February 27, 2013

GATX Corporation

Reducing NAR's Through Tank Car Qualification

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Vice President
Railcar Engineering and Quality

Unless otherwise noted, GATX is the source for data provided

Agenda

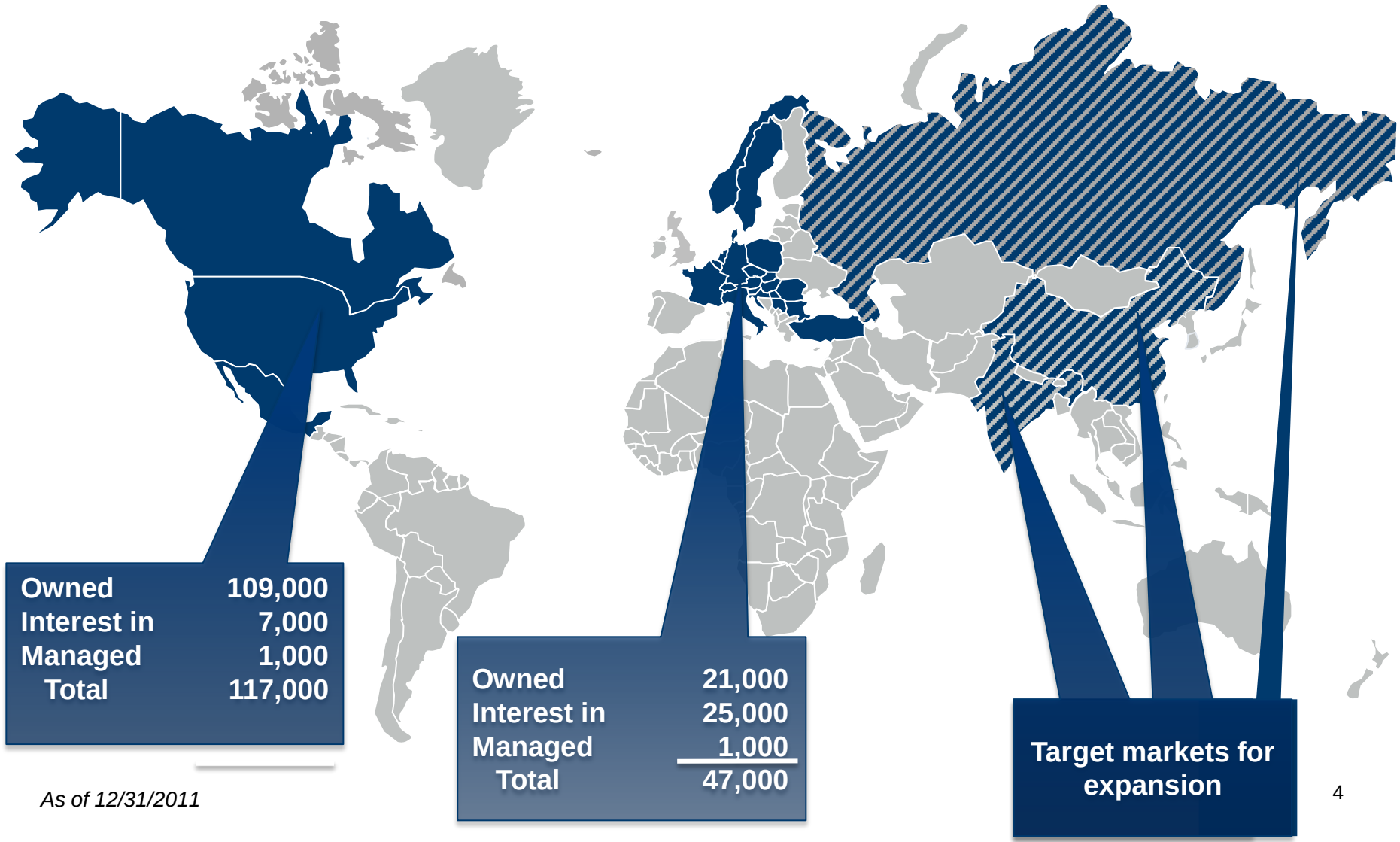
- Company Information
- Qualification Program Methodology
- Achieving results

Company Information

GATX Corporation strives to be recognized as the **finest railcar leasing company** in the world by: customers, shareholders, employees and communities where we operate.

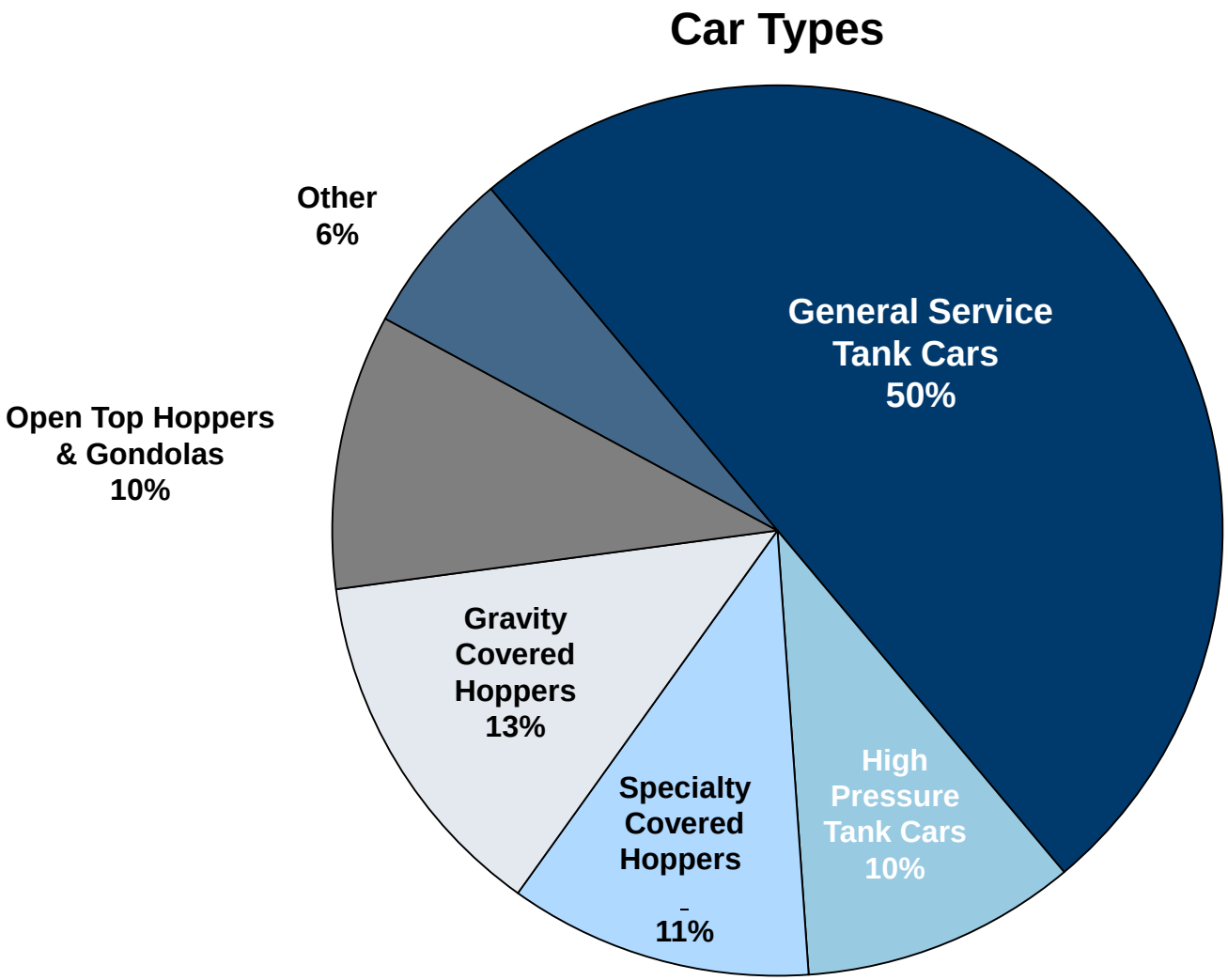
GATX Worldwide Railcar Fleet

GATX owns, manages or has an interest in approximately **164,000 railcars** worldwide



