

Memo

To:

Distribution

Date:

December 16, 2004

From:

Applications Engineering

cc:

Subject:

Garlock Style IFG-5500, HTC-9850 and G-9900 fire test results

Attached are two reports that show Garlock IFG-5500 has successfully passed two different fire tests, the API-589 (modified) and ISO 10497 (modified). The first test, the API-589 (modified), requires the gasket sealability to be below a specified level of leakage (1.1 ml/min) after being exposed to a maximum temperature of 1000°F, and a maximum pressure of 540 psig. The second test, the ISO 10497 (modified), requires the gasket sealability to be below a specified level of leakage (20-200 ml/min/in) after being exposed to an average temperature of 1202°F, and a maximum pressure of 600 psig.

Garlock HTC-9850 and G-9900 have also successfully passed numerous Garlock fire tests. The API-607 fire test report is attached. The API-607 fire test requires the gasket sealability to be below a specified level of leakage (20-200 ml/min/in) after being exposed to a maximum temperature of 1200°F, and a maximum pressure of 540 psig.

Please feel free to contact the Applications Engineering Department at 800-448-6688 if you have any questions.

KEROSENE FIRE-SAFE VALVE TEST SUMMARY

TEST #:FT-0058

TEST DATE: 7/16/91

TEST PROCEDURE: PROPOSED KEROSENE TEST

VALVE:

VELAN NPS 6" ANSI 300 # CLASS

FLANGES - RAISED FACE

BONNET - MODIFIED TO FLAT FACE

PACKING TESTED:

MANUFACTURER: GARLOCK

STYLE: 9000 EVSP SIMPLIFIED

NO. OF RINGS: 2-98; 5-GL

GLAND PEN: .179"

SET COMPRESSION: 28.2 %

NO. OF PREVIOUS TESTS: 1

GASKETS TESTED:

FLANGES: MANUFACTURER: GARLOCK

STYLE: 9900 (X-3427)

THICKNESS: 1/16"

TORQUED TO: 120 FT-LBS

INCREMENTS OF: 30 FT-LBS

NO. OF PREVIOUS TESTS: 1

BONNET: MANUFACTURER: GARLOCK

STYLE: 9900 (X-3427)

THICKNESS: 1/16"
TORQUED TO: 120 FT-LBS
INCREMENTS OF: 30 FT-LBS

NO. OF PREVIOUS TESTS: 0

BOTH THE PACKING AND GASKETING PASSED THE TEST. THE PACKING

EXPERIENCED NO LEAKAGE DURING THE ENTIRE TEST. THE BONNET AND FLANGE GASKETS SHOWED NO SIGNS OF LEAKAGE DURING THE ENTIRE TEST.

TEST PERSONNEL:

MARK ADAMS MARK CLEMENT TOM ENRIGHT TIM HURLEY

KEROSENE FIRE-SAFE VALVE TEST DATA

TEST #:FT-0058

TEST DATE: 7/16/91

SYSTEM DATA I.

A. FILL AND VENT

B. TANK LEVEL - START: 3.3" AT 25 psig.

- C. TANK LEVEL END: 3.2" AT 25 psig.
- D. DELTA HEIGHT 0 INCHES
- E. (DELTA HEIGHT) X (2259.31) = 0 ml

II. PRE-BURN PROCEDURE

- A. PRESSURIZE SYSTEM
 - 1. 540 psig + 10 % (486 585 psig)
 - 2. RECORD TIME 9:50
- B. CHECK SYSTEM
 - 1. N AND S FLANGES OK
 - 2. BONNET OK
 - 3. PACKING OK
 - 4. SYSTEM PIPING OK
 - 5. RECORD TIME 9:55

III. START-UP

- A. REDUCE PRESSURE TO 25 psig MINIMUM
- B. START FLAMES 10:12

IV. FIRE TEST

- A. RECORD PRESSURE EVERY 2 MINUTES
- B. T2 AND T3 MUST REACH 1200°F WITHIN 10 TO 20 MINUTES
- C. MAINTAIN 1200°F TEMPERATURES FOR 15 MINUTES
- D. MAINTAIN 25 psig MINIMUM PRESSURE

