

VCSA GASKET SURVEY

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COMPANY	A	B	C	D	D	D	D	E	E	F	G
PLANT	1	2	3	4	5	6	7	8	9	10	11

GASKET

COMPRESSED FIBER SHEET

FIBER BINDER

ASBESTOS NITRILE VCM, H₂O, STEAM

SBR

VCM/PVC SLURRY
120 F/130 PSI
STEAM/CONDENSATE
365 F/150 PSI

VCM UNLOADING

X

CAUSTIC 50% 60PSI/100 F
H₂O 75PSI/110 F
FUEL OIL 100PSI/200 F
N₂ 215PSI/100 F
AIR 100PSI/100 F
PVC SLURRY 60PSI/120 F
STEAM 100PSI/330 F
VCM 120PSI/120 F

UTILITIES AND
PROCESS

ALL SERVICES
EXCEPT HIGH PRESS.
STEAM

GENERAL SERVICE VCM 60 C/7kg/cm VCM 194 F/200PSI
Cl₂, NaOH, EDC, VCM, PVC SLURRY 80 C STEAM/CONDENSATE
HCl, PVC SLURRY 16kg/cm 390 F/300PSI
65-450 F/50-225 PSI PVC SLURRY 153 F/
150 PSI

EPDM

ARAMID NITRILE

X

VCM PIPELINES

TESTING IN SERVICES
AS WITH NITRILE/ASBESTOS
(HARDENS IN Cl₂ &
CHLORINATED HYDROCARBONS)

SBR

TEST FOR STEAM

UTILITIES & PROCESS
(SERVICE LIFE 50%
OF ASBESTOS) (CHEMICAL
ATTACK)

AIR, H₂O, OIL,
GASOLINE

NEOPRENE

EPDM

UTILITIES & PROCESS
(SERVICE LIFE 50%
OF ASBESTOS) (BETTER
CHEMICAL RESISTANCE)

SPIRAL WOUND GASKET

ASBESTOS FILLED

UNSUCCESSFUL IN
STEAM

VCM/PVC SLURRY
120 F/130 PSI
STEAM/CONDENSATE
365 F/150 PSI

STEAM
125 PSI/353 F

VCM CONDENSERS
(NEED EVEN BOLT
TORQUE)

STEAM 400-600 PSI

VCM, HCl, EDC VCM 90 C/15kg/cm
970 F/200PSI
RETURN BENDS OF
BOTLER ECONOMIZERS
250-450 F/450PSI

MICA FILLED

MICA/GRAPHITE
FILLEDCHLORITE/GRAPHITE
FILLED

SAME AS ASBESTOS
SPIRAL WOUND

CTL016820

VCSA GASKET

PAGE

COMPANY	A	B	C	D	D	D	D	E	E	F	G
PLANT	1	2	3	4	5	6	7	8	9	10	11

GASKET

TFE ENVELOPE

ASBESTOS FILLED VCM (ENAMELED
TANKS)

H₂SO₄ (98%)
600 PSI/100 F

VCM (SPLITTING
OF ENVELOPE AT
BEND)

NON-ASBESTOS
FILLED

VCM (SPLITTING
OF ENVELOPE AT
BEND)

ETHYLENE, PROPYLENE
COMPRESSORS

GLASS LINED TANK
FLANGES & PIPING
BELOW 18 BAR

STRONG ACIDS,
BREAKABLE FLANGES
65-110 F/70 PSI

WIRE MESH
REINFORCED TFE

VCM (EXCELLENT
SERVICE LIFE) (POOR
FOR GLASS LINED
EQUIPMENT)

METAL CLAD GASKET
ASBESTOS FILLED

CAUSTIC SOL'N 200 F/70 PSI
STEAM/CONDENSATE 365 F/150 PSI
WATER/VCM 150 F/80 PSI

HEAT EXCHANGERS- STEAM/CONDENSATE
H₂O, AIR, VCM, 1-20 BAR/100-200 C
STEAM

TFE JOINT SEALANT
(GORET)

LARGE OR DIVIDED
FLANGES 50-130 F
/100 PSI

GRAPHITE VCM (WITH TFE
(GAFDIL) WASHER)

GENERAL USE AND
STEAM (GOOD SERVICE)

VALVE PACKING
(LONGER LIFE THAN
PTFE/ASBESTOS
PACKING)

GLASS FILLED TFE
(GYLON)

VCM (EXCELLENT POLY. ETHYLENE,
AREA GASKET) (GOOD PROPYLENE
COMPRESSIBILITY FOR COMPRESSORS
GLASS LINED EQUIP.)

