FIBA Technologies, Inc.

Review of Acoustic Emission and Ultrasonic Examination Requalification Methodologies and Regulatory Environment

Prepared December 2011

(508) 887-7100 1535 Grafton Road, Millbury, MA 01527 www.fibatech.com

歡迎

Welcome and Introductions

Chris Adams, Manager, Regulatory Affairs

- Employed by FIBA Technologies, Inc. since 1981
- Held a variety of positions ranging from Assembler to Production Planner
- Numerous departments and member in Compressed Gas Association (CGA) provides broad view
- In depth knowledge of the United States Department of Transportation (DOT) regulations
- Knowledge of ISO standards, UN model regulations and IMDG code
- Vice Chairman of the CGA Cylinder Specification Committee
- Chairman of several CGA task forces
- Participant in ISO committees

Sean Macomber, FIBA Taiwan Branch Manager

- Sean has been employed by FIBA Technologies, Inc. since 2007 as a Plant foreman where he oversaw the construction of Trailers, ISO skids and customized ground storage packs. Prior to joining FIBA, Sean spent 12 yrs working for the Airgas Inc, the largest US compressed gas distributor. While with Airgas, Sean worked in a variety of departments including operations, sales and production. He has recent relocated to Taichung, Taiwan where he is overseeing the construction of a new FIBA retest facility that will provide full retest services for South East Asia.

<u>Industry certifications include:</u>

- Acoustic Emissions level I & II
- Ultrasonic Examination level I & II
- Mass Spectrometer Leak Tester level I & II
- Factory-trained by Ceodeux Valve (USA)
- Visual Inspector (per current DOT specifications and CGA pamphlet C-6)
- US DOT Hazmat (49CFR 172)

Introduction to FIBA Technologies, Inc.

- When it comes to experience, expertise and excellence in gas containment equipment, FIBA Technologies, Inc. stands alone
- Founded in 1958, FIBA specializes in helping stakeholders throughout the supply chain
- We help distributors, manufacturers and end users safely transport and store gas in countries around the world, in compliance with highly complex government regulations

- Leading Manufacturer of Gas Containment & Distribution Equipment
- Serving the Global Industrial Gas & Chemical Industries
- Recognized as Industry Leader in Innovation & Technology
- Diversified Product Mix including Manufacturing, Leasing, and Service

Industry Recognition

- Servicing over 100 countries and all seven continents, FIBA is certified by various regulatory agencies as the world's most experienced gas containment manufacturer
- Many FIBA employees hold key positions in some of the associated organizations (e.g. CGA & ISO), driving the standards for compliance even higher
- Our engineering staff is the most knowledgeable in the industry with regard to the numerous international codes, including IMDG, ADR, RID, DNV and UN

International Product and Service Recognition

FIBA holds a variety of certifications and approvals from numerous agencies throughout the world. Below is a summary of the many organizations and regulatory bodies that recognize the quality of our products and services along with a listing of the codes and standards that FIBA follows when performing services or manufacturing products*:

Pressure Vessels:

U.S. Department of Transportation (DOT)-USA
American Society of Mechanical Engineers (ASME)-USA/Worldwide
British Inspection Engineers (BIE)-UK/ Europe
Steigerwalt Associates, Inc.-USA
International Carriage of Dangerous Goods by Road (ADR)-Europe
Special Equipment Licensing Office, People's Republic of China (SELO)-China
Transport Canada (TC)-Canada
International Standards Organization – ISO 11120 (ISO)-Worldwide
National Board (NB)-USA
Compressed Gas Association (CGA)-USA/Canada
International Carriage of Dangerous Goods by Rail (RID)-Europe
International Maritime Dangerous Goods Code (IMDG)-Worldwide
Main Inspectorate of Railway Technical Supervision (KDT)-Poland
Korean Gas Safety Corporation (KGSC)-Republic of Korea

Tube Trailers:

U.S. Department of Transportation (DOT)-USA
Federal Motor Carrier Safety Administration (FMCSA)-USA
Special Equipment Licensing Office, People's Republic of China (SELO)-China
Compressed Gas Association (CGA)-USA/Canada
National Highway Traffic Safety Administration (NHTSA)-USA

Skid Containers (Modules):

American Bureau of Shipping (ABS)-Worldwide
U.S. Department of Transportation (DOT)-USA
U.S. Coast Guard (USCG)-USA
International Carriage of Dangerous Goods by Rail (RID)-Europe
Bureau Veritas (BV)-Worldwide
International Maritime Organization (IMO)-Worldwide
Special Equipment Licensing Office, People's Republic of China (SELO)-China
American Association of Railroads (AAR) – USA
International Standards Organization (ISO)-Worldwide
Compressed Gas Association (CGA)-USA/Canada
International Convention for Safe Containers (CSC)-Worldwide
International Carriage of Dangerous Goods by Road (ADR)-Europe
International Union of Railways (UIC)-Europe
U.S. Customs Certification (TIR)-USA
Main Inspectorate of Railway Technical Supervision (KDT)-Poland

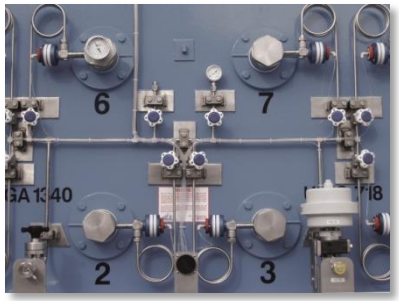
Requalification:

U.S. Department of Transportation (DOT)-USA
Compressed Gas Association (CGA)-USA/Canada

Compliance with the above regulatory bodies, standards, codes, certifications, etc. are not all standard with every FIBA product or service. Compliance is according to the specification requirements of the product or service with additional certification(s) supplied upon customer's request at additional cost.