KEROSENE FIRE-SAFE VALVE TEST DATA

TEST #:<u>FT-0058</u> TEST DATE:<u>7/16/91</u>

TIME	PRESSURE	COMMENTS
10:12	25	START - FLAMES A&F ONLY
10:14	25	
10:16	25	
10:18	26	
10:20	26	FLAMES THROTTLED BACK
10:22	27	UP TO REQUIRED TEMPS
10:24	27	
10:26	27	
10:28	28	
10:30	28	
10:32	28	
10:34	28	
10:36	29	
10:37	29	FLAMES OFF

FLAME F

FLAME A

T2

T8 T7

Т3

T1 T4

T6 T5

KEROSENE FIRE-SAFE VALVE TEST DATA

TEST #:FT-0058

TEST DATE: 7/16/91

V. POST BURN:

- A. QUENCH VALVE TO 200°F
 - 1. QUENCH START 10:38
 - 2. QUENCH END 10:42
- B. STABILIZE TEMPERATURE AND PRESSURE (1 MINUTE MINIMUM)
- C. ACTUATE VALVE OPEN 10:48
- D. LOW PRESSURE TEST .
 - 1. REDUCE PRESSURE TO 10 psig + 1\(\chi_2\) psi 10:48
 - 2. START 10 MINUTE LEAK TEST 10:48
 - 3. END 10 MINUTE LEAK TEST 10:58/
 - 4. PACKING LEAK RATE 0 ml/10 min
 - 5. BODY SEALS LEAK RATERMOCOUPLE1 COMATIONS
- E. MEDIUM PRESSURE TEST
 - 1. INCREASE PRESSURE TO 324 psig + 5 psi 10:59

- 2. START 10 MINUTE LEAK TEST <u>11:01</u>
- 3. END 10 MINUTE LEAK TEST 11:11
- 4. PACKING LEAK RATE _0 ml/10 min
- 5. BODY SEALS LEAK RATE 0 ml/10 min
- F. HIGH PRESSURE TEST
 - 1. INCREASE PRESSURE TO 540 psig + 5 psi 11:12
 - 2. START 10 MINUTE LEAK TEST 11:15
 - 3. END 10 MINUTE LEAK TEST 11:25
 - 4. PACKING LEAK RATE 0 ml/10 min
 - 5. BODY SEALS LEAK RATE _0 ml/10 min

KEROSENE FIRE-SAFE VALVE TEST DATA

TEST #:<u>FT-0058</u>
TEST DATE:<u>7/16/91</u>

LOW PRESSURE TEST (10 psig)

10:48	10	START
10:50	10	
10:52	10	
10:54	10	NO LEAKAGE
10:56	10	
10:58	10	END

MEDIUM PRESSURE TEST (324 psig)

11:01 11:03	<u>324</u> 324		START
11:05 11:07 11:09	324 324 324		NO LEAKAGE
11:11	$\sqrt{\frac{324}{324}}$		END
	HIGH PRESSURE	TEST 540	psig)
11:15 11:17 11:10	540		START
11:19 11:21	540	0/	NO LEAKAGE
11:23 11:25	540		END

BREAK AWAY TORQUES (ft-lbs)

40 45

40 50

55

65 55

65 60

70 55

KEROSENE FIRE-SAFE VALVE TEST SUMMARY

TEST #:FT-0058 TEST DATE:7/16/91

VALVE: VELAN 6" ANSI 300# CLASS

PACKING:

MANUFACTURER: GARLOCK

STYLE: 9000 EVSP SIMPLIFIED

I. LOW PRESSURE BURN

EXTERNAL LEAKAGE RATE OF _0 ML/MIN/IN

OCCURRED DURING A 25 MINUTE BURN PERIOD.

LEAKAGE SHALL NOT RESULT IN FLAMES MORE THAN 4 INCHES HIGH.

II. LOW PRESSURE TEST

EXTERNAL LEAKAGE RATE OF 0 ML/MIN/IN

OCCURRED DURING A 10 MINUTE PERIOD.

ALLOWABLE PACKING LEAKAGE RATE IS 10 DROPS/MIN (.4 ML/MIN)

ALLOWABLE BODY LEAKAGE RATE IS 30 DROPS/MIN (1.1 ML/MIN)

III. MEDIUM PRESSURE TEST

EXTERNAL LEAKAGE RATE OF 0 ML/MIN/IN

OCCURRED DURING A 10 MINUTE PERIOD.

