



INTERNAL CORRESPONDENCE

CHEMICALS AND PLASTICS

INSTITUTE PLANT P. O. BOX 2831, CHARLESTON, WEST VIRGINIA 25330

To (Name) Mr. W. W. Bedford
Division Mr. P. A. Hart
Location Mr. C. A. Kennedy

Date January 19, 1973
Originating Dept. Distribution - Production
 and Distribution Planning
Answering letter date

Copy to Mr. J. R. Clark
 Mr. G. J. Freebersyser
 Mr. R. C. Hawkins
 Mr. A. C. Hemme
 Mr. D. E. Jordan
 Mr. Mike Paton
 Mr. A. W. Rhodes
 Mr. W. H. Schneider

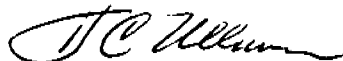
Subject Inspection Procedures
 for FC, FT, and HC
Fluorocarbon Cylinders

Gentlemen:

Due to the many personnel changes which have been made during the past two years, I have attached a copy of my November 26, 1969 letter outlining subject procedures.

We have adopted the 5-year visual inspection schedule in lieu of the 12-year hydrostatic retest. Is this inspection procedure being implemented at your respective locations?

Very truly yours,


 H. C. Ullum

HCU:dc

Attachment

**UNION
CARBIDE****INTERNAL CORRESPONDENCE****CHEMICALS AND PLASTICS**

INSTITUTE PLANT P. O. BOX 2831, CHARLESTON, WEST VIRGINIA 25330

To (Name) Mr. Oscar Hall
 Division Mr. C. A. Kennedy
 Location Mr. R. J. Lindroth
 Mr. Boyd O'Dell
 Mr. V. A. Smith

Copy to Mr. J. R. Clark
 Mr. C. C. Coburn
 Mr. A. W. Cole
 Mr. Peter Granger
 Mr W. H. Green
 Mr. K. J. Gutshaw
 Mr. R. E. Merrill
 Mr. Ernie Mulder
 Mr. T. E. Willoughby

Date November 26, 1969

Originating Dept.

Answering letter date

Subject Inspection of Low-
Pressure Cylinders

Gentlemen:

DOT regulations specify that low-pressure cylinders used in non-corrosive gas service must be given a complete external visual inspection every five years in lieu of a 12-year hydrostatic retest. The regulations also specify that a permanent record must be kept of these inspections and that the inspection date must be stamped upon the cylinder.

Mr. W. H. Greene has prepared a draft outlining the procedure in detail for all Linde cylinder filling locations. A copy of this procedure is attached for your information.

Many of our returnable cylinders have never been inspected in accordance with this regulation. Please initiate the inspection as soon as possible at your respective locations.

As you know, we plan to phase out of FA, FB, FJ, FH, FK, and FL cylinders by the end of 1970. The only cylinders we will consider with be the HC and FC types. Difficulty has been experienced in restamping the retest date on the shoulder of the cylinder. Mr. Mulder suggested that we stamp the retest date on the foot ring in lieu of the shoulder. Mr. Willoughby has indicated that this procedure should be acceptable with the Department of Transportation.

Mr. Greene has attached a form used by Linde for the five-year cylinder inspections report. This format should be applicable for our purposes.

November 26, 1969

The FT (ton) cylinder re-inspections come under ICC Regulation 73.310 , "Periodic retest and re-inspection of tanks other than single-unit tank car tanks." This procedure is also attached. These cylinders will require both an internal and external inspection whereas the FC and HC cylinders will require only an external inspection.

If you have any questions, please contact me.

Very truly yours,



H. C. Ullum

HCU:lw

Enc.

GENERAL MEMORANDUM TO ALL PLANTS:

SUBJECT: Inspection of Low Pressure Cylinders

DOT Regulations specify that low pressure cylinders used in non-corrosive gas service must be given a complete external visual inspection every five years in lieu of the periodic hydrostatic retest. The regulations also specify that a permanent record must be kept of these inspections and that the inspection date must be stamped on the shoulder of the cylinder; the date must include the month and the year followed by the letter "E" to indicate requalification by visual examination.