History of Innovation

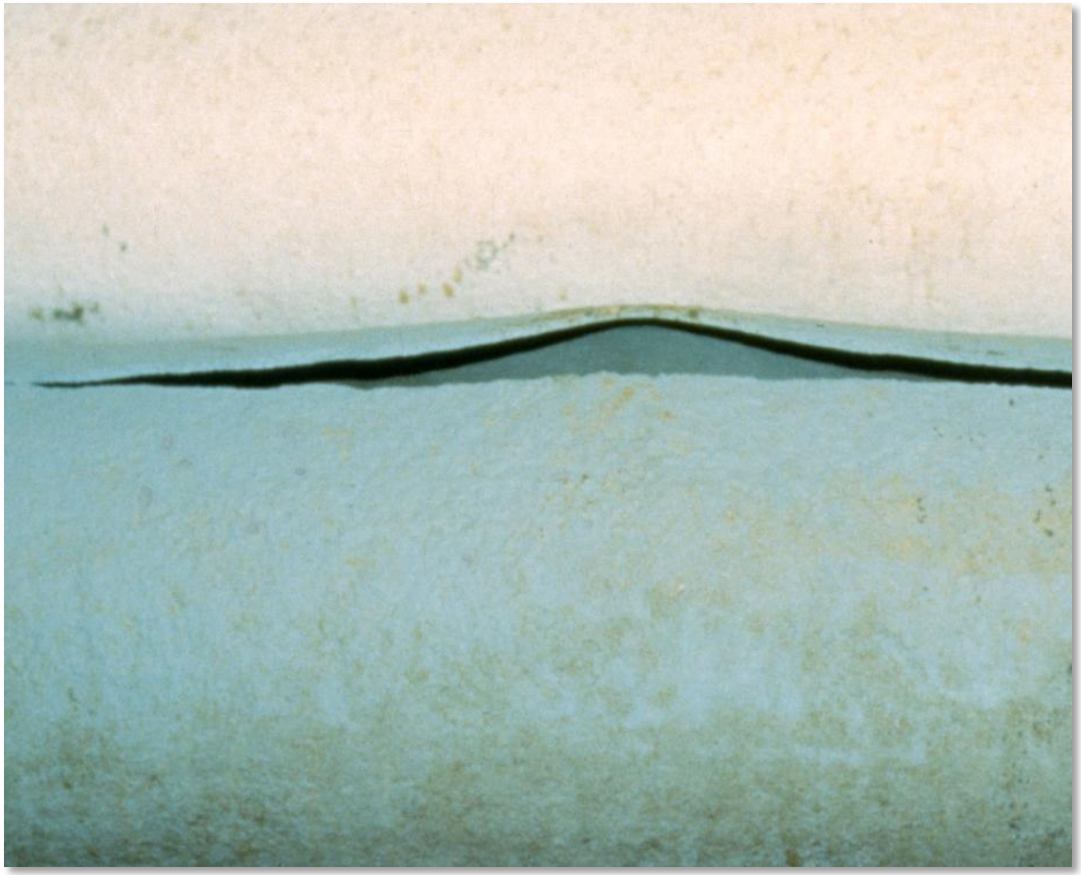
- Superjumbo tube trailers
- First to get ABS certification of our skid containers and approved impact tests
- Patent-holder on modular tube trailer design
- First company approved to manufacture DOT UN tubes in accordance with ISO 11120 (10-year requalification for 2.1 and 2.2 gases)
- Received DOT's first permit to perform ultrasonic examination (UE)
- First retest company to have DOT exemption for AE testing
- Pioneered the "mother-daughter" concept now used everywhere in the alternative fuels industry
- Introduced the Chem-Lite tube design, which allows greater liquefied gas and chemical payloads
- Designer of the Swap Load Skid, which has a custom-made framework that allows easy exchange of empty tanks for full tanks using a hook lift or roll-off truck



Background of UE & AE Testing

Requalification is Necessary

- To prevent cylinders bursting in service
- To ensuring public safety



History of Accidents

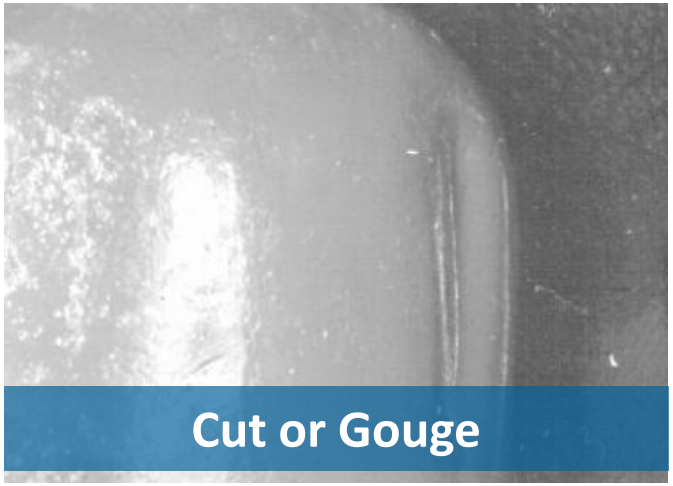
Physical and Material Defect Rejection Criteria

Type of Defect	Definition	Rejection Limits
Bulge	Visible swelling of the cylinder	All cylinders with such a defect
Dent	A depression in the cylinder which has neither penetrated nor removed metal and is greater in depth than 1% of the external Diameter	When the depth of the dent exceeds3 % of the external diameter of the cylinder OR When the diameter of the dent is less than × 15 its depth
Cut or gouge	A sharp impression where metal has been removed or redistributed and whose depth exceeds 5 % of the cylinder wall thickness	When the depth of the cut or gouge exceeds 10% of the wall thickness OR When the length exceeds 25% of the external diameter of the cylinder OR When the wall thickness is less than the minimum guaranteed wall Thickness
Crack	A split or rift in the metal	All cylinders with such defects
Fire damage	Excessive general or localized heating of a cylinder usually indicated by: a) Partial melting of the cylinder b) Distortion of cylinder c) Charring or burning of paint d) Fire damage to valve, melting of plastic guard or date ring or fusible plug if fitted	All cylinders in categories a) and b) cylinders in categories c) and d) may be acceptable after inspection and testing
Arc or Torch Burns	Partial melting of the cylinder, the addition of weld metal or the removal of metal by scarfing or cratering	All cylinders with such defects
Suspicious Marks	Marks introduced other than by the cylinder manufacturing process and approved repair	All cylinders with such defects