As of 12/31/2011

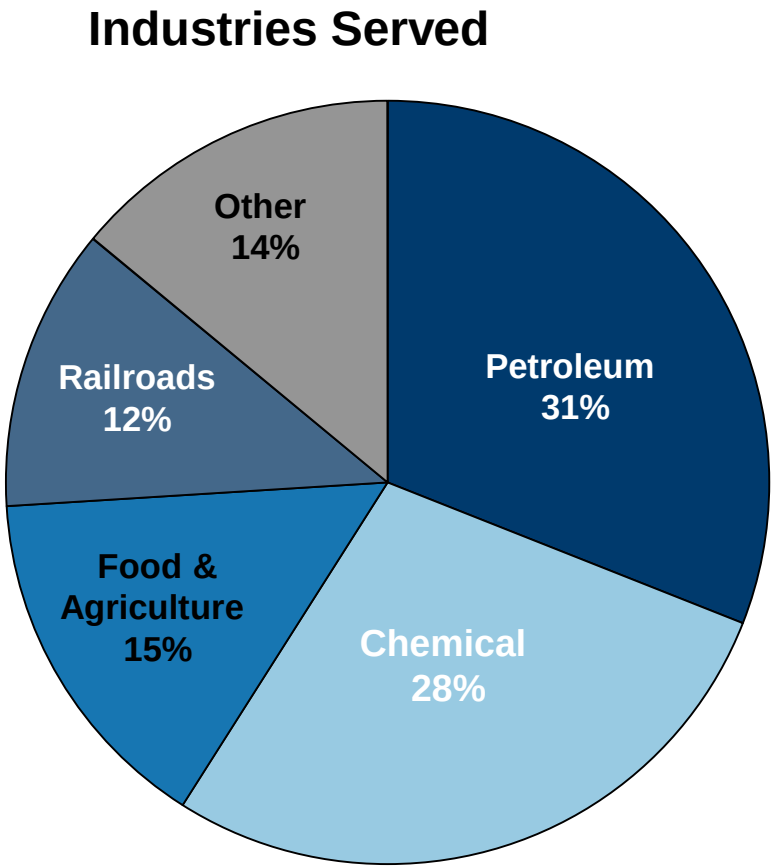
GATX Fleet Composition



Approximately 130,000 wholly-owned railcars *as of 12/31/11*

COMPANY INFORMATION

Rail has a diverse customer base with over **900 customers worldwide**



GATX Locomotive Group

- GATX owns, manages or has an interest in approximately 660 locomotives in North America
- American Steamship Company (ASC)
  - provides transportation of dry-bulk commodities on the Great Lakes including iron ore, coal, and limestone aggregates
- Portfolio Management
  - Invests selectively in domestic marine and container-related assets
  - Joint Ventures in Aircraft Engine Leasing and Marine

Qualification Program Methodology

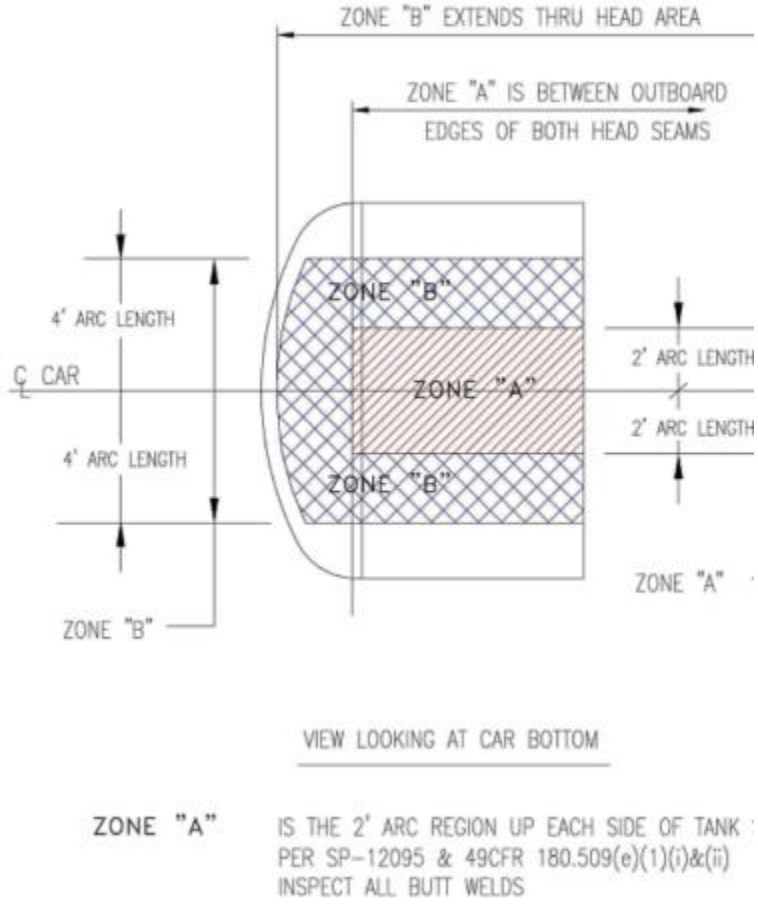
- Qualification – inspect and repair to a specification that ensures reliable performance over the qualification interval
- Key NAR Reduction Opportunities
  - Visual / Structural Integrity
  - Service Equipment
  - Lining / Coating / tank thickness
- Key qualification elements
  - Critical inspection points
  - test acceptance criteria
  - Test methods
  - Qualification intervals
  - Qualification procedures

Source: BENTEK

Structural and visual inspection 180.509 (d), (e)

Structural and visual inspection 180.509 (d), (e)

