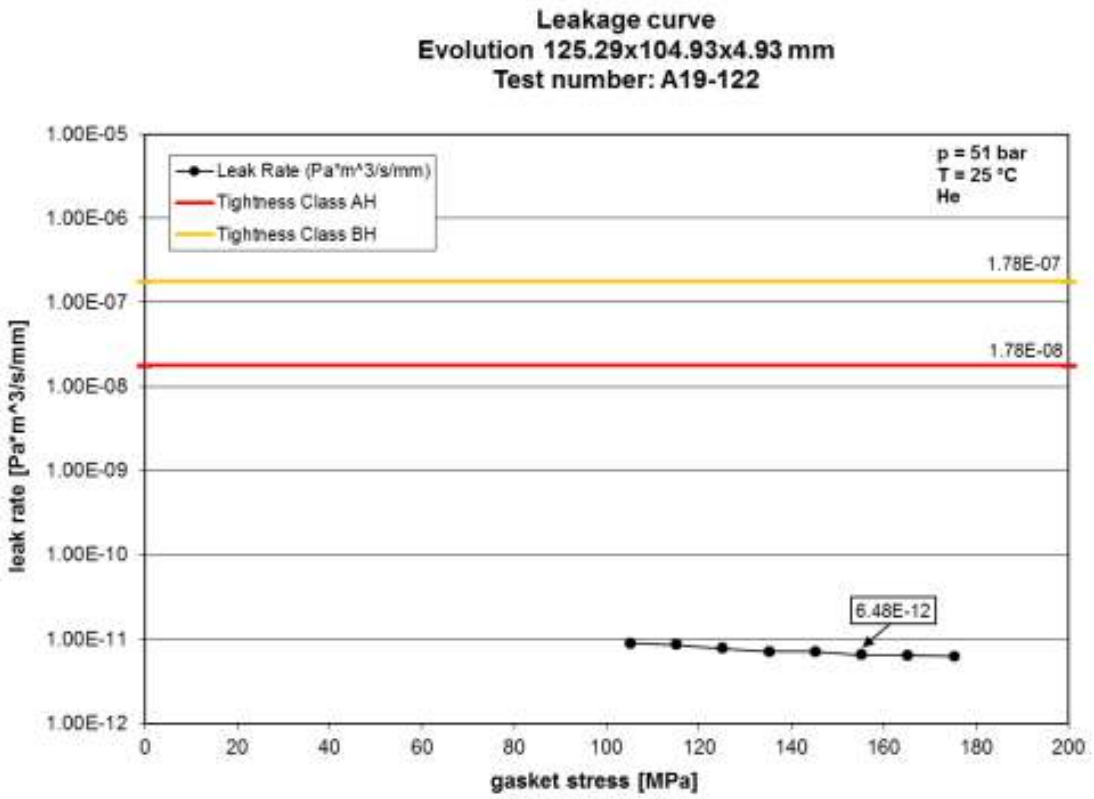
EVOLUTION® Emissions Testing Reports

GPT's Evolution gasket has underwent several industry leakage and emissions testing, to quantify the emission reductions that this can provide. Below are results from the testing that took place.

Shell MESC SPE 85/300 TAT Testing:



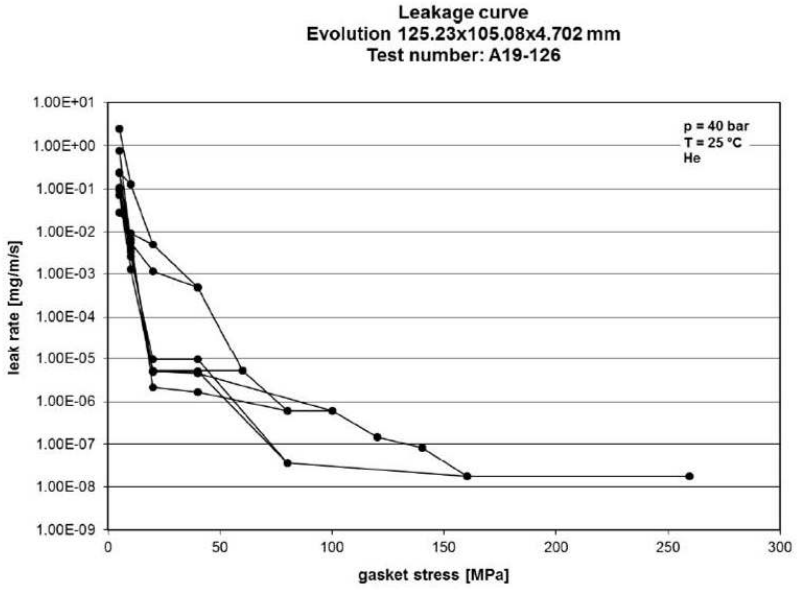
3.3.2 Shell leakage test (RT)