Corrosion Rejection Criteria

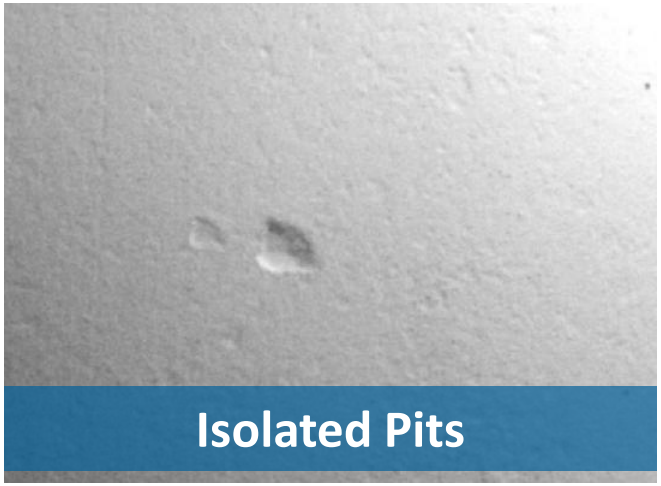
Type of Defect	Definition	Rejection Limits
General Corrosion	Loss of wall thickness over an area of more than 20 % of either the interior or exterior total surface area of the cylinder	If the original surface of the metal is no longer recognizable OR If the depth of penetration exceeds 10% of the original thickness of wall OR If the wall thickness is less than minimum guaranteed wall thickness
Local Corrosion	Loss of wall thickness over an area of less than 20 % of either the interior or exterior total surface area of the cylinder, except for the other types of local corrosion described below.	If the depth of penetration exceeds 20% of the original thickness of the cylinder wall OR If the wall thickness is less than minimum guaranteed thickness
Chain Pitting or Line Corrosion	Corrosion forming a narrow longitudinal or circumferential line or strip, or isolated craters or pits which are almost connected.	If a total length of corrosion in any direction exceeds the diameter of the cylinder and the depth exceeds 10 % of the original wall thickness OR If the wall thickness is less than minimum guaranteed thickness
Isolated Pits	Corrosion forming isolated craters, without significant alignment	If the diameter of the pits is greater than 5 mm, refer to the “local corrosion” row. If the diameter of the pits is less than 5 mm, the cylinder should be assessed as carefully as possible in order to check that the remaining thickness of the wall or base is adequate for the intended use of the cylinder.

Examples of Various Defects on a Cylinder

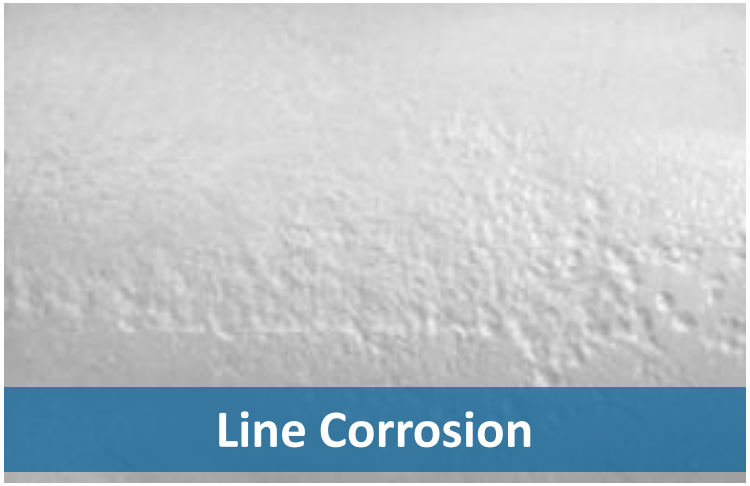


Cut or Gouge

Crack



Isolated Pits



Line Corrosion

Arc Damage

General Corrosion

History of Requalification

- Visual inspection only
- Hammer test
- Proof pressure testing
- Hydrostatic testing with volumetric expansion measurements

  (Total , permanent and elastic expansion)

Today's Preferred Test Methods

Acoustic Emission Testing

FIBA is a leader in Acoustic Emission Testing (AET) of high pressure tubes and vessels. All of our locations provide this service and each location is a DOT-authorized requalification facility. We pride ourselves on our acceptance of new ideas and the innovative application of those ideas. FIBA was the first to adopt AET when, with the participation of major industrial gas suppliers in our R&D programs, the technology was proven to be an important step towards improving tube and pressure vessel requalification technology. With the ability to conduct accurate and fast testing of still-assembled tube trailers and skids, our methods of AET are accepted worldwide and provide many benefits to our customers.

Ultrasonic Examination

FIBA received the U.S. Department of Transportation's (DOT) first permit to perform Ultrasonic Examination (UE) instead of hydrostatic testing for recertification of cylinders—a revolutionary technology that not only protects the environment by eliminating the need to remove hazardous gases from the cylinders, but also prevents product contamination by eliminating the need to introduce water to the cylinders. FIBA UE has become the preferred method of cylinder requalification throughout the world and is encouraged by the DOT and Compressed Gas Association (CGA), as well as being referenced in numerous ISO standards. We have always pushed innovation in testing forward, particularly in Ultrasonic Examination technologies.

Requalification Techniques

Cylinder & Tube Requalification Methods

	Visual Inspection	Hydrostatic Testing	Acoustic Emission	Ultrasonic Examination
Description	Visual exam per CGA C-6 (steel cylinders)	Pressurization using water, while monitoring expansion	Detection of sound emissions generated during pressurization	Use pulse-waves to measure wall thickness and flaws
History	Original method of requalification (1911). Still used with other methods.	Used throughout the 20th century and today	First applied for cylinder requalification in the early 80s	Accepted as a requalification method by the DOT in 1993
Stringency	Effective for obvious flaws	Proof test only	Highly effective to locate flaws (UE measures)	Highly effective to locate and measure flaws
Reliability	Inconsistent	Fair	Very Good (Excellent with UE)	Excellent
Strengths	Immediate evaluation	Widely available and accepted	Locate flaws and test without disassembly	Measure flaws without gas removal or water (gas purity maintained)
Weaknesses	Assessment is incomplete & not precise	Unable to locate flaw. Water contamination	Unable to measure flaw without local UE	**Locates insignificant flaws (reject criteria)**
Cost of Test	$	$$$$	$$	$$

Acoustic Emission Testing

Benefits of FIBA's Acoustic Emission Testing Program

- Holder of DOT special permits
- Testing since 1985.
- Complete evaluation of a tube's integrity by the combination of AET and UE
- Virtually no downtime required for retest
- Burst discs replaced by skilled technicians
- Complete trailer/skid assembly is inspected for leaks throughout the testing process
- Trained and certified test technicians
- Portable equipment for on-site retesting
- Modern state of the art equipment