- Critical Inspection points
  - Structural Analysis



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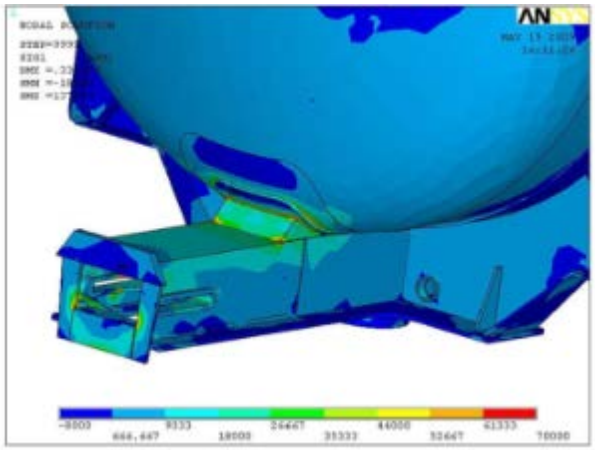
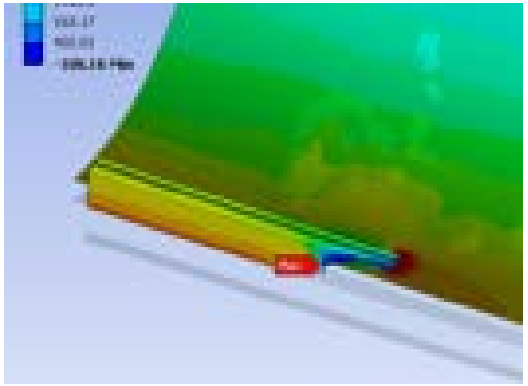
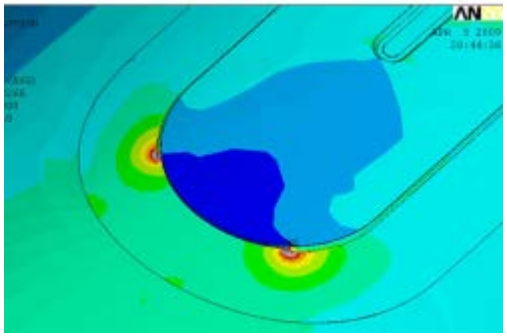
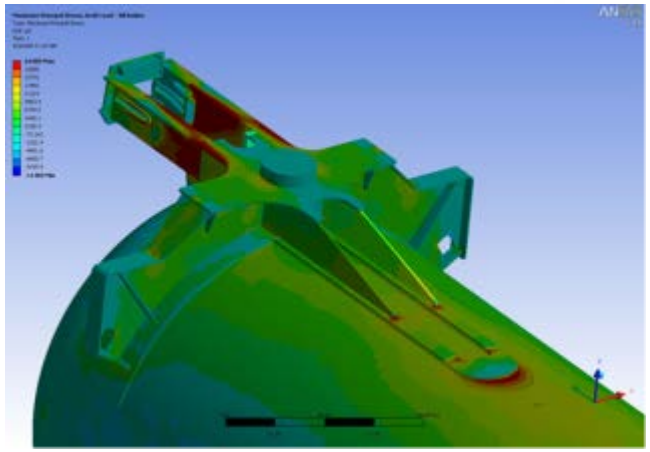
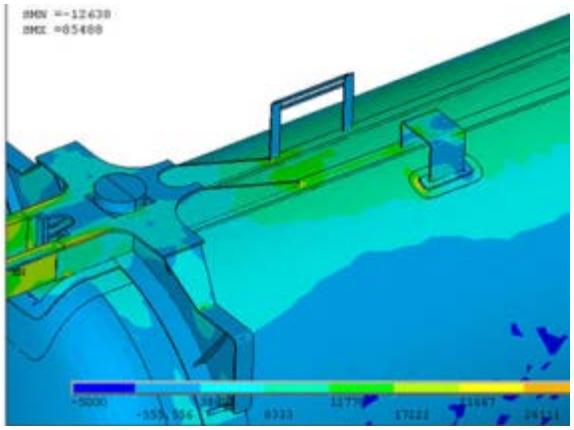
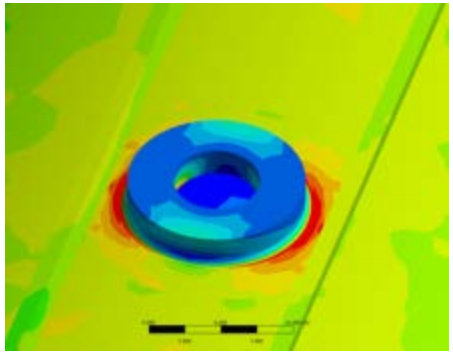












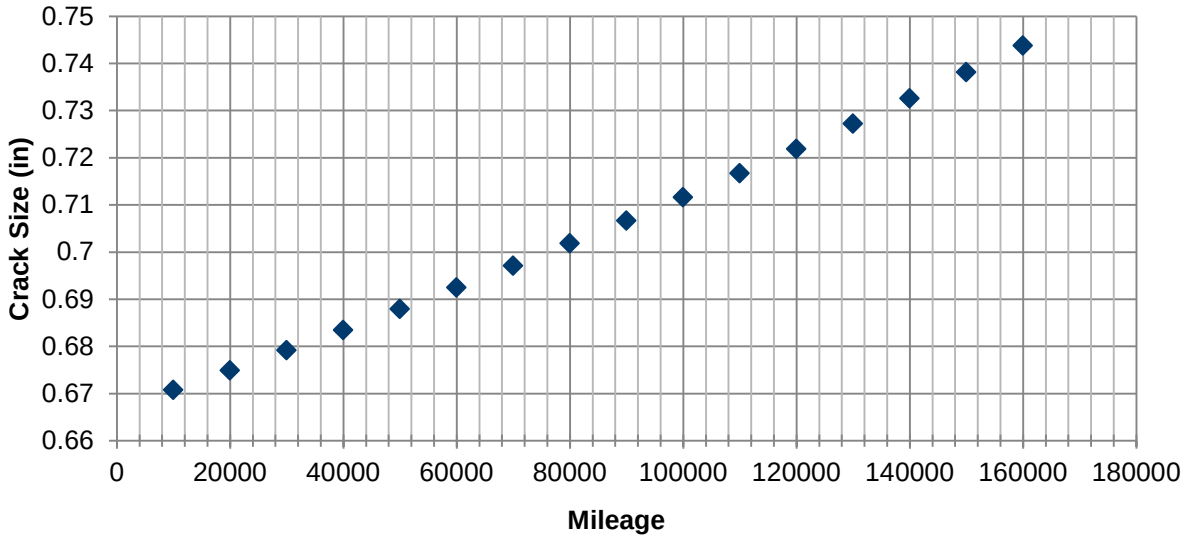
Source: BENTEK

Structural and visual inspection 180.509 (d), (e)

- Develop Test Acceptance criteria
  - Estimate critical Flaw size using fracture mechanics

$$K = (S_0F_0 + S_1F_1)\sqrt{\pi a} \qquad (2)$$

Where K = stress intensity at crack tip.
S0 = membrane stress.
S1 = bending stress.
F0 = geometry correction factor applicable to membrane stress.
F1 = geometry correction factor applicable to bending stress.



Source: BENTEK

Structural and visual inspection 180.509 (d), (e)

