# Hull Integrity Management

## Digital Hull Tracking application

Oil and Gas Industry

### Deployment:

- Platform Deployment
- Reality Capture AI
- Computer Vision Post Processing
- Outputs Delivering

### Technologies:

- Measurement Points
- Planner
- AI Image Analytics

Floating, Production, Storage, and Offloading units (FPSOs) have become popular for offshore oil and gas production due to their **flexibility, cost-effectiveness, and ability to operate in various conditions.** Nevertheless, FPSOs are constantly exposed to harsh environmental conditions, where mechanical stress, impacts, or structural fatigue increase their susceptibility to corrosion, as well as heighten their vulnerability to deterioration over time.

Integrity concerns in FPSOs primarily revolve around the **hull area**, where corrosion, pitting, welding, and other anomalies can occur. Typically, addressing these challenges involves the **manual analysis** and interpretation of **extensive technical reports** and **rope access** techniques for integrity assessments, which raises safety concerns for the workforce. The result is a time-consuming, often costly process, associated with elevated Health, Safety and Environment (HSE) risks.

## Challenges

- Obstacles to viewing, locating, mapping, and quantifying anomalies, critical areas, and repairs to fulfill structural protection
- Data management, inspections, and repairs are carried out in non-intuitive generalist systems.
- Exposure to hazardous environments due to the necessity of rope access techniques for assessment.

## Objectives

- Use of **AI Computer Vision** to map, quantify, and classify **potential discontinuities, pitting, and critical corrosion points.**
- **Support** for the engineering and structural integrity team
- Generation of **Integrity notes on the CMMS** system of the company
- **Reduction of People on Board and rope access** techniques necessary for the integrity assessment

## Results

- **Zero rope access** for the integrity assessment
- Only **2 days onboard** are required for reality capture with drones
- **Positive impact** on health, safety, and environment (HSE)
- **90% precision** on visual anomaly detection using the **Artificial Intelligence Computer Vision**
- Identification and classification of **4 different visual anomalies:** pitting, potential discontinuities, welding, and corrosion, in **less than 30 days.**

## Solution

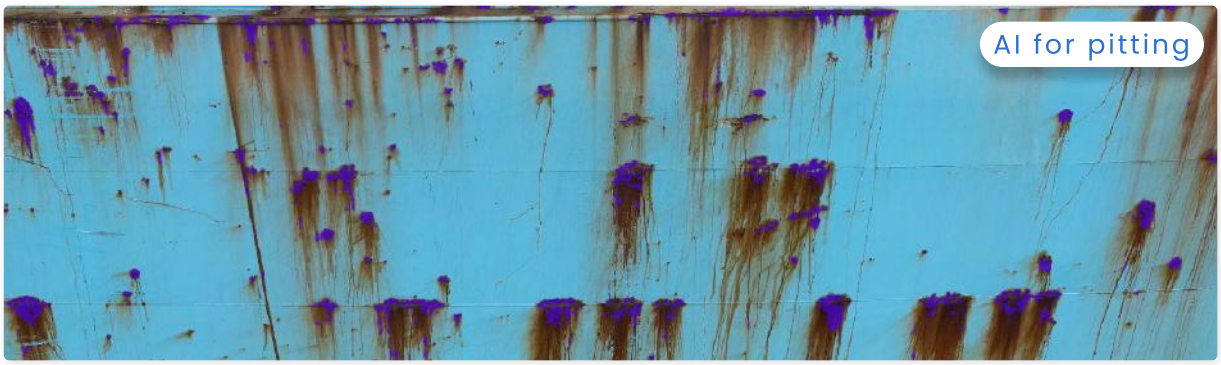
In the pursuit of a solution able to increase the control of assets, as remotely or virtually as possible, with data-driven insights, Vidya, a Brazilian scale-up **specialized in Artificial Intelligence software** with hardware and engineering experience, has developed a platform with specific applications tailored for **corrosion management within the Oil and Gas sector.**

The **Digital Hull Tracking** application is one of these applications. More than just mapping anomalies, the solution **reduces POB** in the inspection phase, enhances **control over temporary repairs**, and **monitors the evolution of structural degradation** over time. This is how we do it in 30 days or less:

The Vidya team starts the application by **contextualizing** reports, documents, technical drawings, and other kinds of data in a **3D environment.** Subsequently, Vidya's team made a **reality capture in 2 days on the field**, to capture images from the superficial area of the hull.

