



CASE STUDY

High Volume Manufacturing of Large Hydraulic Cylinders Under Aggressive Lead Times

Oil and Gas (Offshore) Market | Lifting Application | Texas Hydraulics Custom Cylinder Solution

Executive Summary

Manufacturing large hydraulic cylinders at production volume under compressed schedules requires more than machining capacity.

It requires:

- engineering discipline
- procurement strategy
- inspection planning
- documentation control
- production-line execution
- relentless traceability management

Companies that master this do not simply build cylinders. They become indispensable partners to customers operating mission-critical equipment.

Customer Challenge

A major player in the heavy offshore lifting sector required the rapid production of 36 large-bore hydraulic cylinders for a high stakes, unique lifting application for oil and gas. Each cylinder weighed 4000+ lbs. fully assembled, featured bore diameters of 12 inches, and required strict compliance with customer specifications for:

- Full material traceability
- Stringent weld procedures
- Ultrasonic NDE (Non-Destructive Examination)
- High-pressure hydrostatic testing to 7500 PSI
- Critical design review and documentation control
- Accelerated delivery schedule of less than 20 weeks

The customer's existing supplier base could not meet the timeline.

The challenge was clear: deliver production-scale volume with prototype-level quality control.

Technical Requirements

- Large heavy wall, honed barrel assemblies
- High Strength chrome-plated rods
- Heavy-duty end caps and glands
- Multi-pass weldments requiring qualified WPS (Welding Procedure Specification)/PQR

(Procedure Qualification Record) compliance

- Pressure ratings exceeding 5,000 PSI
- Critical sealing surface tolerances

Quality & Compliance Requirements

- Mill certs for all pressure-containing materials
- Full heat-number traceability from raw material to final assembly
- ASNT Level II and Level III inspection oversight
- 100% UT (Ultrasonic Testing) and MT (Magnetic Particle Testing) designated components
- Weld mapping and inspection records
- Hydrotest documentation
- Final dimensional inspection reports
- Customer witness points during manufacturing, assembly, and testing

Commercial Requirements

- Full production run completed within 20 weeks

Manufacturing Challenges

Long-Lead Material Procurement

Large heavy-walled tubes, high strength chrome rods, large spherical bearings, and specialty seals created procurement risk.

2. Maintaining Traceability at Scale

Managing dozens of large components and assemblies simultaneously increased risk of material traceability confusion.

3. High NDE Volume

Inspection workload threatened to become the production bottleneck.

4. Shop Capacity Constraints

Large-cylinder machining, welding, and assembly competed for limited machining, crane, and floor capacity.

5. Documentation Burden

The customer required detailed manufacturing workbook that included all material certs, work order part check and measurement details, MP and UT inspector certs and inspection details, full hydrostatic pressure test detail for both extend and retract and paint certification.

Manufacturing Strategy

Phase 1: Parallel Procurement & Design Freeze

- Final design review completed within 72 hours
- Critical-path materials identified and ordered first
- Vendor capacity secured with strategic mills and forging houses, and processors
- Long-lead chrome rods, seals, and bearings reserved before release of full drawings



Phase 2: Serialized Material Traceability System

- Unique serialized traveler
- Heat number verification
- Receiving inspection validation
- Traveler linked routing documentation

Each weldment was tied back to:

- Welder qualification
- WPS used
- Inspection records
- NDE acceptance reports

Phase 3: Dedicated Production Line

Dedicated Resources Included:

- Large horizontal boring mills
- Large lathes
- CNC Weld stations
- NDE team scheduling blocks
- Dedicated assembly bay
- Reserved, offline hydrotest station

Phase 4: Embedded Quality Control

Hold Points Included:

- Material receipt verification
- Pre-machining dimensional validation
- Pre-weld fit-up inspection
- In-process weld inspection
- Final machining verification
- Assembly torque verification
- Hydrotest witness
- Final documentation release

Phase 5: Accelerated NDE Execution

Methods Used:

- Ultrasonic Testing (UT)
- Magnetic Particle Testing (MT)
- Liquid Penetrant Testing (PT)

Results at a Glance

Delivery Performance

Schedule

- First article shipped in Week 16
- Full production completed in Week 19
- Zero late deliveries

Quality

- Zero hydrotest failures
- Zero weld rework escapes
- 100% documentation acceptance by customer QA
- No traceability gaps identified



Business Impact

The customers expanded their relationship with Texas Hydraulics to include additional opportunities and recommendations for Texas Hydraulics as their preferred custom cylinder supplier.

Key Lessons Learned

1. Production Discipline Beats Heroics
Large-run success comes from disciplined process and systems—not firefighting.
2. NDE Must Be Planned as Production
Inspection cannot be treated as an afterthought
3. Traceability Must Be Designed into the Workflow
It cannot be added later.
4. Dedicated Capacity Protects Lead Time
Shared resources create scheduling challenges and increased timeline risk
5. Customers Buy Risk Reduction

Texas Hydraulics Advantage

Texas Hydraulics combines engineering expertise, vertically integrated manufacturing, and application-specific hydraulic design to deliver innovative solutions that reduce total system cost while improving performance in demanding operating environments.