- Identify Appropriate Test Methods
  - POD Studies

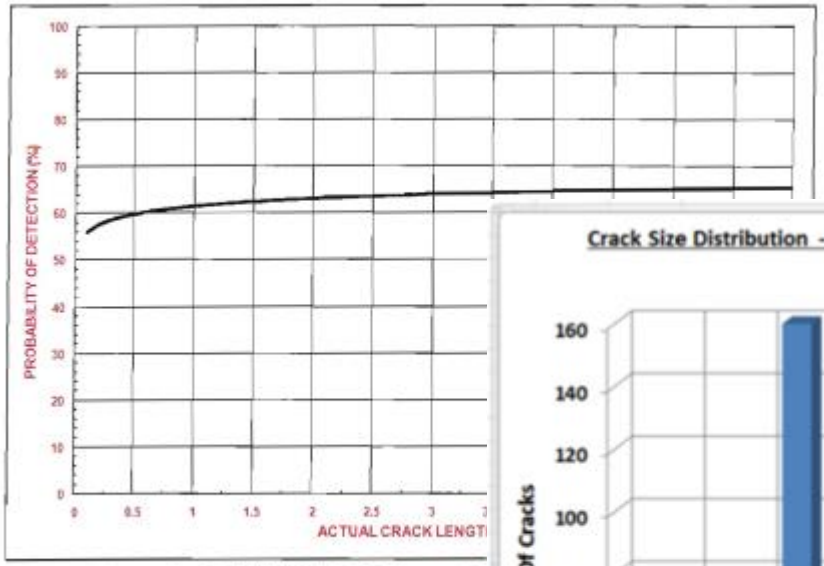
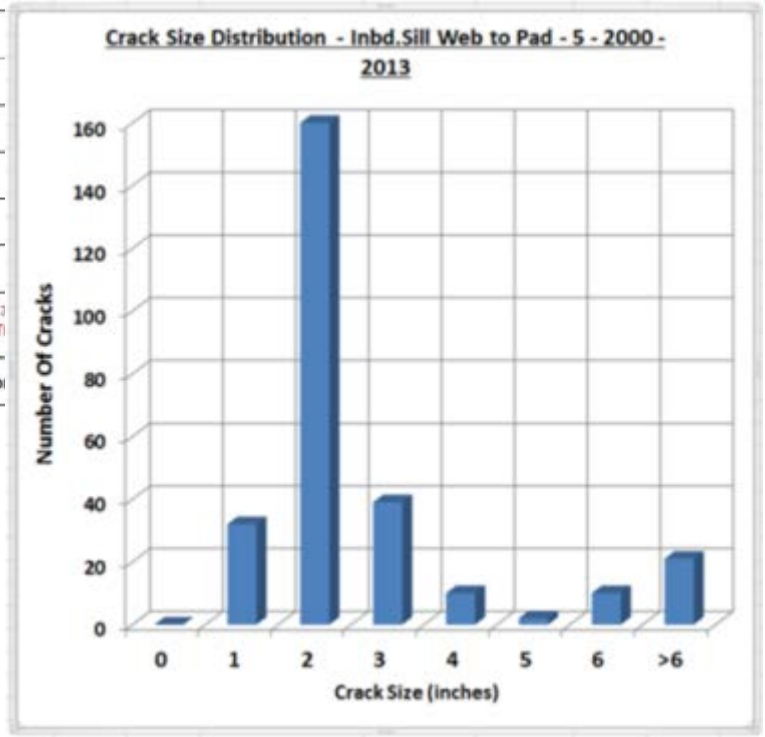


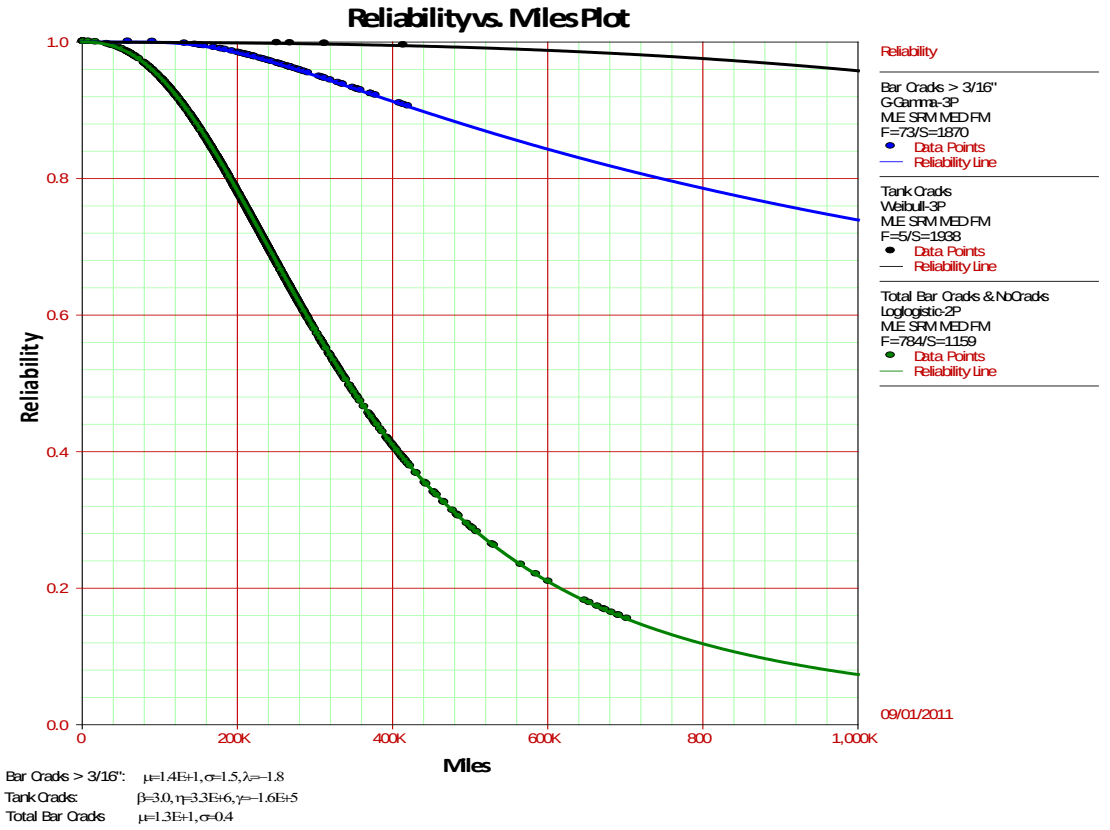
Figure 13. DVT Fillet Weld POD Average fo



Source: BENTEK

Structural and visual inspection 180.509 (d), (e)

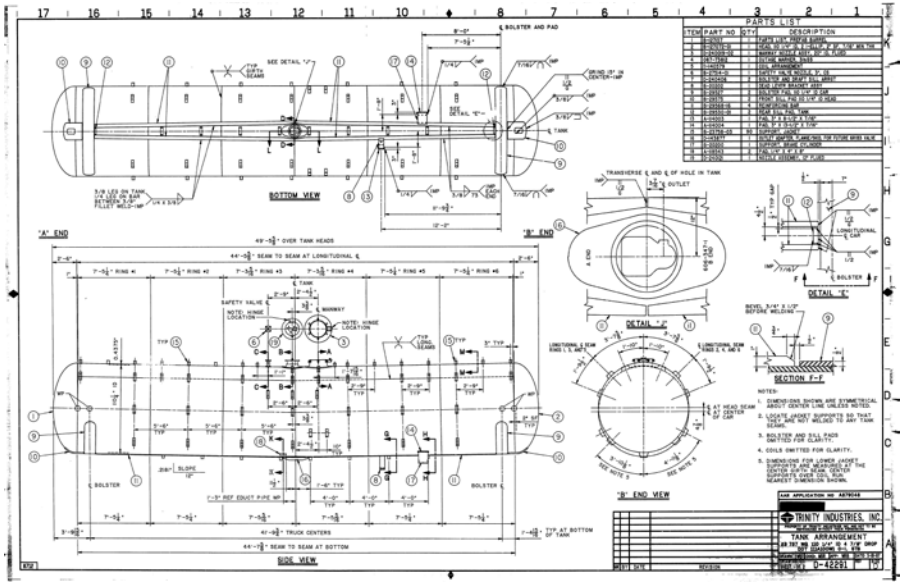
- Verify qualification cycle
  - Statistical reliability analysis



Source: BENTEK

Structural and visual inspection 180.509 (d), (e)