BALL VALVE
SEATS

CTL016821

VCSA BASKET SURVEY

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COMPANY	H	I	I	I	I	J	K	K	L	M	N
PLANT	12	13	14	15	16	17	18	19	20	21	22

BASKET

COMPRESSED FIBER SHEETFIBER BINDERASBESTOS NITRILE

SBR

N 22BAR, AIR 8 BAR
VCM VAPOR 7 BAR, H₂O
9 BAR, GLYCOL 20 BAR,
STEAM 18 BAR

VCM, EDC, HCl, STEAM
ACID, ALKALI 300C/
250 PSI (SBR WITH
WIRE REINFORCEMENT
FOR DIFFICULT SERVICE
-SO C-500 C/40 BAR,
UNLIKELY TO BLOW OUT)

ALL SERVICES
EXCEPT STEAM

PVC SLURRY, H₂O, AIR
STEAM, NITROGEN

EDC, VCM, Cl, CAUSTIC,
AIR, BRINE, L.P. STE

VCM 160 F/160PSI,
PVC SLURRY 240 F/160PSI,
STEAM/CONDENSATE/H₂O
350 F/125 PSI, RESIN
80 F/40 PSI

(IN TRANSITION
FROM SBR TO
NITRILE BINDER)

H₂O, N, AIR, 15
212 F, STEAM -300PSI
EDC, VCM, ETHYLENE
REFRIGERENT

VCM 50 C/100 PSI

EPDM

AREMID NITRILE

SBR

VCM, H₂O, AIR, STEAM
PVC SLURRY
(ASBESTOS SUBSTITUTE)

NEOPRENE

BREATHING AIR 90PSI
AMBIENT TEMP.

EPDM

SPIRAL WOUND BASKETASBESTOS FILLED

CRACKER/QUENCH SYS.
WITH HIGH PRESSURE
STEAM

VCM LIO. 20 BAR,
H₂O 30 BAR, PVC
SLURRY 18 BAR,
STEAM 18 BAR

VCM, EDC, HCl,
CRACKER EXIT STEAM 285 PSI/
500 C/250 PSI 410 F
ETHYLENE 1200 PSI
(NEED GOOD FLANGES)

VCM, STEAM, AIR,
NITROGEN

VCM IN SERVICE
SUBJECT TO EROSION
STEAM 200 PSI

HEAT EXCHANGER
SERVICE: CL, EDC,
VCM, STEAM, H.P.
STEAM

H₂O 70 F/
4700 PSI

STEAM 700 PSI/500 F EDC 200 F/1100 PSI
S.S. STRIP; HOT OIL STEAM/CONDENSATE
150 PSI/640 F S.S. 650 F/235PSI
STRIP, DRY Cl MONEL
STRIP

NICA FILLEDNICA/GRAPHITE
FILLED

ETHYLENE 1200 PSI
(BETTER SEAL WITH
POOR FLANGES)

CHLORITE/GRAPHITE
FILLED

HOT OIL 500 F/
100 PSI (GRAPHITE
FILLED)

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VCSA BASKET SURVEY

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COMPANY	H	I	I	I	I	J	K	K	L	M	N
PLANT	12	13	14	15	16	17	18	19	20	21	22

BASKET

TFE ENVELOPEASBESTOS FILLEDH₂O, VCM, VINYL ACETATE
SUSPENSION AGENT, CHAIN
MODIFIER 60 F/150 PSIHEAT EXCHANGER
COVERS, 11 BAR/210 CGLASS LINED
REACTORS
213PSI/210 FPRACTICALLY NONE PVC SLURRY HCl 150PSI/300 F
USED (PROBLEMS WITH 210 F/160 PSI,
FLANGE TORQUE & DILUTE H₂SO₄
COLD FLOW AMBIENT TEMP.
AND PRESS.NON-ASBESTOS
FILLEDWIRE MESH
REINFORCED TFEMETAL CLAD GASKET
ASBESTOS FILLEDHEAT EXCHANGER NICKEL CLAD;
BONNET JOINTS OXYGEN SERVICE
FULL VAC. -22 BAR/ 150 PSI/150 C
120 C (NEW APPLICATION)