To comply with these regulations, all low pressure refrigerant and sterilant gas cylinders filled by Linde are to be inspected at five-year intervals for the conditions listed below. The results of these inspections are to be logged as indicated on the attached sample "Inspection Report Form" and the inspection date followed by the letter "E" is to be stamped on the shoulder of each cylinder.

Inspection of Low Pressure Cylinders

Cylinders shall be checked for corrosion, general distortion and other defects that might indicate a weakness which would render it unfit for service. Prior to making this inspection, all rust, scale, caked paint, etc., shall be removed from the exterior surface so that the surface can be adequately observed.

Inspection Equipment

The equipment required to complete this inspection will be as specified in Section 8D of the Plant Manual for similar inspections of high pressure and acetylene cylinders.

I. Corrosion Limits

The general limits of acceptability listed below are included in Table I as they apply to each type of cylinder meeting the visual inspection qualifications.

- a. A cylinder shall be rejected when the tare weight is less than 95% of the original tare weight marked on the cylinder. When determining tare weight, be sure that the cylinder is empty.
- b. A cylinder shall be rejected when the remaining wall in an area having isolated pitting, only, is less than 1/3 of the minimum allowable wall thickness.

Corrosion Limits - Continued

- c. A cylinder shall be rejected when line corrosion on the cylinder is three (3) inches in length or over, and the remaining wall is less than $\frac{3}{4}$ of the minimum allowable wall thickness; or when line corrosion is less than three (3) inches in length and the remaining wall thickness is less than $\frac{1}{2}$ the minimum allowable wall thickness.
- d. A cylinder shall be rejected when the remaining wall in an area of general corrosion is less than $\frac{1}{2}$ of the minimum allowable wall thickness.

2. Dents

Dents are of concern where the metal deformation is sharp and confined, or where they are near a weld. Where metal deformation is not sharp, dents of larger magnitude can be tolerated.

a. Dents at Welds

Where denting occurs so that any part of the deformation includes a weld, the maximum allowable dent depth shall be $\frac{1}{4}$ ".

b. Dents Away from Welds

When denting occurs so that no part of the deformation includes a weld, the cylinder shall be rejected if the depth of the dent is greater than $\frac{1}{10}$ of the mean diameter of the dent.

3. Cuts, Gouges or Digs

Cuts, gouges or digs reduce the wall thickness of the cylinder and in addition are considered to be stress raisers. Depth limits are listed below and in addition, cylinders shall be rejected at $\frac{1}{2}$ of the limit set whenever the length of the defect is 3 inches or more.

- a. When the original wall thickness at manufacture is not known, and the actual wall thickness cannot be measured, a cylinder shall be rejected if the cut, gouge or dig exceeds $\frac{1}{2}$ of the minimum allowable wall thickness.
- b. When the original wall thickness at manufacture is known, or the actual wall thickness is measured, a cylinder shall be rejected if the original wall thickness minus the depth of the defect is less than $\frac{1}{2}$ of the minimum allowable wall thickness.

4. Leaks

Leaks can originate from a number of sources, such as defects in a welded or brazed seam, defects at the threaded opening, or from sharp dents, digs, gouges, or pits.

Leaks - Continued

- a. To check for leaks, the cylinder shall be charged and carefully examined. All seams and pressure openings shall be coated with a soap or other suitable solution to detect the escape of gas. Any leakage is cause for rejection.
- b. In accordance with paragraph 73.34 (f) of ICC and BTC regulations, safety relief devices shall be tested for leaks before a charged cylinder is shipped from the cylinder filling plant.