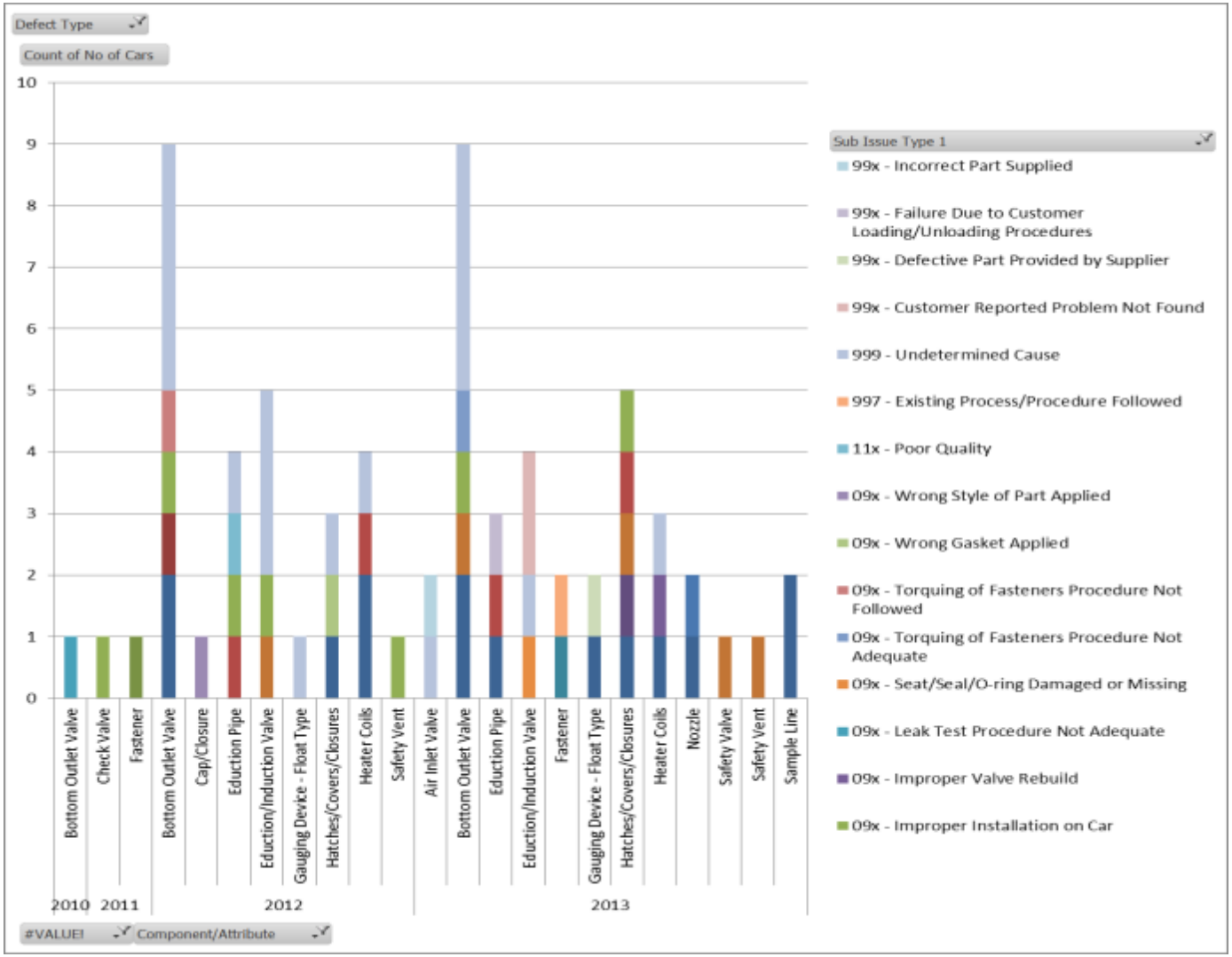
- Qualify
  - Inspect at the critical locations using proper NDT methods and acceptance criteria
  - Repair defects or damage found
  - Restore to original construction or prescribed design modifications



Source: BENTEK

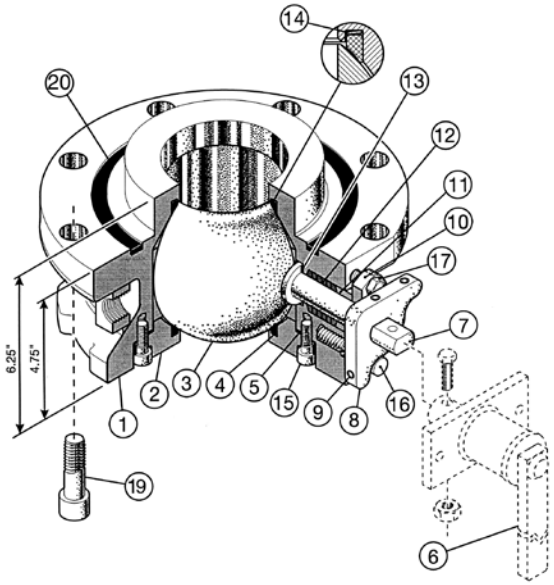
Service Equipment 180.509 (k)

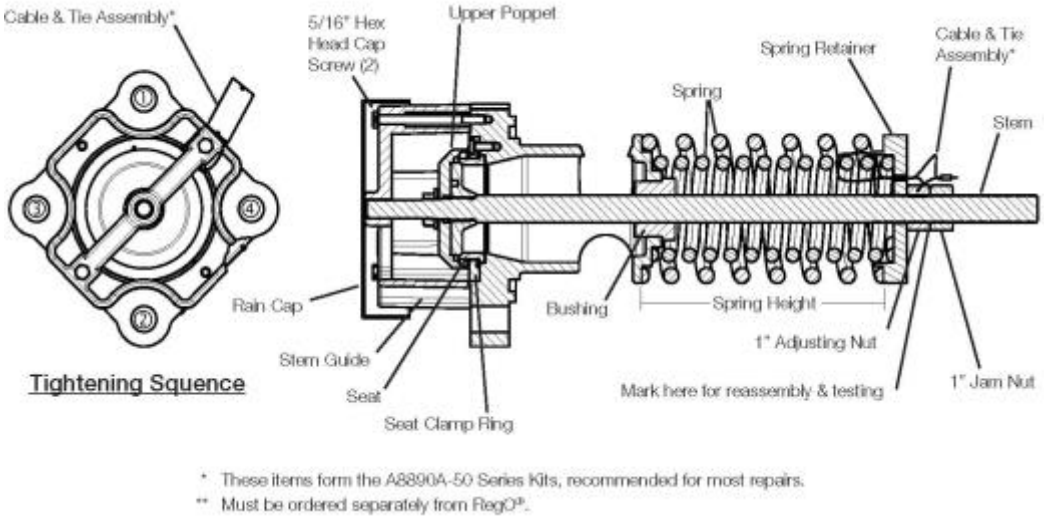
- Service Equipment



Service Equipment 180.509 (k)

- Critical Inspection Points
  - Begin with OEM recommendations
  - Supplement with in-service failure data
    - Bad orders (including OTMA's, customer rejects, NAR's)
    - 3rd party repair information
  - Inspect at component and sub-component level





Source: BENTEK

Service Equipment 180.509 (k)

- Identify appropriate Test Methods
  - Visual
  - Leak Test
  - Bench test
  - MT / PT

