CASE STUDY: Reinstatement of Polypropylene Plant – High Pressure Blow Down Vessel

Emergency Fabrication of a 145-Metric-Ton Pressure Vessel Under Tight Schedule and Complex Design Constraints

Project Snapshot

Industry: Petrochemical / Pressure Vessel Fabrication
Location: Yanbu, Kingdom of Saudi Arabia
Client: NATPET (National Petrochemical Company) / Tecnimont
Fabricated By: Hidada Ltd., Jeddah, KSA
Challenge: Post-explosion plant reinstatement requiring urgent fabrication of a complex, heavy-wall pressure vessel under an exceptionally tight engineering and delivery schedule.
Result: Successfully designed, fabricated, inspected, and delivered a code-compliant 145-metric-ton High Pressure Blow Down Vessel to reinstate plant operations.

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1. Opening Hook – The Challenge

In 2018, a significant explosion at NATPET's polypropylene facility in Yanbu, KSA forced a **complete plant shutdown**, halting production and creating enormous financial and operational pressure to restore operations as quickly as possible.

Three critical pressure vessels were damaged beyond repair and needed to be **replaced with newly fabricated equipment**. All three—**D-601, D-602, and D-603**—were awarded to **Hidada Ltd.**, with D-601 representing the most complex and demanding fabrication challenge in the program.

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2. Problem Definition

The project carried three simultaneous and compounding challenges:

1. **Urgency:** Plant downtime directly translated to lost production revenue for NATPET, creating extreme schedule pressure across all engineering, procurement, fabrication, and inspection activities.
2. **Design Complexity:** D-601 featured a large inner diameter of **4,900 mm** and a tangent-to-tangent length of **14,000 mm**, fabricated from **SA-516 Gr.70N + S5** material with shell

wall thickness reaching up to **68 mm**—an extremely demanding design to execute with precision.

3. **Code Compliance:** The vessel was required to meet **ASME Section VIII Division 1, Edition 2017** with full **ASME stamp applicability**, demanding rigorous documentation, inspection, and quality assurance throughout.

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3. Our Approach

Engineering and Design

The vessel was designed by **Mohammad Bakr**, accounting for:

- High-pressure service duty in a blow-down application.
- Material selection appropriate for both service conditions and weldability at heavy wall thicknesses.
- ASME VIII Div.1 compliance for all design calculations, nozzle loads, and weld joint efficiencies.

The complexity of the design—particularly managing **heat input, distortion control, and mechanical properties** in 68 mm thick plate—required meticulous planning and engineering oversight before a single weld was made.

Procurement

Given the urgency, procurement of **SA-516 Gr.70N + S5 heavy plate**, flanges, nozzles, and ancillary materials was fast-tracked with careful attention to:

- Material traceability and certifications per ASME requirements.
- Supplier lead times compressed to align with fabrication windows.

Fabrication

Hidada's team executed fabrication under a compressed schedule while managing:

- **Heavy plate forming and rolling** at 68 mm thickness.
- Multi-pass **welding procedures** developed and qualified for thick-section vessel construction.
- Dimensional control across a 4,900 mm diameter, 14,000 mm long shell to maintain tolerances required by ASME code.

Inspection and Quality Assurance

Full ASME stamp compliance required:

- Rigorous **NDE (Non-Destructive Examination)** at all weld joints.
- Documentation of material certifications, WPS/PQR records, and hydrostatic testing.
- Third-party inspection aligned with client and code requirements throughout all fabrication stages.

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4. Results and Impact

Parameter	Details
Tag Number	D-601
Service	High Pressure Blow Down Vessel
Shipping Weight	145 Metric Tons
Inner Diameter	4,900 mm
TL/TL Length	14,000 mm
Shell Thickness	Up to 68 mm
Material	SA-516 Gr.70N + S5
Design Code	ASME VIII Div.1, Ed. 2017
ASME Stamp	Applicable

- **Plant reinstatement** achieved within the compressed schedule, enabling NATPET to restore polypropylene production.
- **All three vessels (D-601, D-602, D-603)** delivered by Hidada, meeting full ASME code compliance.
- The project demonstrated Hidada's capability to execute **complex, heavy-fabrication work** under demanding industrial conditions.

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5. Takeaway & Forward Value

This project is a testament to what a **skilled, committed fabrication and engineering team** can accomplish under extraordinary pressure. Managing a 145-metric-ton, 68 mm thick-wall vessel under emergency-driven timelines required:

- **Design precision** to handle complex load cases and code compliance.
- **Procurement agility** to source certified heavy materials rapidly.

- **Fabrication excellence** to maintain quality at heavy thickness under schedule pressure.
- **Inspection rigor** to achieve ASME stamp approval without compromise.

It is a privilege to have contributed to this achievement, and it stands as a benchmark for **emergency fabrication response** in critical industrial reinstatement programs.

Designed by: Mohammad Bakr | Fabricated by: Hidada Ltd., Jeddah, KSA