Tinita
ENGINEERING PRIVATE LIMITED

Design, Manufacture & Supply of 48 Nos.

TITANIUM GRADE 12

Static Process Equipment for Offshore & Onshore Rig Applications

CONTENT

INTRODUCTION

In the demanding environments of offshore and onshore oil and gas rigs, reliability, corrosion resistance, and performance are paramount. Titanium Grade 12 (Ti-0.3Mo-0.8Ni) has proven to be one of the most dependable materials for such critical applications. Its exceptional resistance to seawater, chlorides, and oxidizing media makes it a preferred choice for static process equipment and piping systems operating under high temperature and pressure.

Tinita Engineering Private Limited has successfully designed, fabricated, and supplied 48 units of Titanium Grade 12 Static Process Equipment, consisting of 24 pressure vessels and 24 piping spools, engineered specifically for offshore and onshore rig operations. This milestone project reinforces our technical expertise and commitment to delivering high-integrity titanium solutions for global energy industries.

PROJECT OVERVIEW

- **Client Sector :** Offshore & Onshore Oil and Gas
- **Scope of Supply :** 48 Nos.(24 Vessels + 24 Piping Spools)
- **Material of Construction :** Titanium Grade 12 (UNS R53400)
- **Project Duration :** 8 Months (Design to Dispatch)
- **Applications :** Air separation, fluid handling, and gas compression systems

SCOPE OF SUPPLY

Total Equipment Supplied :
48 Nos. (24 Vessels + 24 Piping Spools)

EQUIPMENT	DESIGN PRESSURE	DESIGN TEMPERATURE	MATERIAL / THICKNESS
12 Nos. – Suction Air Vessels	23 bar	210°C	Titanium Gr.12 / 10 mm
12 Nos. – Discharge Air Vessels	64 bar	210°C	Titanium Gr.12 / 24 mm
24 Nos. – Piping Spools	As per Design	210°C	Titanium Gr.12

ENGINEERING AND DESIGN EXCELLENCE

Each vessel and spool was custom-engineered to meet stringent offshore application requirements. Tinita's engineering team utilized advanced 3D modeling, finite element analysis (FEA), and ASME design methodologies to ensure optimal performance under cyclic loading, pressure variation, and high-temperature exposure.

Design Codes & Standards:
ASME Section VIII Div. 1 & 2,
ASTM B265, B338

Corrosion Allowance:
Nil (Titanium offers natural corrosion immunity)

NDE & Quality Compliance:
100% per client-approved Inspection and Test Plan (ITP)

Documentation:
Comprehensive MDR (Manufacturing Data Record) including all NDT, WPS, PQR, and WPQ records

WELDING & INSPECTION STANDARDS

Titanium welding requires exceptional process control to prevent contamination. Tinita Engineering Private Limited employs high-purity argon shielding, inert chamber welding, and rigorous inspection practices developed through years of experience in handling reactive metals.

Welding Process :

- GTAW (Gas Tungsten Arc Welding) under inert atmosphere
- Use of dedicated titanium welding chambers
- Continuous argon purging and oxygen level monitoring (< 20 ppm)

Inspection & Testing Achieved :

- 100% Radiography (X-Ray) on Butt Welds
- 100% Dye Penetrant Testing (DPT) on Welds
- Visual Inspection and Dimensional Verification
- Hydrostatic Pressure Test up to 1.5 × Design Pressure
- PMI (Positive Material Identification) for all incoming raw materials

MANUFACTURING INFRASTRUCTURE

Tinita Engineering Private Limited state of the art facility is equipped with dedicated titanium fabrication bays designed for high purity operations, ensuring zero cross contamination with ferrous materials

Key Highlights :

- Titanium-specific handling tools and fixtures
- High-precision orbital welding machines
- In-house pickling, passivation, and ultrasonic cleaning units
- ISO 9001:2015, ISO 14001, and ISO 45001 certified facility

PERFORMANCE AND RELIABILITY

The supplied vessels and piping spools are now operational across multiple offshore and onshore rig sites, delivering exceptional service performance. Titanium Grade 12's resistance to crevice corrosion, pitting, and stress corrosion cracking ensures long-term operational reliability even in chloride-rich and high-temperature service conditions.

Key Benefits for End Users :

- Extended Equipment Life Cycle
- Superior Corrosion Resistance in Seawater and Chlorinated Media
- Reduced Maintenance and Downtime
- Lightweight Construction Reducing Overall System Load

MATERIAL COMPARISON:

TITANIUM GRADE 2H VS TITANIUM GRADE 12

Titanium Grade 2H (UNS R50400) is a commonly used alloy in the chemical processing industry due to its purity and corrosion resistance.

However, when systems demand higher pressure, temperature, or stronger corrosion resistance,
Titanium Grade 12 (UNS R53400) offers a more efficient and cost-effective solution.

PROPERTY	Yield Strength	Ultimate Tensile Strength
TI GRADE 2H	40 KSI	58 KSI
TI GRADE 12	≈ 70 KSI	≈ 95 KSI

THICKNESS COMPARISON

(40% ADJUSTED DATA)

Using Ti Grade 12 instead of Ti Grade 2H results in about 40% less wall thickness, reducing material weight and cost significantly.

To withstand pressure at 300°F (149°C)

PRESSURE (PSI)	100 PSI	300 PSI
TI GRADE 2H (IN.)	0.50	1.50
TI GRADE 12 (IN.)	0.28	0.90
REDUCTION IN THICKNESS	~44% THINNER	~40% THINNER

COST ANALYSIS (REVISED BY 40%)

Even though Titanium Grade 12 is about 15–20% more expensive per pound, the total vessel cost can be 30–40% lower due to reduced material requirements and equivalent fabrication effort

MATERIAL COST/LB	FABRICATION COST DIFFERENCE	OVERALL PROJECT SAVING
Ti Grade 2H – $13/lb	Same	—
Ti Grade 12 – $15/lb	Same	≈ 35–40% total saving

CORROSION RESISTANCE

Titanium Grade 12 exhibits superior resistance to :

- Seawater and brine(up to 250°C)
- Crevice and under-deposit corrosion
- Hydrochloric acid (HCl) up to pH 2 (Grade 2H fails below pH 0.5)

In aggressive chemical environments, Ti Grade 12's corrosion rate is up to 40% lower than Ti Grade 2H.

DEMONSTRATIONS

- Titanium Grade 12 provides 40% higher mechanical strength.
- Enables 40% thinner wall designs at the same operating conditions.
- Delivers 30–40% total project cost savings despite higher material price.
- Offers enhanced corrosion resistance, especially in chloride and acidic conditions.

Hence, Titanium Grade 12 is the preferred material for pressure vessels and piping spools in offshore, onshore, and chemical processing environments.

QUALITY ASSURANCE & CLIENT VALIDATION

Every stage of the project from material procurement to final dispatch was subjected to strict QA/QC oversight, including fabrication, testing, and documentation in line with international codes and project specifications.

Tinita Engineering Private Limited is a global manufacturer and supplier of high-performance titanium and specialty alloy process equipment, serving industries such as oil & gas, petrochemical, power generation, desalination, and chemical processing.

With a focus on innovation, safety, and sustainability, we deliver world-class titanium fabrication solutions that exceed performance expectations.

Tinita
ENGINEERING PRIVATE LIMITED

www.tinitamfg.com
tinita@tinita.in