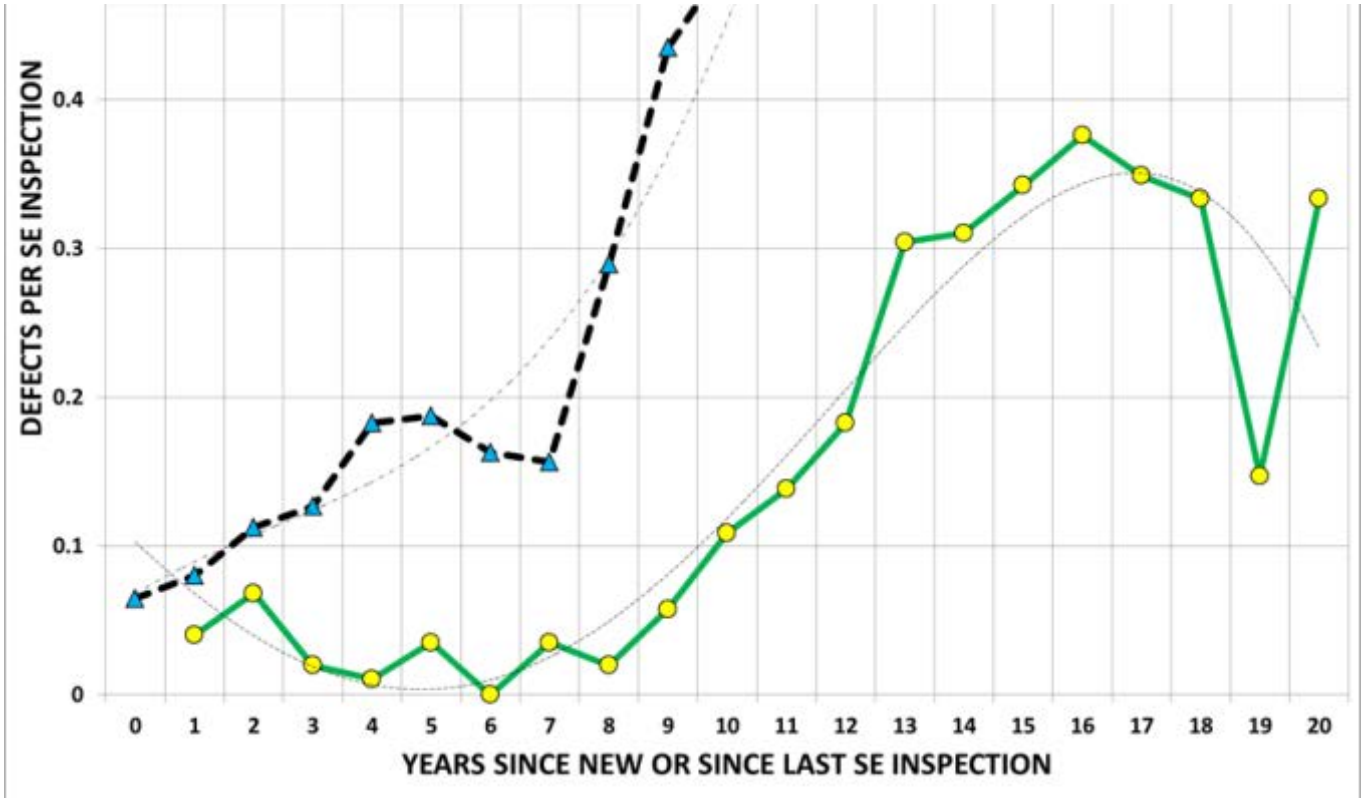
Source: BENTEK

Service Equipment 180.509 (k)

- Develop acceptance criteria
  - OEM guidelines
  - No progressive defects (ex: cracks)
  - No damage that results in leaks (nicks, gouges, dents)
  - Proper operation
  - New soft components

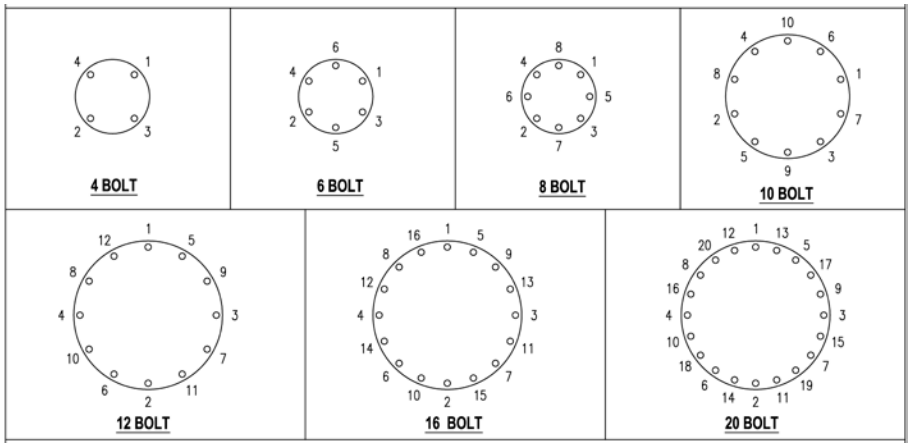
Service Equipment 180.509 (k)

- Confirm Design level of reliability
  - Ex: defect rate vs. qualification cycle

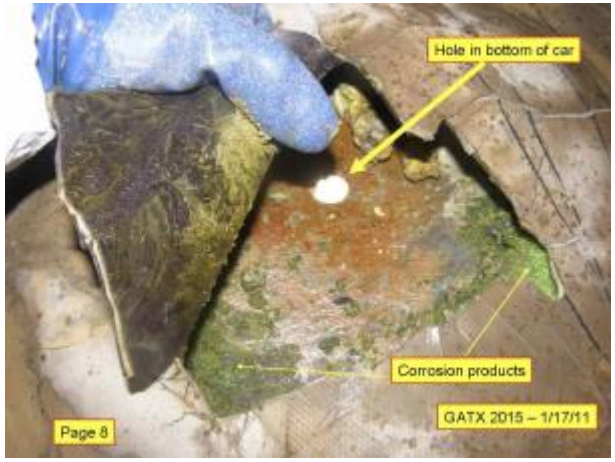


Service Equipment 180.509 (k)

- Qualify
  - M-1002 Appendix D requirements
    - Repair / rebuild to OEM guidelines, or replace new
  - Verify acceptance criteria is met
    - Bench or leak test
    - Maintenance vs. periodic
  - Confirm MSDS compatibility
    - SE Material
    - Sealing material
  - Torque properly
    - Lubrication
    - Sequence



Interior Coating / Lining/ Thickness inspection 180.509 (?)



Interior Coating / Lining/ Thickness inspection 180.509 (?)

Tank Inspection Points

Weld seams

Pitting

Bathtub Rings

Valve body corrosion

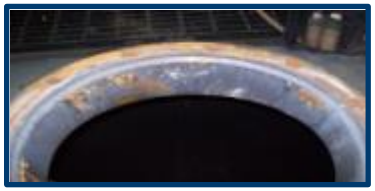
Corrosion of flange

High heat flux areas

Interior Coating / Lining/ Thickness inspection 180.509 (?)

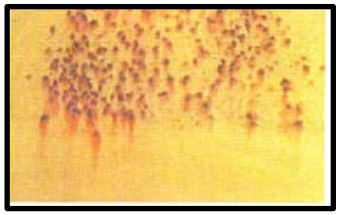
Interior Coating Inspection points

Blistering

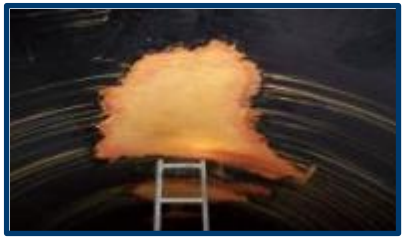


Etching

Cracking



Rust Spotting



De-lamination

Lining Inspection Points

Cuts / gouges

Overlap

Blister

Pinholes

Interior Coating / Lining/ Thickness inspection 180.509

- Testing techniques
  - Sonic thickness readings
  - NDT-VT (with proper lighting)
  - Spark test (rubber lined cars)
  - Hardness (rubber lined cars)