5. Fire Damage

Cylinders shall be carefully inspected for evidence of exposure to fire.

a. Inspection

Common evidences of exposure to fire are: a) charring or burning of the paint or other protective coat, b) burning or sintering of the metal, c) distortion of the cylinder, d) melted out fuse plugs, e) burning or melting of valve.

b. Evaluation

ICC and BTC regulations state that, subject to the special provisions of paragraph 73.34 (h), "Cylinders which have been in a fire must not again be placed in service until they have been properly heat treated and retested ...". The general intent of this requirement is to remove from service cylinders which have been subject to the action of fire which has changed the metallurgical structure or the strength properties of the steel, or in the case of acetylene cylinders, caused breakdown or porous filler. This is normally determined by visual examination as covered above with particular emphasis to the condition of the protective coating. If the protective coating has been burn off or if the cylinder body is burnt, warped, or distorted, it is assumed that the cylinder has been overheated, and paragraph 73.34 (h) shall be complied with. If, however, the protective coating is only dirtied from smoke or other debris, and is found by examination to be intact underneath, the cylinder shall not be considered affected within the scope of this requirement.

6. Bulges

- A. Cylinders are manufactured with a reasonably symmetrical shape. Cylinders which have definite visible bulges shall be removed from service and evaluated as outlined below.

Bulges - Continued

- b. Bulges in cylinders can be measured in several different ways as follows:
 - 1. Bulges on the cylinder sidewall can be measured by comparing a series of circumferential measurements.
 - 2. Bulges in the head, and also in some cases on the sidewall, can be measured by comparing a series of measurements of the peripheral distance between the valve spud and the center seam (if any) or an equivalent fixed location on the cylinder sidewall.
 - 3. Variations from normal cylinder countour can be measured directly by; a) measuring the height of a bulge with a scale, b) comparing templates of bulged areas with similar areas not bulged.

c. Limits

Cylinders shall be rejected when a variation of 1% or more is found in the measured circumferences or in peripheral distances measured from the valve spud to the center seam, (or equivalent fixed point).

7. Neck Defects

- a. Cylinder necks shall be examined for serious cracks, folds and flaws. Neck cracks are normally detected by testing the neck during charging operations with a soap solution.
- b. Cylinder neck threads shall be examined whenever the valve is removed from the cylinder. At manufacture, cylinders have a specified number of full threads of proper form, as required in applicable thread standards. Cylinders shall be rejected if the required number of effective threads are materially reduced, or if a gas tight seal cannot be obtained by reasonable valving methods. Gages shall be used to measure the number of effective threads. Common thread defects are worn or corroded crests, broken threads, wicked or cut threads.

8. General Distortion

- a. Noticeable distortion may be evaluated by reference to the sections under denting or bulging. If the valve is noticeably tilted the cylinder shall be rejected.
- b. The footring and headring of cylinders may become so distorted through service abuse that they no longer perform their functions;

General Distortion - Continued

1) to cause the cylinder to remain stable and upright, 2) to protect the valve. Rings shall be examined for distortion, for looseness, and for failure of welds. Appearances may often warrant rejection of the cylinder. Repair rules for such cylinders are established in ICC and BTC regulations, paragraph 73.34, subparagraphs (1) to (q)

c. Inspection Report Form

ICC and BTC regulations, paragraph 73.34 (k) (12) require that results be recorded and a permanent record kept of all visual inspections made in lieu of the periodic hydrostatic retest. A sample inspection report form is shown in Figure 2. The completed report forms are to be retained in the plant files as a permanent record of cylinder retesting. The above report form and procedures use the standards set forth in CGA pamphlet C-6, copyright 1962.