At room temperature, Evolution had an average leak rate of 6.48 x 10^{-12} Pa*m^3/s/mm. The test medium that is used for this is Helium. This falls well within Shell Tightness Class AH, the only gasket to do so that GPT has ever tested. To help quantify this number, Shell provides leak rate equivalents shown below:

Leak Rate Equivalents					
$\frac{cc}{sec}$	$\frac{mbar-liter}{sec}$	$\frac{Torr-liter}{sec}$	$\frac{Pa-m^3}{sec}$	Approximate Equivalent	Approximate 1mm³ Bubble Equivalent
1	1.01	$7.6x10^{-1}$	$1.01x10^{-1}$	$2x10^{-3}$ SCFM	Steady Stream
$1x10^{-1}$	$1.01x10^{-1}$	$7.6x10^{-2}$	$1.01x10^{-2}$	1 cc every 10 seconds	Steady Stream
$1x10^{-2}$	$1.01x10^{-2}$	$7.6x10^{-3}$	$1.01x10^{-3}$	1 cc every 100 seconds	10 per second
$1x10^{-3}$	$1.01x10^{-3}$	$7.6x10^{-4}$	$1.01x10^{-4}$	3 cc per hour	1 per second
$1x10^{-4}$	$1.01x10^{-4}$	$7.6x10^{-5}$	$1.01x10^{-5}$	1 cc every 3 hours	1 every 10 seconds
$1x10^{-5}$	$1.01x10^{-5}$	$7.6x10^{-6}$	$1.01x10^{-6}$	1 cc every 24 hours	1 every 100 seconds
$1x10^{-6}$	$1.01x1^{-6}$	$7.6x10^{-7}$	$1.01x10^{-7}$	1 cc every 2 weeks	3 per hour
$1x10^{-7}$	$1.01x10^{-7}$	$7.6x10^{-8}$	$1.01x10^{-8}$	3 cc per year	Bubbles too infrequent to observe
$1x10^{-8}$	$1.01x10^{-8}$	$7.6x10^{-9}$	$1.01x10^{-9}$	1 cc every 3 years	
$1x10^{-9}$	$1.01x10^{-9}$	$7.6x10^{-10}$	$1.01x10^{-10}$	1 cc every 30 years	
$1x10^{-10}$	$1.01x10^{-10}$	$7.6x10^{-11}$	$1.01x10^{-11}$	1 cc every 300 years	
$1x10^{-11}$	$1.01x10^{-11}$	$7.6x10^{-12}$	$1.01x10^{-12}$	1 cc every 3000 years	

This states that utilizing an Evolution gasket, with a leak rate to 10^{-12} will provide an equivalent of 1 cc of helium leaked every 3000 years, with bubbles too infrequent to observe.

EN 13555 – MESC 85/300 3.3.4



3.3.4 Leakage Test according EN 13555

Again, at room temperature, Evolution had a standard leak rate of approximately 1.00 x 10^{-8} mg/m/s at a typical gasket stress, and still provides tight sealing capabilities at low gasket stresses. This leakage is approximately 10,000 times less than any other gasket GPT has tested in the EN 13555 test.

Chevron Fugitive Emission Test (CFET)

Thermal	*Leakage Readings (PPMv)*				*Flange Temperatures*	
Cycle	*Ambient Temp.*		*500 deg F Temp.*		*Heated*	*Other*
Number	*Avg.*	*Max.*	*Avg.*	*Max.*	*(deg F)*	*(deg F)*
Start	0	1	19	27	501	340
1	3	3	38	38	501	332
2	0	1	19	20	501	322
3	0	1	18	25	500	343
4	1	2	28	29	501	344
5	0	1	End of Test- 5 Thermal Cycles Complete			
Averages ->	**1**	**2**	**24**	**28**	**501**	**336**
Maximums ->	**3**	**3**	**38**	**38**	**501**	**344**

During the Chevron Fugitive Emissions Test, the gasket is sent through cycling testing, at both ambient temperatures, and the max design temperature of 500 F. The test medium for this is methane. For ambient temperatures, Evolution had an average leakage of 1 PPMv. For elevated temperatures, Evolution had an average leakage of 24 PPMv. The standard criteria that are used for considering a gasket to pass at ambient temperatures would be 100 PPMv leakage.

GPT Industries

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