Source: BENTEK

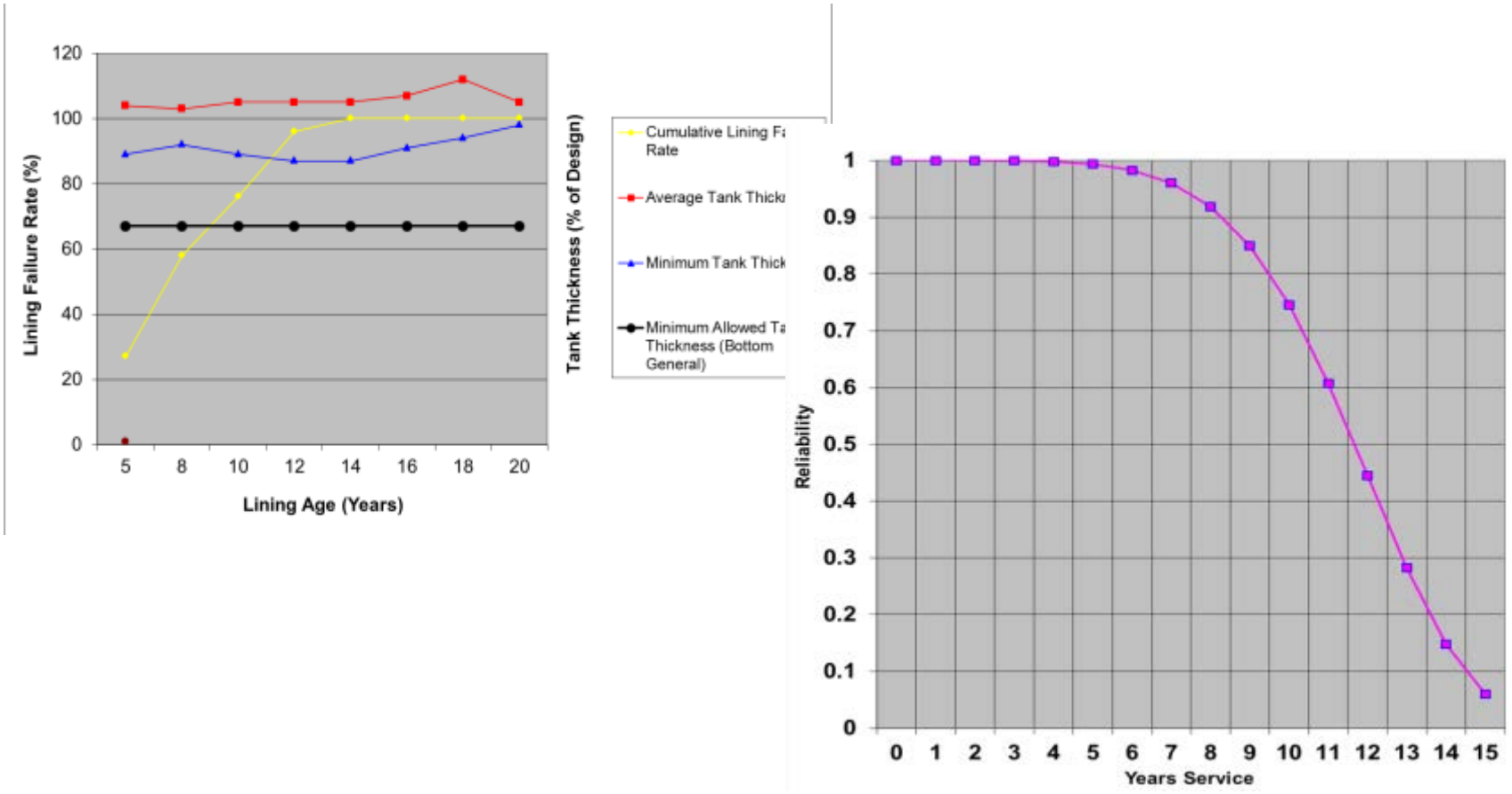
Interior Coating / Lining/ Thickness inspection 180.509 (?)

- Acceptance criteria
  - Tank thickness within acceptable limits
    - Corrosion
    - abrasion or other damage
  - Lining or coating Defect assessment
    - Defect size, depth, characteristics
    - Cuts, gouges or other damage generally unacceptable
    - No metal exposure

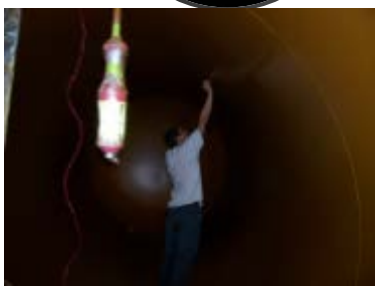
Source: BENTEK

Interior Coating / Lining/ Thickness inspection 180.509 (?)

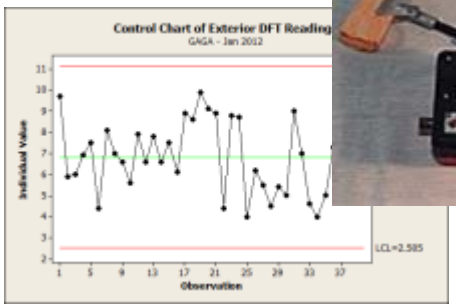
- Validate inspection intervals



Interior Coating / Lining/ Thickness inspection 180.509 (?)



- Qualify
  - Ensure compatibility with MSDS
    - Acceptance criteria
    - Inspection interval
  - Repair tank
    - Restore tank thickness to COC
    - M-1002 Appendix R, T, W
  - Repair / renew coating or lining
    - Follow manufacturer instructions
    - Adhere to coating / lining acceptance criteria



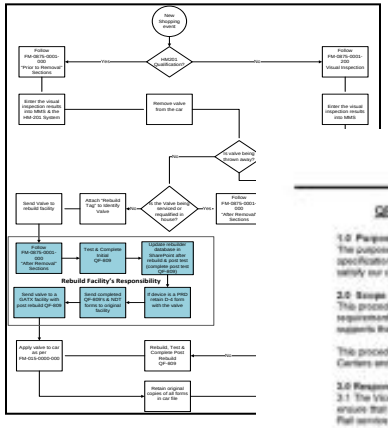
Quality Control

- Quality is essential to reducing NAR's through qualification
- Key responsibilities assigned to facilitate quality
  - Equipment owner responsibilities
  - Tank Car maintenance facility requirements and responsibilities
  - Shipper responsibilities

Source: BENTEK

Quality Control

- Definition of Equipment owner
  - Car mark owner and/or:
  - Financially responsible for equipment linings or service equipment
- Owner Responsibilities
  - Develop qualification instructions




GATX RAIL

QP 050 Customer Requirements Implementation Process

1.0 Purpose

The purpose of this procedure is to ensure that customer requirements, expectations, and specifications are received, reviewed, and controlled, to ensure that we have the capability to satisfy our customers' expectations.

2.0 Scope

This procedure describes the process of the receipt, review and notification of customer requirements, specifications, and expectations, utilized in the GATX Rail service network, and supports the Operational Excellence Policy Manual requirement, Section 4.8.

This procedure applies to the GATX Rail Service Network, including all GATX Rail Service Centers and Field Operations located in Canada, Mexico and the USA.

3.0 Responsibilities

3.1 The Vice Presidents and General Managers of the Service Network, are responsible to ensure that this procedure is documented, maintained, and implemented throughout the GATX Rail service network.

3.2 The Fleet Execution team is responsible to provide the Maintenance Network with the shopping reasons / notifications, customer orders, requirements, specifications, cleaning certificates (if car is reported clean or has been cleaned at a contract shop) and AEDSI prior to shopping GATX Rail Owned Assigned Railcars.