ALLOWABLE PACKING LEAKAGE RATE IS 10 DROPS/MIN (.4 ML/MIN)

ALLOWABLE BODY LEAKAGE RATE IS 30 DROPS/MIN (1.1 ML/MIN)

IV. HIGH PRESSURE TEST

EXTERNAL LEAKAGE RATE OF 0 ML/MIN/IN

OCCURRED DURING A 10 MINUTE PERIOD.

ALLOWABLE PACKING LEAKAGE RATE IS 10 DROPS/MIN (.4 ML/MIN)

ALLOWABLE BODY LEAKAGE RATE IS 30 DROPS/MIN (1.1 ML/MIN)

TEST#: <u>FT-0184</u>		DATE: <u>4/25/97</u>
PROCEDURE	ISO 10497 (mo	
was me	g and bonnet gask ade to evaluate the	e following fire test was to evaluate the performance of the stem tet in accordance with the above standard. No attempt te through seat leakage. System limitations restricted test pressure to 600 psig.
VALVE	6" Velan gate valve; 300# class Stuffing Box - 1.250" x 1.875" Flanges - raised face Bonnet - modified to flat face	
PACKING	Manufacturer: Style No: No. of Rings: Gland Pen: Compression: Stud Torque: No. of Tests:	Garlock 9000-EVSP-S 7 Ring 0.500" 33.4% 300 in-lbs 2
GASKETS		
BONNET	Manufacturer: Style No: Thickness: Torqued to: Increments of: No. of Tests:	Garlock IFG 5500 1/16" 200 ft-lbs 67 ft-lbs 0
FLANGE	Manufacturer: Style No: Thickness: Torqued to: Increments of: No. of Tests:	Garlock 3123 1/16" 200 ft-lbs 50 ft-lbs 8
PERSONNEL	Scott Tanner Jim Smith Ed Earsing	

COMMENTS

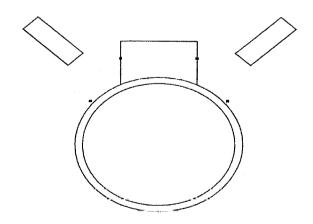
TEST#: <u>FT-0184</u> DATE: 4/25/97

I. PRE-BURN PROCEDURE

- A. Locate the flame environment and calorimeter cubes in the positions shown in figures 1.
- B. Pressurize system to 600 psig +/- 10% (540 660).
- C. Check for and eliminate any system leaks.
- D. Reduce pressure to 563 psig +/- 10% (507 619).
- E. Record the tank level 8.1".

II. START-UP

- A. Start flames and record time 3:03.
- B. Record pressure at two minute intervals.
- C. Average temperature of the two flame environment thermocouples (T5 and T6) must reach 1382°F within 2 minutes from the start of the burn. Maintain the average temperature between 1382°F to 1832°F, with no reading less than 1292°F for the remainder of the 30 minute burn.
- D. Average temperature of the two calorimeter cubes (T1 and T2) must reach 1202°F within 15 minutes from the start of the burn. Maintain the minimum average temperature of 1202°F, with no calorimeter cube temperature falling below 1040°F.
 - E. Maintain 507 to 619 psig during entire 30 minutes.