Ultrasonic Examination

Benefits of FIBA's Ultrasonic Examination Program

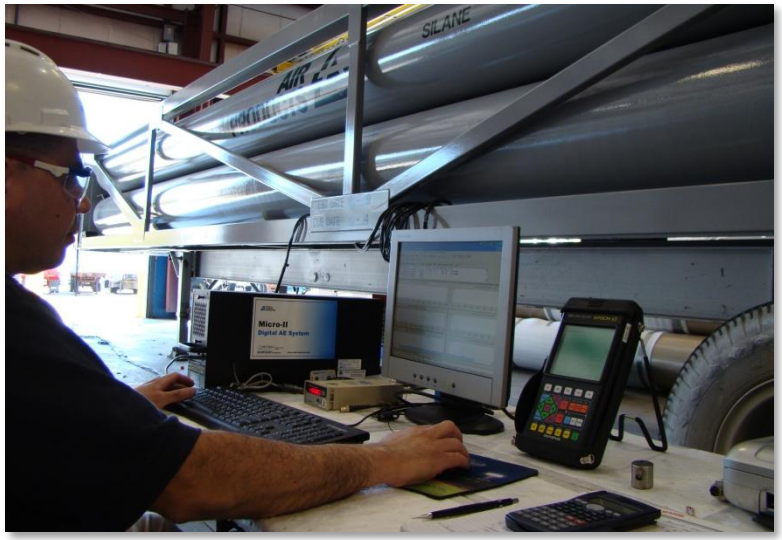
- Holder of DOT special permits
- UE testing since 1993
- Test results maintained on file and summarized for the DOT
- Burst discs can be replaced by skilled technicians
- Trained and certified test technicians
- Eliminates the need for valve removal and internal visual inspection. Thus allowing the cylinder to be tested with residual product
- No water introduced to the interior of the cylinder
- Equipment accurately measures wall thickness and locates and quantifies flaw size
- FIBA UE is the preferred method of cylinder requalification throughout the world
- UE is encouraged by DOT and CGA, as well as being referenced in numerous ISO standards

KHK Cylinder Requalification

- For KHK cylinders manufactured using materials and standards with key similarities to DOT specification cylinders, FIBA will requalify those cylinders using DOT special permits and certify compliance as follows:
  - Cylinders tested in accordance with DOT special permits
  - Cylinders found to conform to all requirements set forth by the DOT special permit
  - Cylinders approved for continued service
  - Documentation of inspection and test records are on file
  - Test (UE) performed using test files setup for DOT Specification cylinders (e.g. 3AA-2400)
  - Cylinders are stamped in accordance with special permit, excluding the retester's identification number (RIN)

Review of AE and UE Requalification Procedures

Acoustic Emission Equipment



1. Acoustic Emission Testing Procedure

1. Place tube trailer in inspection area.

The inspection environment can be inside or outside, but rain and other outside debris can disrupt testing. Also, electrical wires, excessive noise, and certain equipment can interfere with a test. The ideal environment is inside away from noise and other distractions.

2. Replace burst discs and valves.

As part of the test, FIBA will provide and replace burst discs and valves as necessary.

2. Acoustic Emission Testing Procedure

3. Pressurize trailer to start pressure.

Data collection must begin at a pressure less than or equal to 50% of the AE test pressure. The rate of pressurization must be such that the saturation of electronic circuitry does not occur.

4. Place AE sensors on tube ends.

The acoustic emission testing sensors must be placed on both ends of the tube and 1 inch from the bell ends.

3. Acoustic Emission Testing Procedure

5. Calibrate equipment with sensors on tubes.

Calibration is done through pencil lead break test calibration.

6. Pressurize trailer to test pressure.

The test pressure must equal 1.1 times the highest fill pressure experienced by any individual cylinder in the unit for the last 12 months prior to requalification.

4. Acoustic Emission Testing Procedure

7. Evaluate acoustic emission testing data.

If 5 or move AE events occur within an 8” axial distance on the cylindrical portion of the tube, ultrasonic inspection using angle beam sensors is required.

8. Perform manual ultrasonic testing where required (shear wave testing).

The extent of the examination shall be 18 inches on either side of the axial location (on the cylindrical portion) as determined through AE.

5. Acoustic Emission Testing Procedure

9. Evaluate ultrasonic data.

10. Complete test and prepare report.

Ultrasonic Examination Equipment

- Cylinder handling
- Sensor array
- Computer hardware and software
- Calibration pieces

Ultrasonic Examination Video

Global Regulations and Standards

U.S. DOT Regulation

- ICC adopts BOE-draft of compressed gas shipping regulations in 1911
- ICC publishes the first regulations of transportation of compressed gases in 1912
- DOT writes regulations (sometimes with industry assistance)
- Post NPR in Federal Register (public review & comment)
- Final rulemaking

U.S. DOT Departments

- Standards and Rulemaking
- Engineering and Research
- Approvals and Permits
- Outreach, Training and Grants
- Program Development
- Enforcement
- Special Investigations

U.S. DOT Special Permits

- Special permit is a DOT document authorizing a person to perform a function that is not otherwise permitted in the current DOT regulations
- 49 CFR 107.105 provides procedures for applying
- DOT evaluates and either approves or denies the application
- Sometimes the function is adopted by regulation and the permit is no longer required

CGA Standards

- CGA founded in 1913 to promote industry-wide standards and procedures
- CGA members are gas and equipment suppliers. Regulators also participate.
- Standards are written by CGA members in committees
- Standards may be incorporated by reference in the DOT regulations (49 CFR 171.7)
- CGA petitions DOT to incorporate standards
- Standards are written to be enforceable by DOT
- Periodic review required (6 years)
- Antitrust guidelines

CGA Committee Structure

- CGA Members
- Board of Directors
- Executive Committee
- Standards Council
- Technical Committees (examples follow)
  - Bulk Distribution
  - Cylinder Specifications
  - Cylinder Valve
  - Specialty Gases

International Standards (ISO)

- ISO standards are developed according to the following principles:
  - **Consensus** - The views of all interests are taken into account
  - **Industry wide** - Global solutions to satisfy industries and customers worldwide
  - **Voluntary** - International standardization is market driven and therefore based on voluntary involvement of all interests in the market-place

