

**UNION
CARBIDE****INTERNAL CORRESPONDENCE****UNION CARBIDE CHEMICALS COMPANY**P. O. BOX 471, TEXAS CITY, TEXAS
335

To (Name)

Mr. D. A. Bernard
BROWNSVILLE PLANT

Date

July 2, 1964

File

H Gas Process

Copy to

Mr. A. L. Barefoot - 526
Mr. O. T. Carlisle
Mr. H. B. Coons - 526
Mr. D. W. Moody, Jr. - 511
Mr. J. E. Murray/Mr. W. S. Jackson
Mr. L. B. Trenholme
Mr. W. M. Watkins, II - 511
MECCO

Subject

Failure of Spiral Wound Gaskets -
H Gas Unit

Dear Mr. Bernard:

We have examined several stainless steel spiral wound gaskets (Flexitallic) which you sent us in an effort to determine the cause of the failure of the gaskets. Two 8-inch diameter gaskets and one 4-inch diameter gasket were found to have the spiral components broken into many pieces. One 3-inch gasket was also received which was in good condition. All four of the gaskets were in service in the preheater outlet piping at an operating temperature of approximately 500°C (930°F). Fig. 1 shows the condition of the 4-inch gasket with the broken stainless spirals and pieces of the asbestos packing from between the spirals.

Close examination of the damaged gaskets revealed the type 304 stainless steel spiral material to be embrittled or cracked in a large number of places and the asbestos packing to be very hard, brittle, and shiny black. Metallographic examination of the stainless spiral revealed the attack to be intergranular corrosion of sensitized 304 stainless steel. An example of this corrosion may be seen in Fig. 2. With the temperatures involved, it appears that some decomposition of the asbestos packing and its filler material has taken place, releasing some corrosive constituent such as HCl. By comparison, the 3-inch gasket was found to be built of 316 stainless spirals and the asbestos packing was still soft and fibrous in nature. The three gaskets which failed were part of the original material ordered for the unit, while the 316 gasket was taken from the Brownsville plant stores.

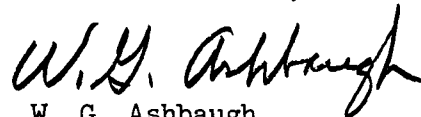
A review of the Flexitallic catalog indicates that they have two types of asbestos which are supplied in their gaskets. One is the Canadian asbestos which is compounded with some filler material, and the second is a blue African asbestos. The 316 gaskets at the Brownsville plant use the blue African asbestos filler. Because of the difference in the appearance of the asbestos packing in the used gaskets, we have assumed that the 304 gaskets which failed contained the Canadian asbestos. The organic filler, or polymer material, which was used to bind the fibers together, is believed to have caused the corrosion of the stainless steel.

July 2, 1964

As a result of this investigation, we recommend that all the Flexitallic gaskets used in the hot zones of the H gas reaction system be specified as type 304 stainless steel with blue African asbestos. We surmise from the catalog and from discussions with Mr. W. S. Jackson, of our Purchasing Department, that when a Flexitallic gasket is ordered as "stainless steel with asbestos filler," one would receive 304 stainless and the Canadian asbestos. This is the standard run-of-the-mill gasket. If a particular stainless alloy, or more resistant asbestos material is required, it will be necessary to specify them individually.

If we may be of any further assistance in this matter, please contact us.

Very truly yours,


W. G. Ashbaugh

WGA/ab



Fig. 1 This is the 4" Flexitallic gasket which fell apart as the result of corrosion of the stainless spiral.

Approximately 1/3 natural size.



Fig. 2 A portion of the corroded 304 stainless steel spiral is shown in this photomicrograph. This intergranular attack is believed to have been caused by decomposition products of the filler in the asbestos packing.

150 X - Electrolytic Oxalic Acid Etch.

MC-530-00

WV-0136 #55

CARBIDE AND CARBON CHEMICALS COMPANY

SOUTH CHARLESTON 3. W. VA.



DEVELOPMENT DEPARTMENT

49-18

TO Mr. G. L. Lansdale
Advertising Department
New York Office

DATE May 8, 1956

SUBJECT Ketones - Materials
of Construction

MATERIALS OF
CONSTRUCTION
GROUP

Dear Mr. Lansdale:

32
50
112
119
126
140
773

Replying to your note of May 3, it may be stated in general that piping materials will be the same for the ketones as previously designated for shipping containers and storage vessels.

For the lower molecular weight ketones, or for those other than isophorone and mesityl oxide, both asbestos and rubber type gasket and packing materials are suitable, such as Garlock No. 7735, U.S. Rubber Nos. 899, 3773, 200, and 9, Buna S and Thiokol. Polyethylene is also suitable for most ketones except isophorone and mesityl oxide.

For isophorone, Garlock No. 7735 and Asbestos No. 899 gasket and packing materials appear to be preferable. For mesityl oxide Asbestos No. 899 and Garlock No. 7021 have shown superior resistance in tests.

We have no information on ketones that require an inert atmosphere as a safety precaution and no information on those that may require special precautions in handling. If such information is available we would suggest that you may obtain the data from the Process Safety Department by contacting Mr. A. P. Dunlap or from Mr. G. L. Funk of the Development Department.

