the architecture. You build to it. No supply chain dependency on IDC.

STRUCTURAL, NOT CHEMICAL

A nut and an opposite-hand bolt lock against each other. Retention without adhesives. No cure variability.

PASSIVE FLOW CONTROL

INERTRA™ Flow: no active systems and no power consumption.

FIELD-OF-USE LICENSE

License scoped to your application: specific industry, product category, and commercialization path.

SERVICEABLE BY DESIGN

Controlled disengagement across service cycles. Compatible with standard field maintenance procedures.

BOTH FAMILIES AVAILABLE

Retention (vibration / cyclic / biomechanical) and Flow (vapor / mist dispersion), separately or combined.

Patent Portfolio: 3 Issued U.S. Patents

US 9,422,969 B2

Locking System: Primary Retention Patent, Industrial and Medical

Continuation-in-part of US 8,398,349. The primary patent for both industrial and medical licensing, including orthopedic fixation, surgical systems, and biomechanical loading environments.

US 8,398,349 B2

Locking System and Method of Using Same: Parent Retention Patent, Industrial

Addresses rotational back-off and preload decay in heavy equipment, wind energy, military ground vehicles, rail, and industrial automation environments. Licensed for industrial applications.

US 8,226,158 B1

Vehicle Mist Suppression Apparatus: Flow Program, Commercial Transportation

Frame-mounted housing that reduces wheel spray and aerodynamic drag, with no active systems. Licensed separately.

03 • APPLICATION INDUSTRIES

Six Industries. One Root Cause.

The physics of preload decay and rotational back-off appear wherever bolted interfaces operate under sustained dynamic load. What changes is the cost per event and the access cost to correct it.

OFFSHORE ENERGY & OIL/GAS

Nacelle, hub, and tower flange interfaces in offshore wind. Pumps, compressors, and skid-mounted systems in oil & gas. Vessel and crane access only. Offshore wind turbines average 8.3 failures per turbine per year [4]; oil & gas downtime runs almost \$500K per hour [1].

RAIL & TRANSPORTATION

Bogies, axles, commercial highway vehicles. Millions of oscillatory load cycles per year. Both INERTRA™ families apply.

AEROSPACE & DEFENSE

High-reliability structural interfaces. AS9100, DO-160, MIL-SPEC qualification environments. Serviceability non-negotiable.

HEAVY EQUIPMENT & DEFENSE

Mining, construction, and military ground vehicles. Shock loads, extreme vibration. A large heavy-industry plant loses about \$59M per year to unplanned downtime [2].

INDUSTRIAL AUTOMATION

Drives, gearboxes, and precision assemblies. High-cycle resonance. OEE impacted by interface-driven unplanned downtime.

MEDICAL & BIOMECHANICAL

Orthopedic fixation and implant systems. ~1M physiological load cycles per year. FDA 510(k)/PMA. ISO 13485.

04 · LICENSING PROCESS

Structured. Qualified. Controlled.

Engagement follows a defined intake-and-validation path. Each stage exists to qualify technical fit and commercial alignment before resource commitment on either side.

STEP 1 Technical Fit Submit application context. IDC evaluates architecture relevance and commercial alignment.	STEP 2 NDA Execution Mutual NDA enables confidential claim mapping and detailed engineering materials exchange.	STEP 3 OEM Validation Licensee evaluates fit against duty cycle, vibration profile, and integration constraints.	STEP 4 License Agreement Field-of-use license structured for the specific application and commercialization path.
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BEGIN EVALUATION

If the Problem Is Real, the Conversation Is Worth Having.

Engagement is for organizations where interface-level degradation is a material operational and engineering variable, not general product inquiries. Bring application context, a real failure mode, and an internal evaluation path.

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Trademark	INERTRA™ is a trademark of Timothy J. Fore, used under license by Ireland Design Company, LLC. A patent license does not include trademark rights.
Website	ireland-design.com
Note	IDC does not manufacture or distribute products. All implementations, testing, validation, and regulatory approvals are the responsibility of the licensee.

SOURCES

1. Siemens / Senseye, *The True Cost of Downtime 2022*. Oil & gas: almost \$500,000 per hour of unplanned downtime; \$149M per facility per year.
 2. Siemens, *The True Cost of Downtime 2024*. Large heavy-industry plant: about \$59M per year; Fortune Global 500: about \$1.4 trillion per year, 11% of revenue.
 3. ABB, *Value of Reliability* survey, October 2023 (3,215 plant maintenance decision-makers). Typical business: close to \$125,000 per hour.
 4. Carroll, McDonald & McMillan, "Failure rate, repair time and unscheduled O&M cost analysis of offshore wind turbines," *Wind Energy* 19(6), 2016, pp. 1107-1119. doi:10.1002/we.1887.
- All figures are all-cause downtime or failure benchmarks, not specific to fastener loosening. Full links: ireland-design.com/economics.html#sources