CYLINDER SPECIFICATIONS			DIMENSIONS (INCHES)		MINIMUM WALL THICKNESS (INCHES)					
Cylinder Type	Gas Service	DOT Spec.	Minimum Wall	Outside Diameter	Isolated Pitting	*Line Corrosion	General Corrosion	Corrosion & Pitting	** Dents *** (Dents)	Cuts, Digs & Gouges
FA FB	UCON	4BA	0.078	6.6	0.026	0.059 (0.039)	0.039	0.026	0.25 (0.66)	0.039
FH	UCON	4BA	0.078	12	0.026	0.059 (0.039)	0.039	0.026	0.25 (1.2)	0.039
FJ	UCON	4BA	0.078	9	0.026	0.059 (0.039)	0.039	0.026	0.25 (0.9)	0.039
FK (Alum)	UCON	4BA	0.078	10.3	0.059	0.059	0.059	0.059	0.25 (1.03)	0.059
FL (Alum)	UCON	4BA	0.078	12.3	0.059	0.059	0.059	0.059	0.25 (1.23)	0.059
FC FH	UCON & Sterilit	4BA	0.080	10.2	0.027	0.060 (0.040)	0.040	0.027	0.25 (1.02)	0.040
Typ X	Sterilant	4B240	0.090	15	0.030	0.068 (0.045)	0.045	0.030	0.25 (1.5)	0.045
FE	Sterilant	4B240	0.090	7.5	0.030	0.068 (0.045)	0.045	0.030	0.25 (0.75)	0.045
FT	UCON	110A-500W	0.343	30	0.114	0.257 (0.172)	0.172	0.114	0.25 (3.0)	0.172

*** The depth limitation for dents not including a weld is 1/10 of the mean diameter of the cylinder.

*The first number in each box refers to thickness when corrosion length is over 3 inches long. The number in parenthesis refers to thickness when the corrosion is less than 3 inches long.

APPENDIX A

SAMPLE INSPECTION REPORT FORM

8 - 69

Month Year

UNION CARBIDE - LINDE DIV.

COMPANY NAME

876

Plant

25

Report No.

(Superintendent)

Approved Signature

FIVE YEAR CYLINDER INSPECTION REPORT

ICC SPEC.	CYLINDER DATA				INSPECTED FOR					PROTECTIVE COATING		INSPECTORS INITIALS	DISPOSITION (See Code)
	TYPE	SERIAL NUMBER	DATE MFD.	REGISTERED SYMBOL	CONDITION OF RINGS	DENT, DIG. BULGE, GOUGE	CORROSION	LEAKAGE	FIRE DAMAGE	TYPE	CONDITION		
4B	FL	21304	6/64	Linde	x	x	x	x	x	Paint	Good	L.D.	1
4B	FH	28821	4/63	Linde	x	x	x	x		Paint	Poor	L.D.	3
4B	F3	22011	2/64	Linde	x		x	x		Paint	Fair	L.D.	3

Original _____

Duplicate _____

Disposition Code:

1. Returned to Service
2. Returned to Manufacturer for Repair
3. Scrapped

FIGURE 2

BLAND/UCC 279

FT CYLINDERS

PERIODIC RETEST AND RE-INSPECTION OF TANKS OTHER THAN SINGLE-UNIT TANK CAR TANKS

Tanks of ICC-110A-W specifications used exclusively for transporting fluorinated hydrocarbons and mixtures thereof which are free from corroding components may be given a periodic complete internal and external visual inspection in lieu of the periodic hydrostatic retest. Visual inspections may be made only by competent persons. Acceptance or rejection of tanks shall be based upon the methods used for cylinders in CGA Pamphlet No. 6. (A copy of this pamphlet is attached for your information.) The results shall be recorded on a suitable data sheet, the completed copies of which shall be kept as a permanent record. The points to be recorded and checked on these data sheets are:

1. Date of inspection (month and year followed by a "V" to indicate visual inspection).
2. ICC specification number.
3. Tank identification and serial number.
4. Date of manufacture.
5. Type of protective coating.
6. Conditions checked (leakage, condition of rings, dents, bulges, gouges, corrosion, fire damage).
7. Internal condition.
8. Disposition.

The month and year of retest followed by a "V" must be plainly and permanently stamped into the metal on one head or chime of each tank passing test.

The tanks will be re-inspected every five year interval.

Safety relief devices must be retested every two years by air or gas, must start to discharge at or below the prescribed pressure, and must be vapor tight at or above the prescribed pressure.