3.3 The Customer Service team is responsible to provide the Maintenance Network with the

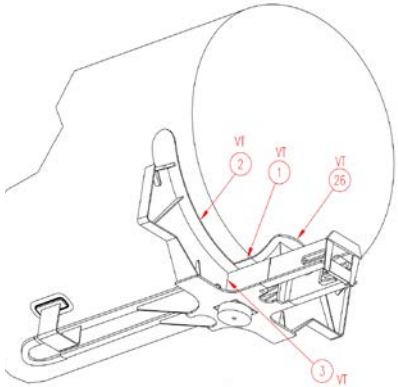
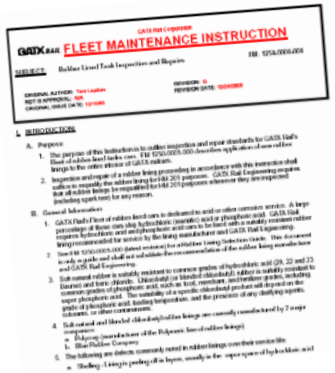


FIGURE #4


GATX RAIL FLEET MAINTENANCE INSTRUCTION

SUBJECT: Rubber Lined Tank Inspection and Repairs

I. INTRODUCTION

A. Purpose

1. The purpose of this instruction is to outline inspection and repair standards for GATX Rail's fleet of rubber lined tanks cars. FM 9765/0005-000 describes applications of new rubber linings to the entire interior of GATX railcars.

2. Inspection and repair of a rubber lining proceeding in accordance with this instruction shall suffice to requalify the rubber lining for Mid 201 purposes. GATX Rail Engineering requires that all rubber linings be requalified for Mid 201 purposes whenever they are inspected (including spark test) for any reason.

B. General Information

1. GATX Rail's fleet of rubber lined cars is dedicated to acid or other corrosive service. A large percentage of these cars ship hydrochloric (muriatic) acid or phosphoric acid. GATX Rail requires hydrochloric acid and phosphoric acid cars to be lined with a suitably resistant rubber lining recommended for service by the lining manufacturer and GATX Rail Engineering.

7. Since FM 9765/0005-000 (latest revision) for a Rubber Lining Selection Guide. This document is only a guide and shall not substitute the recommendation of the rubber lining installer here and GATX Rail Engineering.

3. Soft natural rubber is suitably resistant to common grades of hydrochloric acid (28, 22 and 23 Baume) and ferric chloride. Chlorinated or blended chlorinated rubber is suitably resistant to common grades of phosphoric acid, such as food, merchant, and fertilizer grades, including vapor phosphoric acid. The suitability of a specific chlorinated product will depend on the grade of phosphoric acid, loading temperature, and the presence of any displaying agents, odorants, or other contaminants.

4. Soft natural and blended chlorinated rubber linings are currently manufactured by 2 major companies:

a. Polycorp (manufacturer of the Polycorp line of rubber linings)

b. Blue Rubber Company

5. The following are defects commonly noted in rubber linings over their service life:

a. Shelling: Lining is peeling off in layers, usually in the vapor space of hydrochloric acid

Quality Control

- Owner Responsibilities (Continued)
  - Provide qualification instructions to maintenance facilities
  - Ensure qualification program is followed
    - Proper inspection, test and evaluation of each item
    - Documentation of qualification activities, including inspection and test results
    - Marks car properly
    - Training and certification

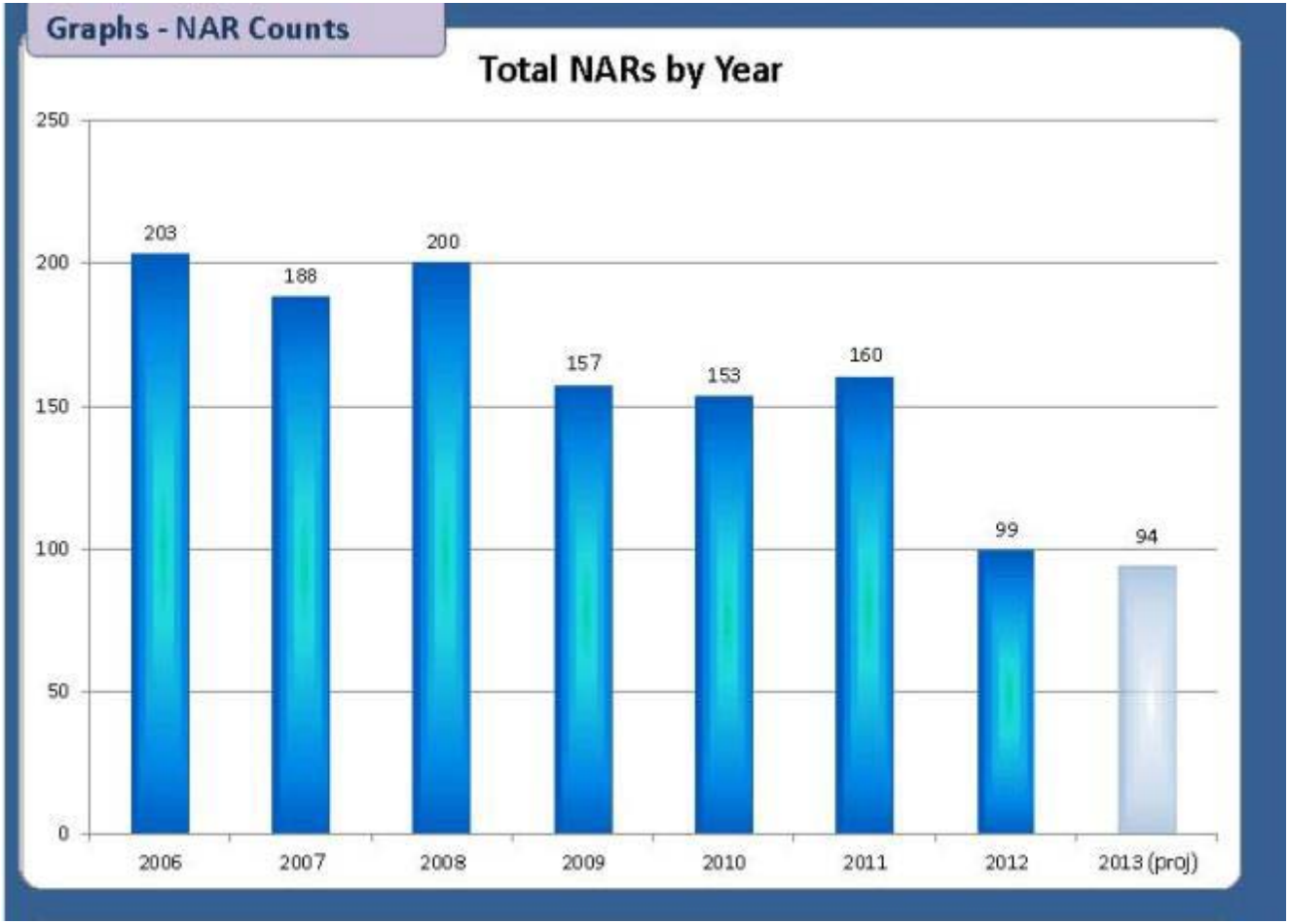
Quality Control

- Facility Responsibilities
  - Must meet DOT quality requirements (CFR 179.7)
  - Must obtain car owner permission to perform work
  - Must adopt owner qualification program
  - Must be M-1003 and M-1002 certified
    - Class A, B, C, D, F, G, L
- Shipper Responsibilities
  - Notify the tank car owner if maintenance or qualification is required

Source: BENTEK

Quality Control

GATX NAR's



Source: BENTEK