STEAM VALVES

DOUBLE JACKET CAUSTIC -20 - 500 F/
ASBESTOS FILLED 170 PSI (DOUBLE
JACKETED STEEL)TFE JOINT SEALANT
(GORTEX)PVC RESIN CONVEYING,
DRYER 210 F/150 PSITEMPORARY
SERVICES ONLYVALVE PACKING,
H₂O GASKETVCM LOW PRESS.
SERVICE (SUBSTITUTE
FOR ASBESTOS FILLED
TFE ENVELOPE)GRAPHITE
(GROFOIL)STEAM/CONDENSATE OXYGEN
360 F/150 PSI

STEAM

PUMP PACKING ONLY

HOT OIL TRACING

GLASS FILLED TFE
(GYLON)REACTOR MANWAYS
170 F/22"Hg VAC-
180 PSIVALVE SEAT
MATERIALS - VCM
VALVES

CTL016823

COMPANY	N	O	P	Q	Q	R	R	S	T
PLANT	23	24	25	26	27	28	29	30	31

GASKET

COMPRESSED FIBER SHEET

FIBER BINDER
ASBESTOS NITRILE

ALL SERVICES

ALL GASKETS FOR ALL
 SERVICES IN PVC
 PLANT - COMPRESSED
 ASBESTOS SHEET. NO
 BINDER SPECIFIED.

GENERAL PURPOSE
 ASBESTOS FIBER
 (UNKNOWN BINDER)

SBR

VCM PROCESS LINES ALL SERVICES
 EXCEPT SOME
 STEAM

VCM 165 PSI/160 F
 REACTOR RUPTURE DISC
 FLANGES

GENERAL PURPOSE:
 STEAM/CONDENSATE 390 F/200 PSI
 VCM 80 F/350 PSI
 PVC SLURRY 200 F/150 PSI

EPDM

AUTOCLAVE DEBASS
 FILTER HEADS

ARAMID NITRILE

VCM, H₂O, PVC SLURRY
 165 PSI/160 F
 STEAM 200 PSI/390 F
 CAUSTIC 30 PSI/150 F
 GENERAL PURPOSE GASKET

STEAM 150 PSI

SBRNEOPRENE

PRODUCT CONVEYING
 LINES

WATER 150 F/300 PSI

EPDM

DROP LINE HEADER

SPIRAL WOUND GASKET

ASBESTOS FILLED EDC, VCM, FULL RANGE
 -40-200 C/0-1200 PSI

C₂H₄ 120 BAR/150 C STEAM 400 F/
 210 PSI

NICA FILLED

STEAM (REPLACEMENT
 FOR SBR-ASBESTOS
 SHEET)

STEAM 200 PSI/390 F

NICA/GRAPHITE
FILLED

STEAM (REPLACEMENT
 FOR SBR-ASBESTOS
 SHEET)

CHLORITE/GRAPHITE
FILLED

VCM AMBIENT TEMP.
 60-200 PSI ASBESTOS
 SPIRAL SUBSTITUTE

CTL016824

VCSA GASKET SURVEY

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COMPANY	N	O	P	Q	Q	R	R	S	T
PLANT	23	24	25	26	27	28	29	30	31

GASKET

TFE ENVELOPE

ASBESTOS FILLED HC1 0-50 PSI ADJACENT TO TFE VCM
LINED EQUIPMENT

SPECIFIED REACTOR ACID, H₂O
FLANGES (ALL FUTURE 40 C/16 BAR
ENVELOPE GASKETS
WILL BE NON-ASBESTOS
FILLED)

NON-ASBESTOS HC1 0-50 PSI
FILLED

WIRE MESH
REINFORCED TFE

ACID, H₂O
150 C/10 BAR

METAL CLAD GASKET
ASBESTOS FILLED

COMP. VALVES

FREON HEAT ETHYLENE
EXCHANGERS 120 BAR/150 C

TFE JOINT SEALANT
(GORTEX)

VCM FINAL CONDENSER STEAM VALVE
HEAD PACKING

DRYER AIR SEALS

GRAPHITE
(GRAFOIL)

PUMP PACKING

STEAM 400 F/
210 PSI

GLASS FILLED TFE
(GYLON)

VCM - AMBIENT TEMP
/150 PSIG

OVERHEAD CONDENSER
FLANGES, VCM 160 F
/165 PSI, GOOD FOR
FLANGES IN POOR
CONDITION

CTL016825

QUESTION 2: Is gasket testing done prior to substituting for an asbestos gasket? If yes, describe the testing method.