International Standards (ISO)

- The ISO standards development process follows:
  - Need for a standard expressed by an industry sector, which communicates need to a national member body (e.g. DOT). The latter proposes the new work item to ISO as a whole.
  - Technical scope of the future standard is defined by working groups, which comprise technical experts (e.g. CGA and its members) from countries interested in the subject.
  - When agreement has been reached on technical aspects to be covered in the standard, countries negotiate the standard (consensus).
  - Finally, formal approval of draft International Standard (the acceptance criteria stipulate approval by two-thirds of the ISO members that have participated actively in the standards development process, and approval by 75% of all members that vote).
- Publication of the ISO International Standard.
- Periodic revision (5 years)

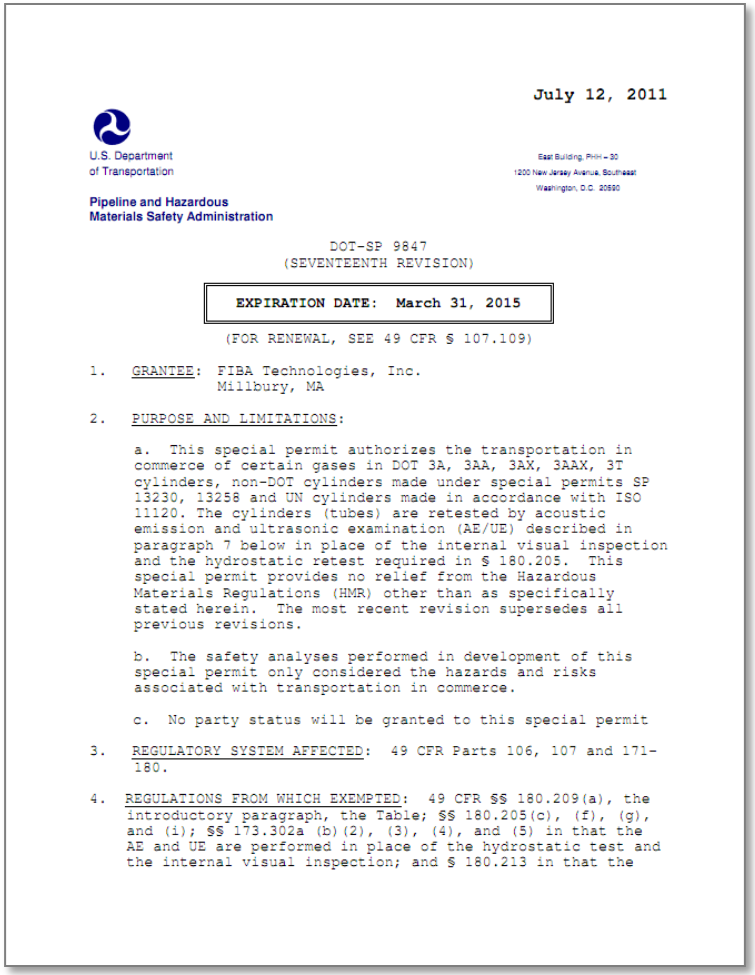
UN Recommendations

- UN Recommendations on the Transport of Dangerous Goods - Model Regulations
- Transport of dangerous goods regulated to prevent accidents
- With different regulations in every country and for different modes of transport, international trade in dangerous products would be difficult
- To ensure consistency between all these regulatory systems, the United Nations has developed mechanisms for the harmonization of:
  - Hazard classification criteria
  - Hazard communication tools
  - Transport conditions for transport by road, rail and waterways
- Significant portions of the UN Model Regulations are adopted by regulators, including the DOT, Transport Canada, IMDG, ADR, and RID

DOT Special Permits

Special Permits that Allow AE Testing

FIBA's Special Permit 9847 (5-Year)



July 12, 2011

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

East Building, PHH – 30
1200 New Jersey Avenue, Southeast
Washington, D.C. 20590

DOT-SP 9847
(SEVENTEENTH REVISION)

EXPIRATION DATE: March 31, 2015

(FOR RENEWAL, SEE 49 CFR § 107.109)

1. GRANTEE: FIBA Technologies, Inc.
Millbury, MA

2. PURPOSE AND LIMITATIONS:

a. This special permit authorizes the transportation in commerce of certain gases in DOT 3A, 3AA, 3AX, 3AAX, 3T cylinders, non-DOT cylinders made under special permits SP 13230, 13258 and UN cylinders made in accordance with ISO 11120. The cylinders (tubes) are retested by acoustic emission and ultrasonic examination (AE/UE) described in paragraph 7 below in place of the internal visual inspection and the hydrostatic retest required in § 180.205. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.

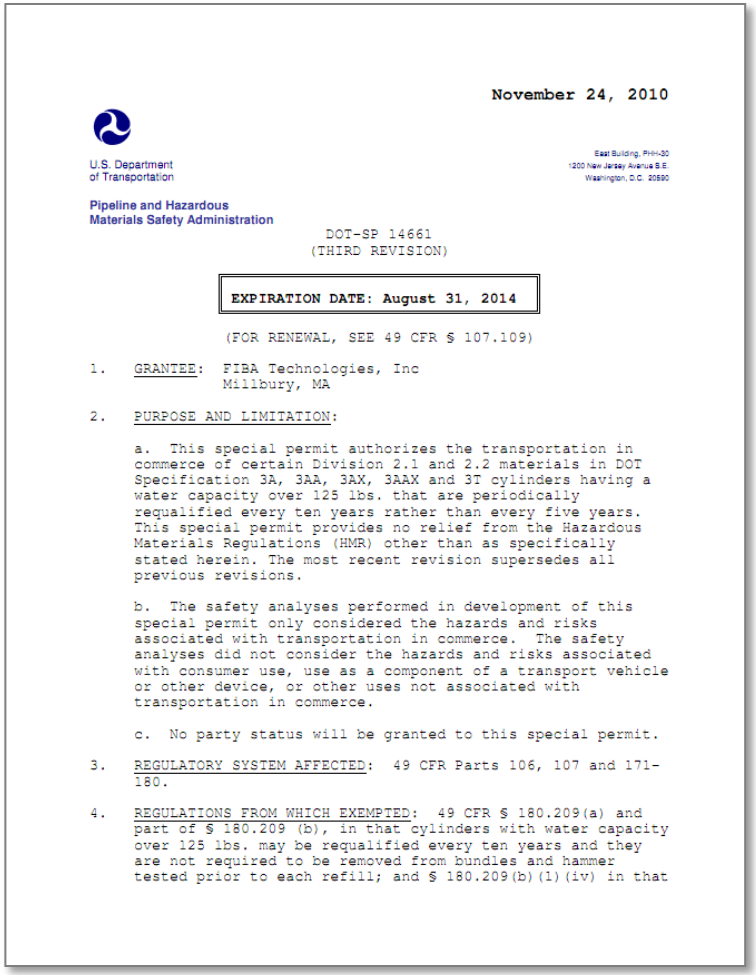
b. The safety analyses performed in development of this special permit only considered the hazards and risks associated with transportation in commerce.