TEST#: <u>FT-0184</u>

DATE: 4/25/97

III. BURN

TIME	PRESSURE	COMMENTS
13:03	550	T1=1319°F, T2=1140°F, T5=2026°F, T6=1933°F
13:05	540	T1=1145°F, T2=1318°F, T5=1900°F, T6=1628°F
13:07	540	T1=1168°F, T2=1416°F, T5=1875°F, T6=1647°F
13:09	535	T1=1185°F, T2=1457°F, T5=1903°F, T6=1655°F
13:11	535	T1=1245°F, T2=1489°F, T5=1738°F, T6=1737°F
13:13	530	T1=1392°F, T2=1508°F, T5=1753°F, T6=1787°F
13:15	530	T1=1443°F, T2=1525°F, T5=1767°F, T6=1792°F
13:17	530	T1=1454°F, T2=1531°F, T5=1760°F, T6=1785°F
13:19	530	T1=1545°F, T2=1479°F, T5=1761°F, T6=1977°F
13:21	530	T1=1579°F, T2=1485°F, T5=1767°F, T6=1994°F
13:23	530	T1=1598°F, T2=1505°F, T5=1754°F, T6=1974°F
13:25	580	T1=1605°F, T2=1524°F, T5=1738°F, T6=1970°F
13:27	580	T1=1598°F, T2=1522°F, T5=1723°F, T6=1964°F
13:29	565	T1=1594°F, T2=1509°F, T5=1710°F, T6=1959°F
13:31	570	T1=1599°F, T2=1515°F, T5=1708°F, T6=1946°F
13:33	570	T1=1599°F, T2=1506°F, T5=1688°F, T6=1928°F Stop/Start Quench
13:35	563	T4 = 236°F, T8= 176°F
13:36	565	T4 = 201°F, T8 = 177°F Stop Quench
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TEST#: FT-0184

DATE: 4/25/97

IV. POST BURN

- A. Allow the valve to cool to 212°F or less and record time 13:36.
- B. Record the tank level 8.1"
- C. Calculate the burn and cool leakage.

Tank level change x 2259 = 0 ml.

- D. Low Pressure Test
 - 1. Reduce pressure to 58 psig +/- 10% (52 64).
 - 2. Start five minute leak test 13:40.
 - 3. End five minute leak test 13:45.
 - 4. Record external leakage rate <u>0</u> ml/5 min.
- E. High Pressure Operational Test
 - 1. Increase pressure to 563 psig +/- 10% (507 619).
 - 2. Actuate valve to the open position.
 - 3. Start five minute leak test 13:56.
 - 4. End five minute leak test 14:01.
 - 5. Record external leakage rate 0 ml/5 min.

TEST#: <u>FT-0184</u> DATE: <u>4/25/97</u>

V. PERFORMANCE SUMMARY

A. High Pressure Burn and Cool

External leakage rate of <u>0</u> ml/in NPS/min occurred during a <u>33</u> minute burn and cool down period. Allowable leakage rate is 100 ml/in NPS/min.

B. Low Pressure Burn and Cool

External leakage rate of <u>0</u> ml/in NPS/min occurred during a five minute period. Allowable leakage rate is 20 ml/in NPS/min.

C. High Pressure Operational Test

External leakage rate of $\underline{0}$ ml/in NPS/min occurred during a five minute period. Allowable leakage rate is 200 ml/in NPS/min.

FIRE-SAFE VALVE TEST SUMMARY

TEST #:FT-0014

TEST DATE: 7/26/89

TEST PROCEDURE:

API 607 3rd EDITION

VALVE:

NIBCO NPS 6" ANSI 300 # CLASS

FLANGES - RAISED FACE

BONNET - MODIFIED TO FLAT FACE

PACKING TESTED:

MANUFACTURER: GARLOCK

STYLE: 1298

NO. OF RINGS: 5

GLAND PEN: ?

SET COMPRESSION: 30 %

NO. OF PREVIOUS TESTS: ?

GASKETS TESTED:

FLANGES: MANUFACTURER: GARLOCK

STYLE: 9850
THICKNESS: 1/16"
TORQUED TO: 90 FT-LBS

INCREMENTS OF: 30 FT-LBS

NO. OF PREVIOUS TESTS: 1

BONNET:

MANUFACTURER: GARLOCK

STYLE: 9850

THICKNESS: 1/16"
TORQUED TO: 90 FT-LBS
INCREMENTS OF: 30 FT-LBS
NO. OF PREVIOUS TESTS: 1

COMMENTS:

BOTH THE PACKING AND GASKETING PASSED THE TEST. THE PACKING LEAKED DURING THE COOL DOWN AND PRESSURE TESTS. THE GASKETING

SHOWED NO SIGNS OF LEAKAGE.

TEST PERSONNEL: JIM DRAGO

FIRE-SAFE VALVE TEST SET-UP

TEST #:FT-0014

TEST DATE: 7/26/89

SYSTEM DATA I.