<u>NO</u> <u>17</u> <u>PLANT</u>	<u>YES</u> <u>11</u> <u>COMMENT</u>
C3	Yes; if gasket is not an approved gasket./ By process exposure
D6	Yes; installation in areas of high chemical incompatibility. Flanges checked periodically with a gas meter for leaks. Later gasket is inspected for physical integrity and polymer growth during normal maintenance.
E8	After 1970, we began to test substitutes for asbestos packing in stuffing boxes and after 1980, also for gasket services between flanges. All tests are made online in our plants.
E9	The tests are done at the Research Center in our company and we have also tested the gaskets in service at the PVC plant.
G11	No; contacts with suppliers, their specifications and recommendations. Then experience during periods from 3 months to one year for one gasket.
H12	Field test
I13	We are testing grooved joints with graphite layer in the cracker-quench system.
I15	We are not actively seeking replacements for asbestos joints so testing is not regularly done.
L20	We do not aggressively seek asbestos gasket replacements. Prior to substituting for an asbestos gasket on a large scale, selective implementation and extensive monitoring are performed.
M21	We have not substituted asbestos gaskets.
O24	In our company, all gaskets are standardized and have been tested.
P25	No deviations from plant specifications are permitted.
Q26	Field trial
R28	Yes; a test gasket is installed in a side branch of a process line where it can be isolated in case of a leak. The flange is monitored daily with a HNY meter. Thirty days is the normal testing period. The used gasket is then examined for wear.
R29	Yes; the gasket is installed where it can be blocked in if it leaks. The location of the gasket is noted on a plant change log. The gasket is examined for wear or chemical attack before complete substitution is made.

CTL016826

QUESTION 3: Do you have an established Quality Review Program in which non-asbestos gasket performance is reviewed at designated service intervals?

<u>NO</u> <u>22</u> <u>PLANT</u>	<u>YES</u> <u>4</u> <u>COMMENT</u>
A1	As a trial program; the review is time dependant of the reliability.
C3	Yes; periodic check by unit and corrosion personnel.
E8	We compare the test gaskets with reference to the tightening of bolted joint, tightness/leakage, chemical resistance, influence on the surfaces of the flanges, crevice corrosion, easy to handle or change, etc. All our review is visual and can be done in intervals.
I15	The bulk of our gaskets are asbestos so we have no quality review program.
R29	Comparisons of different kinds of non-asbestos gaskets are made after testing. Leakage, ease of handling, chemical or heat attack is reviewed.

QUESTION 4: Is the use of asbestos type gaskets restricted in any way by Corporate guidelines?

<u>NO</u> <u>19</u> <u>PLANT</u>	<u>YES</u> <u>12</u> <u>COMMENT</u>
D6	Yes; recommend finding alternatives.
D7	Loose or loosely woven asbestos gaskets are not used per plant policy, i.e., boiler manhole gaskets - fire blankets, etc.
E8	From 1975, we have had the intention to find substitutes for asbestos fiber. For the hard service in our petrochemical plant the quality of the substitutes was bad at first. The quality has been better in the last few years.
H12	Asbestos type gaskets cannot be used in the manufacture of food grade materials.
K18	Yes; no asbestos gaskets allowed since May, 1986.
L20	Asbestos gaskets are prohibited in breathing air applications (solid TFE or neoprene gaskets are used).
R28	We are to find asbestos substitutes within one year of June, 1986.
R29	Yes, we are asked to find substitutes by June, 1987.

CTL016827

QUESTION 5: Is the use of asbestos type gaskets restricted in any way by Government regulations?

NO	YES	DON'T KNOW	*Excluding Asbestos Disposal Regulations
24*	2	2	

<u>PLANT</u>	<u>COMMENT</u>
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D7	OSHA regulations
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E8	Yes; the restricted regulations started in June, 1975, and have been harder during new additions 1981, 1983, 1984, 1986. After the 1st of January, 1987, the use of asbestos and asbestos filled gaskets is forbidden for new installations or exchanged in service. We have to use asbestos free substitutes, but can, in very exceptional cases, apply for exemption in one year.
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E9	Yes; we are not allowed to use any type of materials containing asbestos.
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H12	Don't know
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I15	No; the only guidelines/regulations are those covering the cutting, shaping, and handling of asbestos sheet, e.g., shear only; do not grind; bag any waste. In all our air sampling, asbestos fibers around cutting areas have been non-detectable.
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I16	No; if handled following manufacturers instructions.
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K18	Disposal of asbestos gaskets is subject to Government regulations.
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L20	There is no Government regulation restricting the use of asbestos gaskets; however, the Occupational Health and Safety Act - designated substance regulations - August 1982 requires the employer provide engineering controls, work practices, hygiene practices, and facilities such that maximum airborne asbestos levels are:
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- 0.5 Fibers/CM³ Air - Amosite
- 0.2 Fibers/CM³ Air - Crocidolite
- 1.0 Fibers/CM Air - Other Asbestos