Very truly yours,

A. C. Hamstead

ACH/11d

COPIES TO: Mr. E. F. Hillenbrand, Jr.
Mr. J. M. Sartorius

UCC 015679

INTRACORPORATION CORRESPONDENCE

WV-0136 #64

FOR INTERNAL CORRESPONDENCE

CARBIDE AND CARBON CHEMICALS COMPANY

UCC

MATERIALS OF
CONSTRUCTION
GROUP

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

To (Name) Mr. J. C. Malone
Company Carbide and Carbon Chemicals Company
Location Institute, West Virginia

Date August 16, 1955

Originating Dept. Oxide-Glycol

5246

Answering letter date

Copy to Mr. H. B. Coons

File Ethylene Oxide
ACH

The Scope of the Ethylene
Oxide Protective Program
at the Institute Plant

MC-567-00

Dear Mr. Malone:

The program in progress has five primary objectives:

1. Eliminate asbestos, in any form, from contact with ethylene oxide liquid or vapor.
2. Clean equipment on a periodic schedule in order to eliminate dangerous deposits.
3. Insulate lines where fire exposure would allow detonations to propagate into process equipment or tanks.
4. A systematic replacement of badly corroded equipment with more corrosion resistant alloys, essentially stainless steel of the 18-8 variety.
5. Installation of fire water sprays on vulnerable equipment

Due to the scope of the program, it is well to discuss each of the five objectives individually and to give our reasons for believing the changes are necessary.

The Elimination of Asbestos, Primarily as a Gasket Material - Asbestos is known

to promote the polymerization of ethylene oxide in the liquid state. From the stand-point of product quality, it would be well to eliminate one of the causes of suspended matter in our product.

Asbestos in sheet form has been widely used as a gasket material throughout the Corporation, but we have discovered that a one-inch face on a gasket will deteriorate at the rate of approximately 1/8-inch per year. This will cause gasket failures, and possible fires, after a line has been in service for 5 to 10 years. The gaskets that are now being used are the metal spiral wound type with a Teflon filler between the metal spirals, solid soft copper, or asbestos with copper wrapped all around it. It is hoped that even Teflon can be eliminated because we do not feel that Teflon will stand up under fire exposure. All-metal spiral wound gaskets are on order, at this time, for testing purposes.

Gaskets are being replaced as follows:

- a. Pipe lines - spiral wound or soft copper.
- b. Motor valve bonnets - soft copper.
- c. Pump heads - soft copper if casings will stand bolt stresses required to seal. Replacement of some pumps may be required.
- d. Column flanges (purifying column - exhausting column) - copper clad asbestos on purifying column spiral wound or soft copper on exhausting column.
- e. Valve bonnets - soft copper and steel valves only. Cast iron valves cannot be used.
- f. Any safety valves having internal gaskets will have soft copper gaskets.

The regasketing program starts at the stripping still vapor line and continues up to the vent scrubber. All liquid and vapor oxide lines throughout the plant and the transfer line to South Charleston will be regasketed. This, of course, includes valve bonnet gaskets.

So far a suitable packing for valves in ethylene oxide service has not been found. This also applies to pump packing. Mr. Weber of our Maintenance Engineering Department is now testing a polyethylene pump packing that we hope will prove suitable for both pump and valve packing.

Cleaning Equipment to Remove Dangerous Deposits - We know that oil and corrosion deposits collect in the shell of the cycle gas heat exchangers and that they can ignite and burn. All heat exchanger shells will be mechanically cleaned and the shell "Insaluted". The chemical cleaning of the No. 17 Unit's shell did not appear to be very effective when it was done the week of August 10. After all the shells are cleaned, a 1-1/2 to 2 year cleaning schedule will probably be maintained.

Deposits removed from the No. 17 Oxide Unit's Recovery system on August 10 are now being tested by Carbide's Fire Research Laboratory to determine if they will lower the known detonation temperature of ethylene oxide. If the deposits do lower the detonation temperature, more equipment cleaning will be in order.

Insulation - All the ethylene oxide liquid and vent lines within the individual unit areas will be insulated to minimize the possibilities of detonations due to fire exposure. The oxide lines on the main piperacks will be considered after cost estimates are obtained.

Systematic Replacement of Corroded Equipment - The corrosion in the base section of No. 17 Unit's purifying column is 8 to 12 per cent general. The extent of corrosion on all the purifying columns is being investigated to determine the necessity of buying stainless steel replacement base sections, the top

August 16, 1955

part of these columns is in good shape in general.

The tubes in the cycle gas heat exchangers are corroding to the point where replacement of the tubes is necessary. A tube bundle with all stainless tubes is being ordered so that replacement of all the tube bundles can be accomplished without an excessive amount of down time (one day instead of 3-4 days per unit). The baffles in the new bundle and the retubed bundles will be stainless to minimize any catalytic effect of steel corrosion products.

The base sections of the No.'s 18 and 19 Units' stripping stills (steel) have been replaced once and nozzle replacements are again being made. Extensive repairs have also been made on the steel base sections of the No.'s 15, 16 and 17 Unit stripping stills. An investigation is being made to determine the necessity of replacing these base sections with stainless steel.

Extensive nozzle replacements and baffle replacements are being made on the stripping still heat exchanger shells of the No. 15, 16 and 17 Units. New shells will be required within the next 2-3 years.

The corrosion in the cycle water system of the No.'s 15, 16 and 17 Units appears to be more extensive than the other units in the plant. It is believed that this is due to using low pressure steam from the glycol evaporator system as live steam supply to these stripping stills.

Installation of Fire Water Sprays on Vulnerable Equipment - Fire exposure on the recovery systems of the oxide units would cause serious detonations within the equipment. Adequate spray protection will be installed on the following equipment:

- a. Entrainment separator in suction of oxide compressors.
- b. Purifying columns.
- c. Exhausting columns.
- d. Storage tanks already have spray protection.

Due to the large quantity of oxide that might be accumulated in the field storage tanks, it is planned to bury these two tanks so that there can be no possibility of fire exposure. The nozzles on the tanks will be altered so that there will be no flanges underground.

Very truly yours,

Rollin K. Wilson

R.K.Wilson:ak