c. No party status will be granted to this special permit

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR §§ 180.209(a), the introductory paragraph, the Table; §§ 180.205(c), (f), (g), and (i); §§ 173.302a (b)(2), (3), (4), and (5) in that the AE and UE are performed in place of the hydrostatic test and the internal visual inspection; and § 180.213 in that the

FIBA's Special Permit 14661 (10-Year)



November 24, 2010

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

East Building, PHH-30
1200 New Jersey Avenue S.E.
Washington, D.C. 20590

DOT-SP 14661
(THIRD REVISION)

EXPIRATION DATE: August 31, 2014

(FOR RENEWAL, SEE 49 CFR § 107.109)

1. GRANTEE: FIBA Technologies, Inc
Millbury, MA

2. PURPOSE AND LIMITATION:

a. This special permit authorizes the transportation in commerce of certain Division 2.1 and 2.2 materials in DOT Specification 3A, 3AA, 3AX, 3AAX and 3T cylinders having a water capacity over 125 lbs. that are periodically requalified every ten years rather than every five years. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.

b. The safety analyses performed in development of this special permit only considered the hazards and risks associated with transportation in commerce. The safety analyses did not consider the hazards and risks associated with consumer use, use as a component of a transport vehicle or other device, or other uses not associated with transportation in commerce.

c. No party status will be granted to this special permit.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR § 180.209(a) and part of § 180.209 (b), in that cylinders with water capacity over 125 lbs. may be requalified every ten years and they are not required to be removed from bundles and hammer tested prior to each refill; and § 180.209(b)(1)(iv) in that

AE Permit Selected Language

- This special permit authorizes the transportation in commerce of certain gases in DOT 3A, 3AA, 3AX, 3AAX, 3T cylinders, non-DOT cylinders made under special permits SP 13230, 13258 and UN cylinders made in accordance with ISO 11120. The cylinders (tubes) are retested by acoustic emission and ultrasonic examination (AE/UE) described in paragraph 7 below in place of the internal visual inspection and the hydrostatic retest required in § 180.205. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.
- The acoustic emission and ultrasonic examination (AE/UE) are used in lieu of hydrostatic pressure test and internal visual inspection.
- Acoustic Emission (AE) Equipment: The AE equipment must be in accordance with the specification described in FIBA Technologies application on file with OHMSPA and as prescribed in this special permit. The power supply, signal cable, signal processor and couplant must meet all requirements of the American Society for Testing and Materials (ASTM), 1419-02b Standard Test Method for Examination of Seamless, Gas-Filled, Pressure Vessels Using Acoustic Emission.
- The test pressure must equal 1.1 times the highest fill pressure experienced by any individual cylinder in the unit for the last 12 months prior to requalification. If the highest fill pressure is not available the test pressure must be 1.20 times the lowest service pressure stamped cylinder in the unit.
- The data collection must begin at a pressure less than or equal to 50% of the AE test pressure. The rate of pressurization must be such that the saturation of electronic circuitry does not occur.
- The UE of each cylinder must be in accordance with the ultrasonic examination described in ASTM E 2223-02 except that: (A) The extent of the examination shall be 18 inches on either side of the axial location (on the cylindrical portion) as determined through AE.

AE Permit: 10 Year Retest Requirements

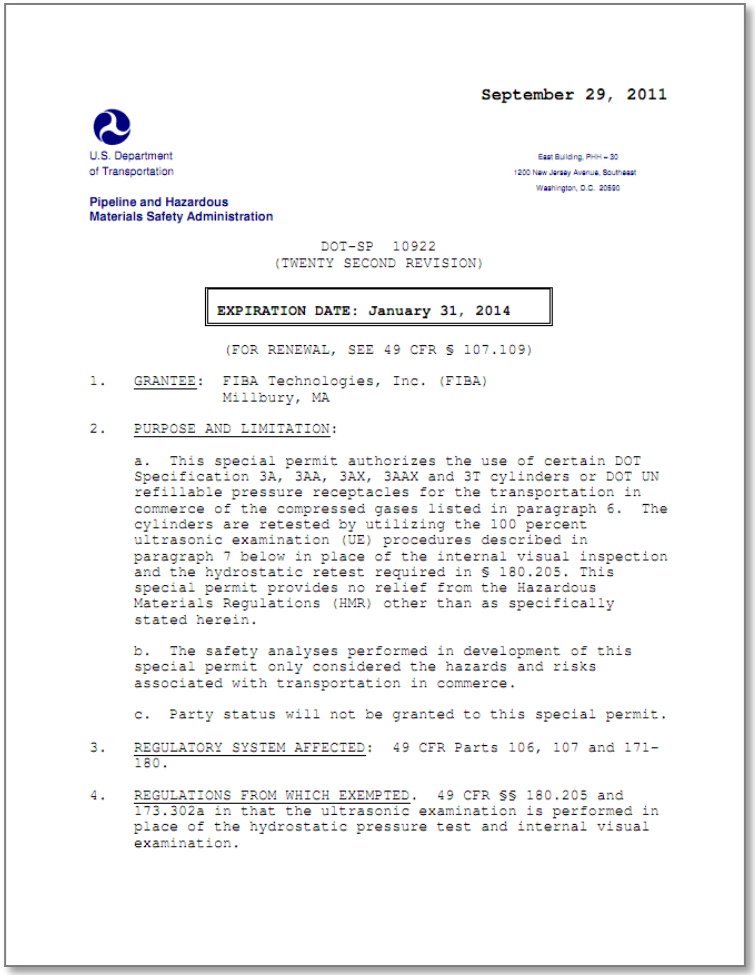
- Maximum of 600 fills in 10 years (3A, 3AA, 3AX & 3AAX)
- Maximum of 300 fills in 10 years (3T only)
- 3T cylinders require 100% UE test at manufacture or prior to 10-year retest (5% notch)
- Dewpoint cannot exceed -52° F (-46.6° C/59 PPM)
- No CO_2 or corrosive gas in cylinder
- No H_2 in 3T cylinders
- Visual examination required every 5 years
- Neck thread inspection required every 10 years (disassembly required)