A. FILL AND VENT

B. TANK LEVEL - START: 8.63" AT 0 psig

- C. TANK LEVEL END: 3.5" AT 0 psig
- D. DELTA HEIGHT 5.13 INCHES
- E. (DELTA HEIGHT) X (2259.31) = 11,578 ml

II. PRE-BURN PROCEDURE

- A. PRESSURIZE SYSTEM
 - 1. 540 psig + 10 % (486 585 psig)
 - 2. RECORD TIME 9:04
- B. CHECK SYSTEM
 - 1. N AND S FLANGES OK
 - 2. BONNET

OK

3. PACKING

OK

4. SYSTEM PIPING

OK

5. RECORD TIME 9:16

III. START-UP

A. START FLAMES 9:22

IV. FIRE TEST

- A. RECORD PRESSURE EVERY 2 MINUTES
- B. T1 AND T2 MUST REACH 1200°F WITHIN 15 MINUTES
- C. MAINTAIN AVERAGE OF 1200°F FOR REMAINDER OF 30 MINUTES
- D. MAINTAIN 486 TO 594 psig DURING ENTIRE TEST

FIRE-SAFE VALVE TEST DATA

TEST #: FT-0014

TEST DATE: 7/26/89

TIME		PRESSURE	COMMENTS	9:22
	535		START	
9:24		535		
9:26		535		
9:28		535		
9:30		535	PRESENTATION TO THE PROPERTY OF THE PROPERTY O	9:32
	535	UP 7	TO REQUIRED TEMPS 9:34	
	. S. A. Walter Control of the Contro			
9:36		540		
9:37		540	·	
9:38		540		9:40
	540			
9:42		540		
9:44		540		
	9:24 9:26 9:28 9:30 9:36 9:37 9:38	9:24 9:26 9:28 9:30 535 9:36 9:37 9:38 540 9:42	535 9:24 535 9:26 535 9:28 535 9:30 535 535 UP 7 9:36 540 9:37 540 9:38 540 9:42 540	535 START 9:24 535 9:26 535 9:28 535 9:30 535 535 UP TO REQUIRED TEMPS 9:34 9:36 540 9:37 540 9:38 540 9:42 540

545	
550	
555	
560	
560	
570	FLAMES OFF
	
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FIRE-SAFE VALVE TEST DATA

TEST #: FT-0014

TEST DATE: 7/25/89

V. POST BURN:

- A. ALLOW VALVE TO COOL BELOW 200°F
- B. LOW PRESSURE TEST
 - 1. REDUCE PRESSURE TO 50 psig + 5 psi
 - 2. START 5 MINUTE LEAK TEST 11:41
 - 3. END 5 MINUTE LEAK TEST 11:46
 - 4. RECORD EXTERNAL LEAKAGE RATE 10 ml/5 min
- C. HIGH PRESSURE OPERATIONAL TEST
 - 1. INCREASE PRESSURE TO 540 psig ± 50 psi
 - 2. ACTUATE VALVE OPEN 11:52
 - 2. START 5 MINUTE LEAK TEST 11:53
 - 3. END 5 MINUTE LEAK TEST 11:58
 - 4. RECORD EXTERNAL LEAKAGE RATE 503 ml/5 min

FIRE-SAFE VALVE TEST SUMMARY

TEST #: FT-0014

TEST DATE: 7/26/89

VALVE: NIBCO 6" ANSI 300# CLASS

PACKING:

MANUFACTURER:

GARLOCK

STYLE:

1298

I. HIGH PRESSURE BURN AND COOL

EXTERNAL LEAKAGE RATE OF 50.76 ML/MIN/IN.

OCCURRED DURING A 218 MINUTE BURN AND COOL DOWN PERIOD.

ALLOWABLE LEAKAGE RATE IS 100 ML/MIN/IN.

II. LOW PRESSURE TEST

EXTERNAL LEAKAGE RATE OF .33 ML/MIN/IN.

OCCURRED DURING A 5 MINUTE PERIOD.

ALLOWABLE LEAKAGE RATE IS 20 ML/MIN/IN.

III. HIGH PRESSURE TEST WITH VALVE FULL OPEN

EXTERNAL LEAKAGE RATE OF 16.8 ML/MIN/IN.

OCCURRED DURING A 5 MINUTE PERIOD.

ALLOWABLE LEAKAGE RATE IS 200 ML/MIN/IN.