The images captured are **processed by the AI Computer Vision,** a model developed and trained by Vidya, which autonomously identifies anomalies such as **pitting, welding, potential discontinuities, and corrosion** using Deep Neural Networks. The AI evaluates the visual anomalies in each hull plate based on the company's business rules, such as:

- Coating condition and general corrosion evaluation
- Rust degree
- Deepness level of corrosion
- Pitting evaluation and number of pitting spots
- Deformation evaluation and number of deformation spots
- Number, length, and orientation of potential discontinuities

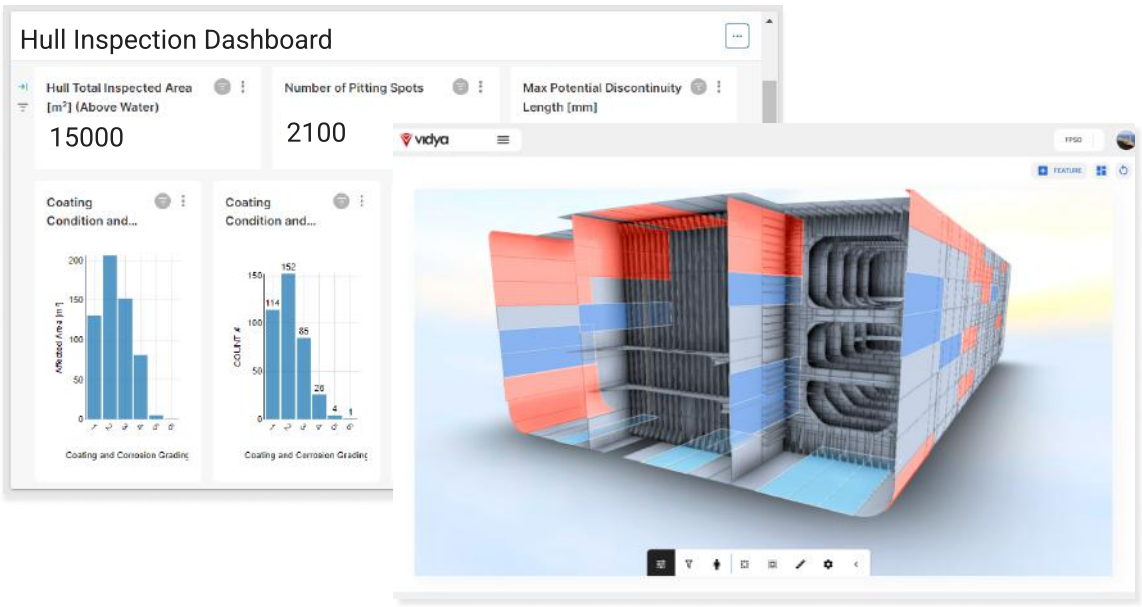




The AI Computer Vision is then able to **map, classify, and identify** the number, area, and length of potential discontinuities, corrosion, welding, and pitting spots with its grade classified based on the **ABS Hull Inspection Grading Manual.** This information is then used on an **AI risk and prioritization matrix,** which systematically makes a rank of risks according to the severity and criticality founded on the asset.

Using the AI outputs, coating and maintenance plans are generated, which include **components, affected area, area to be painted, locations, and prioritizations.** In addition, to facilitate the analysis and prioritization of activities, the platform has a **3D environment** with all the crucial data to optimize the repair scope of work delivered on a **customized dashboard,** supporting an auditable and traceable maintenance process. The dashboard includes information such as, but not limited to:

- The total external area of the hull in square meters
- The total area of coating condition and general corrosion affected
- The total potential discontinuity length
- The total inspected area
- Number of Pitting Spots
- Number of Potential Discontinuity




The result is an AI-driven application with all the hull inspection records delivered to the client's CMMS in 30 days. With the Digital Hull Tracking solution, it's possible to:

- Provide **accurate data** for class society RBI to **optimize inspection** campaigns
- Consolidate deadlines and extension intervals with **planning and mapping tool**
- **Support** for the class society evaluation
- **Reduce rope access** for hull inspection and the general number of **PoB** (People on Board)
- Enhance **control over temporary repairs**
- **Monitor the structural degradation** of the hull over time
- Digital Management of the hull inspection on a **visual dashboard**