Proper Shipping Name
1,1-Difluoroethylene or Refrigerant gas R 1132a
1-Chloro-1,1-difluoroethane or Refrigerant gas R 142b
Air, compressed
Argon, compressed
Chlorodifluoromethane or Refrigerant gas R 22
Ethylene, compressed
Helium, compressed
Hexafluoroethane, compressed or Refrigerant gas R 116
Hydrogen, compressed
Neon, compressed

Proper Shipping Name
Nitrogen trifluoride, compressed
Nitrogen, compressed
Nitrous oxide
Oxygen, compressed
Silane, compressed
Sulfur hexafluoride
Tetrafluoromethane, compressed or Refrigerant gas R 14
Trifluoromethane or Refrigerant gas R 23
Compressed gas, n.o.s. (mixture of Air, Argon, R22, Helium, R116, Neon, Nitrogen trifluoride, Nitrogen, Nitrous oxide, Oxygen, Sulfur hexafluoride, R14, and/or R23)
Compressed gas, flammable, n.o.s. (mixture of R 1132a, R142b, Air, Argon, R22, Ethylene, Helium, R116, Hydrogen, Neon, Nitrogen trifluoride, Nitrogen, Nitrous oxide, Oxygen, Silane, Sulfur hexafluoride, R14, and/or R23)

Special Permits that Allow UE Testing

FIBA's Special Permit 10922 (5-Year)



September 29, 2011

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

East Building, PHH – 30
1200 New Jersey Avenue, Southeast
Washington, D.C. 20590

DOT-SP 10922
(TWENTY SECOND REVISION)

EXPIRATION DATE: January 31, 2014

(FOR RENEWAL, SEE 49 CFR § 107.109)

1. GRANTEE: FIBA Technologies, Inc. (FIBA)
Millbury, MA

2. PURPOSE AND LIMITATION:

a. This special permit authorizes the use of certain DOT Specification 3A, 3AA, 3AX, 3AAX and 3T cylinders or DOT UN refillable pressure receptacles for the transportation in commerce of the compressed gases listed in paragraph 6. The cylinders are retested by utilizing the 100 percent ultrasonic examination (UE) procedures described in paragraph 7 below in place of the internal visual inspection and the hydrostatic retest required in § 180.205. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein.

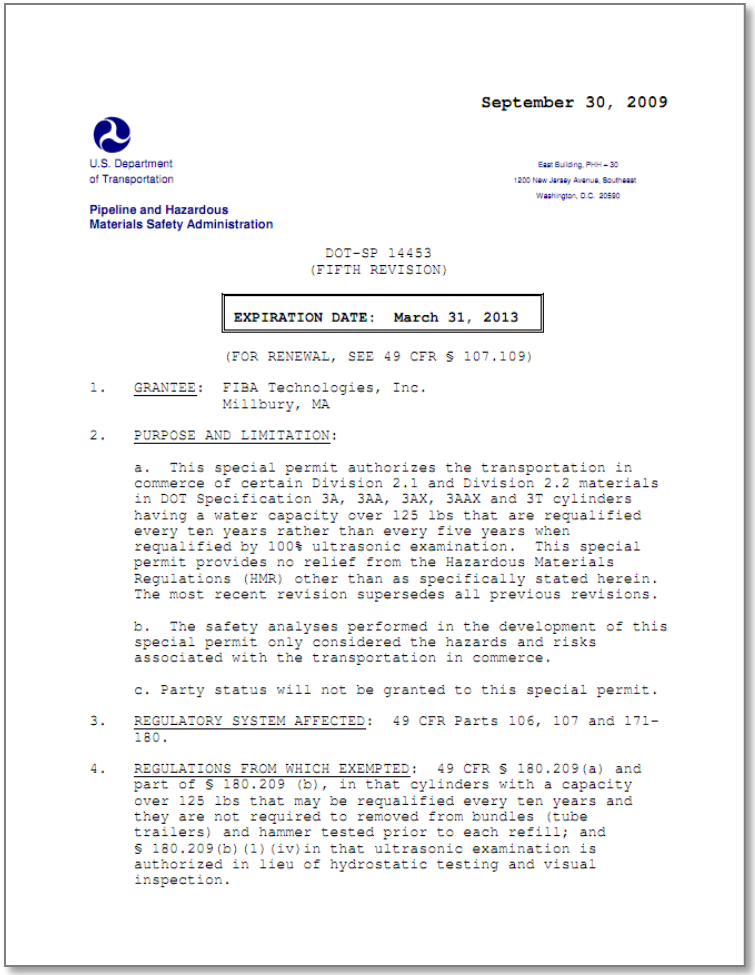
b. The safety analyses performed in development of this special permit only considered the hazards and risks associated with transportation in commerce.

c. Party status will not be granted to this special permit.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED. 49 CFR §§ 180.205 and 173.302a in that the ultrasonic examination is performed in place of the hydrostatic pressure test and internal visual examination.

FIBA's Special Permit 14453 (10-Year)



September 30, 2009

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

East Building, PHH – 30
1200 New Jersey Avenue, Southeast
Washington, D.C. 20590

DOT-SP 14453
(FIFTH REVISION)

EXPIRATION DATE: March 31, 2013

(FOR RENEWAL, SEE 49 CFR § 107.109)

1. GRANTEE: FIBA Technologies, Inc.
Millbury, MA

2. PURPOSE AND LIMITATION:

a. This special permit authorizes the transportation in commerce of certain Division 2.1 and Division 2.2 materials in DOT Specification 3A, 3AA, 3AX, 3AAX and 3T cylinders having a water capacity over 125 lbs that are requalified every ten years rather than every five years when requalified by 100% ultrasonic examination. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.

b. The safety analyses performed in the development of this special permit only considered the hazards and risks associated with the transportation in commerce.

c. Party status will not be granted to this special permit.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR § 180.209(a) and part of § 180.209 (b), in that cylinders with a capacity over 125 lbs that may be requalified every ten years and they are not required to removed from bundles (tube trailers) and hammer tested prior to each refill; and § 180.209(b)(1)(iv)in that ultrasonic examination is authorized in lieu of hydrostatic testing and visual inspection.

