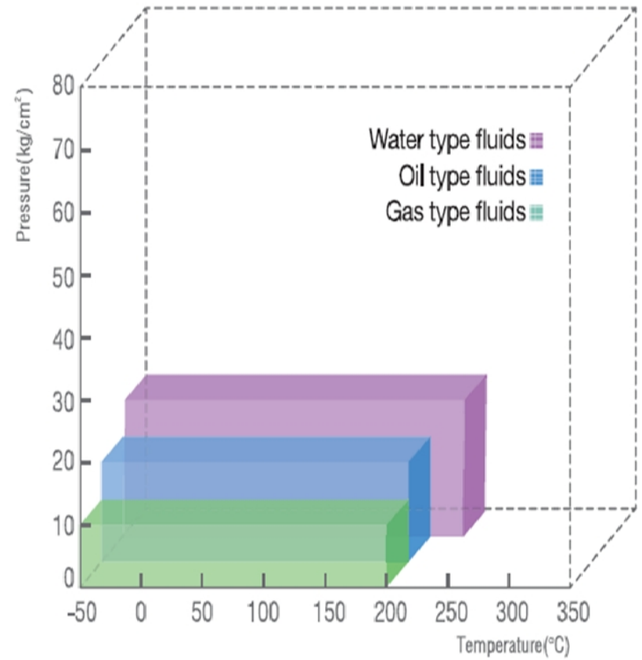
Eco Friendly Gasket Sheet specially created with environmentally friendly solvent free process. Unique features of superior sealability, strong durability and excellent flexibility are distinguished from the conventional products.

Grade		Eco Friendly Gasket Sheet				
Application		Industrial / offshore				Extremely high Temp
Binder		Synthetic	NBR	SBR	NBR	NBR
Type Code		NA-333	NA-336	NA-339	NA-400	NAS-344
Temp (℃)	Continuous Operating	180	220	220	260	320
	Maximum	260	350	350	430	480
Peak Pressure (Bar)		60	80	80	100	100
pH		4-11 Above is general range and has no guarantee for every case. Please contact us for further details.				
Thickness		0.8mm ~ 3.2mm				
Width		1270mm(50"), 1500mm(60")				
Length		1270mm(50"), 1500mm(60"), 3M~10M, 15M~20M & ETC				
Applicable Fluids		Potable Water, Oils, Fuels Salt Solution, gas line, Mild acids and alkalis				

Service Range



Eco Friendly Gasket Sheet is optimized for general application and provide stable service ranges in water, oil, gas &

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Comparison of Test Values of Eco Friendly Gasket Sheet with Conventional CNAF

Test Items	Material Specification			Properties Achieved	
	Test Method	Units	Values	Eco Friendly Gasket Sheet	Conventional CNAF
Tensile Strength Across grain	ASTM F 152	MPa (kg/mm_2)	0.90	10.00 (1.02)	10.80 (1.10)
Compressibility @350kgf/cm_2	ASTM F36J	%	7.00-17.00	10.00	10.00
Recovery after 350kgf/cm_2	ASTM F36J	Min. %	40.00	76.00	50.00
Immersion Test after 5hrs @ 150°C in ASTM Oil =3 Tensile Loss Thickness Increase	ASTM F146	Max. % Max. %	50.00 20.00	19.00 7.00	45.00 8.00
Immersion Test after 5hrs @ 20-30°C in ASTM Fuel B Thickness Increase Weight Increase	ASTM F146	Max. % Max. %	20.00 20.00	6.00 5.00	8.00 13.00
Density	ASTM D792	g/cm_3	1.60-1.80	1.81	1.60
Ignition Loss after 1/2hr @ 850°C	ASTM F495	Max. %	38.00	30.00	31.00
Flexibility	ASTM F147	-	No Break	Accepted	Accepted