M21	Don't know
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R28	No; only exposure to the dust created when removing an old gasket.
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R29	No regulations specifically for gaskets. OSHA regulations to asbestos dust apply. EPA regulations apply for asbestos gasket disposal.
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CTL016828

QUESTION 6: Are there any required special guidelines for the cutting or handling of asbestos gaskets in your facility? If yes, describe what is required.

<u>NO</u> <u>21</u> <u>PLANT</u>	<u>YES</u> <u>7</u> <u>COMMENT</u>
D4	No grinding of gasket material. Cutting is done with razor knife. 95% of gaskets purchased are sized properly.
D5	The only asbestos gaskets in use are the compressed asbestos gaskets in the SBR binder.
D7	No; the only asbestos gaskets that we cut from JM-61 compressed asbestos sheet.
E8	Yes; we must work below the limiting value of hygiene (1 fiber/ml in air). For temporary work, cutting and handling arrangement must be done with mechanical ventilation (point drought) and 99.9% of the asbestos fibers must go through the filter in the return air. We must also flush the gasket surface with water on the flanges when remains of asbestos gaskets are taken off.
E9	Yes; all old and used asbestos filled gaskets are collected in plastic bags and deposited in a special place, confirmed by Government regulations.
I14	Sheets to be cut with sharp tools (not sawn or ground). Off cuts to be placed in bags marked "asbestos" and collected on request by licensed asbestos removers.
I15	Use shears, do not grind, do not tear, do not file. All waste especially with torn or exposed edges is to be bagged, sealed, and marked asbestos waste.
K18	No asbestos gaskets eliminates need for special guidelines.
L20	We avoid cutting asbestos gaskets where possible. After extensive testing and monitoring, it was determined that routine handling of asbestos gaskets presented no hazard providing the integrity of the gasket is maintained. In the majority of our services/applications, asbestos gaskets may be removed intact. In extreme cases, where the gasket has decomposed and represents a source for loose asbestos fibers, standard asbestos handling procedures (respirator, monogoggles, gloves, wetting the asbestos, etc., are used).
P25	Gaskets are cut by commercial vendors.
Q27	No; standard sizes (ANSI 150 lb.) are bought ready for use. Only specials are cut from sheet.

CTL016829

- R28 We do not allow asbestos gaskets to be cut in the facility.
- R29 No asbestos gaskets are cut, any asbestos gaskets and all used asbestos gaskets are kept in plastic bags.
- T31 No; most of our gaskets are bought pre-cut.

QUESTION 7: For what services and types of gaskets have you tried and been unable to find a non-asbestos substitute gasket?

<u>NONE</u>	<u>OTHER</u>
<u>23</u>	<u>4</u>
<u>PLANT</u>	<u>COMMENT</u>

- A1 In trial for steam (and water) not successful for VCM.
- D6 No problem finding substitutes; high cost though.
- E8 Stuffing boxes in valves, pumps, agitators o.s.o. are no problem. We use mechanical seals and asbestos for sealing of expanded graphite or coolfiber.
- For flanges in pipes, vessels, and boilers up to the diameter of 400 millimetre and normal service, we hope to use plain sheets of special rubber impregnated glassfiber and also expanded graphite on metal foil.
- In strong acids, PTFE with or without filler or reinforcement.
- For bigger diameter or divided gaskets, for instance in heat exchangers, we try to get an exemption for at least one year. We need better knowledge from our test with asbestos-free substitutes since it can be hazardous if they fail. The same will also be done for liquid chlorine in storage tanks and pressure vessels.
- E9 Alternative gaskets for steam pipes are too thin and difficult to use.
- I15 Have not sought non-asbestos substitute gaskets.
- L20 We are not aggressively seeking asbestos gasket substitutes. As outlined previously, asbestos gaskets typically do not represent a health hazard in our operation. Where asbestos gaskets are sufficiently decomposed so as to release fibers to the air, standard asbestos handling procedures are in place.
- Q26 The non-asbestos flexitallic in steam service are too compressible. Bolts need to be re-tightened at a later date. EPDM "O" rings are used on Lenape manheads and VCM charge filters.

CTL016830