UE Permit Selected Language

- This special permit authorizes the use of certain DOT Specification 3A, 3AA, 3AX, 3AAX and 3T cylinders or DOT UN refillable pressure receptacles for the transportation in commerce of the compressed gases listed in paragraph 6. The cylinders are retested by utilizing the 100 percent ultrasonic examination (UE) procedures described in paragraph 7 below in place of the internal visual inspection and the hydrostatic retest required in § 180.205. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein.
- 49 CFR §§ 180.205 and 173.302a in that the ultrasonic examination is performed in place of the hydrostatic pressure test and internal visual examination.
- The ultrasonic equipment performance must conform to the FIBA application on file with OHMSPA and as prescribed in this special permit. The equipment will be a fully automated, pulse echo type, and incorporate multiple channel transducers, with interactive software. The ultrasonic system must be capable of entering shear waves into the cylinder wall in both longitudinal and circumferential directions and normal to the cylinder wall to ensure 100 percent coverage of the cylinder wall. The ultrasonic system must be capable of detecting all defects (such as isolated pits, line corrosion, sidewall defects and line corrosion inside-wall-to base transition area (SBT)) must be detected.
- A cylinder or cylinder section must be used as a standard reference and must have similar acoustic properties, surface finish and metallurgical condition as the cylinders under test. The standard reference, (reference cylinder) must have a known minimum design wall thickness (tm) which is less than or equal to the cylinder under test. The standard reference cylinder for cylinders less than or equal to 6-inches in diameter must have the same nominal diameter as the cylinder being tested.
- Prior to retesting a cylinder, the cylinder class (DOT specification) must be identified. The UE system must be standardized for testing the identified cylinder by using a standard reference. The standard reference must be similar (material of construction, size, wall thickness, etc.) to the identified cylinders to be tested.

UE Permit: 10 Year Retest Requirements

- Maximum of 600 fills in 10 years (3A, 3AA, 3AX, 3T & 3AAX)
- 3T cylinders require 100% UE test at manufacture or prior to 10-year retest (5% notch)
- Dewpoint cannot exceed -52° F (-46.6° C/59 PPM)
- No CO_2 or corrosive gas in cylinder
- No H_2 in 3T cylinders
- Visual examination required every 5 years
- Neck thread inspection required every 10 years (disassembly required)

Proper Shipping Name
Air, compressed
Argon, compressed
Helium, compressed
Hydrogen, compressed
Neon, compressed
Nitrogen trifluoride, compressed
Nitrogen, compressed
Oxygen, compressed
Silane
Sulfur hexafluoride
Tetrafluoromethane, compressed or Refrigerant gas R 14
Compressed gas, n.o.s. (mixture of air, hydrogen, argon, helium, neon, nitrogen and/or oxygen)

Proper Shipping Name
Compressed gas, N.O.S (mixture of air, hydrogen, argon, helium, neon, nitrogen and/or oxygen)

NOTE: USA UN TUBES IN DIVISION 2.1 AND 2.2 GAS SERVICE HAVE A 10 YEAR REQUALIFICATION CYCLE WITHOUT SPECIAL PERMIT

Overview of FIBA Products and Services

FIBA's Products and Capabilities

High Pressure Systems

- DOT/ASME/UN Tubes
- ASME Ground Storage
- Tube Trailers
- ABS/ISO Skids (MEGCs)
- Gas Dispensers
- Accessories
- New & Used Equipment

Cryogenic Equipment

- ABS/ISO Containers
- CO_2 Receivers
- CO_2 Transports
- Vaporizers
- DOT Containers
- Easy-Load Portable Tanks
- Chemical Transports
- Cryogenic Tanks

Services

- Tube Trailer Requalification
- Mobile On-Site Testing
- Acoustic Emission Testing
- Ultrasonic Testing
- CO_2 Tank Conversion
- CO_2 Trailer Refurbishment
- Cryogenic Tank Rehabilitation
- Cryogenic Trailer Rehabilitation
- P, K, V, I Tests

High Pressure Systems


Tube Trailers


20’ ISO Tube Modules (Skids)


40’ ISO Tube Modules (Skids)


ASME & DOT Ground Storage (I-Beam)


ASME & DOT Ground Storage (Saddle)


Ton Containers (Y-Cylinders)

Cryogenic Equipment

Cryogenic ISO Containers

CO_2 ISO Containers

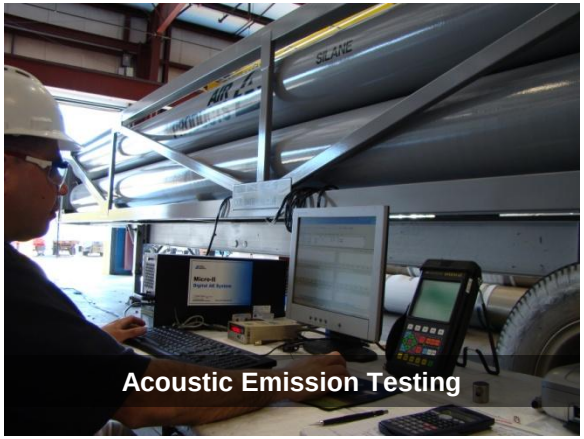
Easy Load Portable Customer Stations


Cryogenic Customer Stations


Vaporizers


Cryogenic Transports

Services



Acoustic Emission Testing


Ultrasonic Examination


Disassembly


Painting


Equipment Repair


Sand Blasting

Parts and Accessories

- FIBA manufactures in house a full line of parts and accessories for all of its products
- Hundreds of components and assemblies are available for order through FIBA published parts catalog
- FIBA has manufactured these components to support its own equipment manufacturing needs along with the needs of customers for over 25 years

謝謝你

Thank You & Discussion