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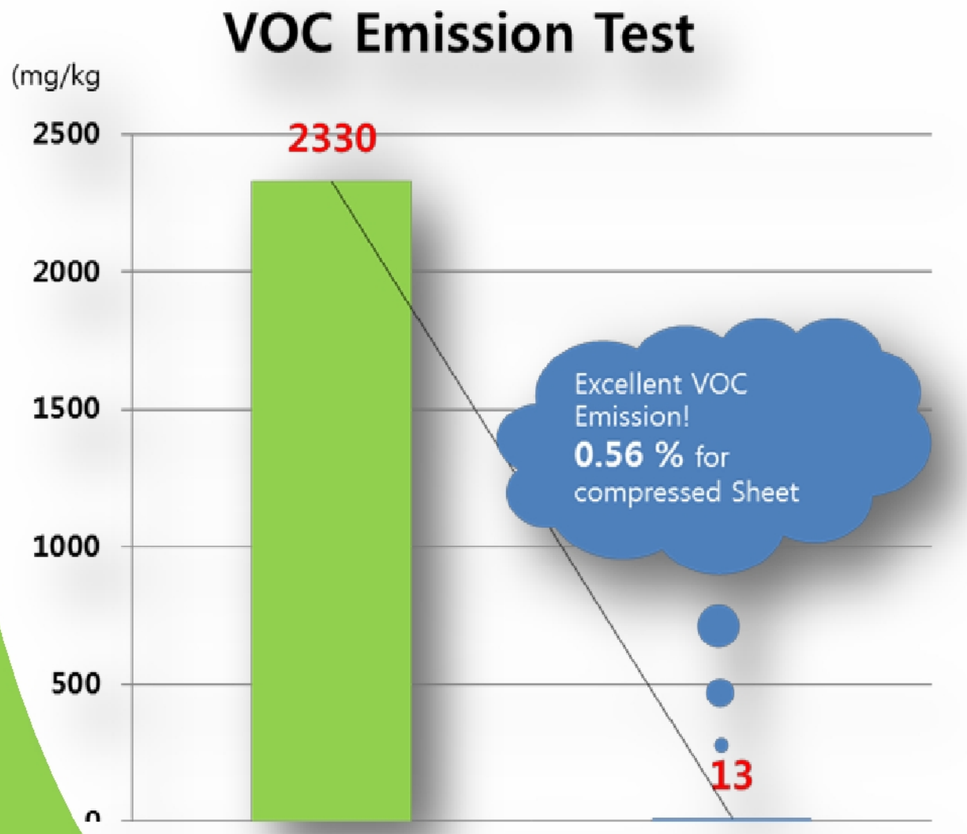
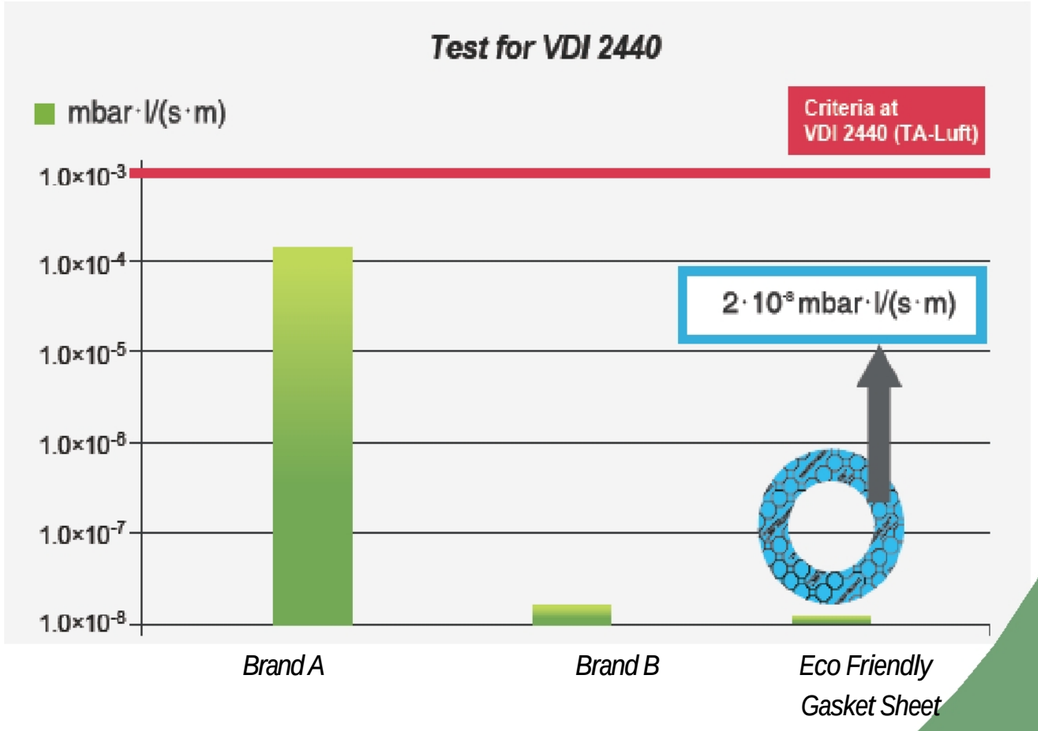
VOC Emission



Gas Permeability

High grade of next generation gasket, Eco Friendly Gasket Sheet shows excellent gas permeability with dedicated protection from fugitive emission control which is considered the possible risk of fire & explosion etc. it provides distinguish level of TA-Luft acceptance criteria.



-Test Method : VDI 2440 (TA-Luft.

-(Techniche Anleitung Zur Reinhaltung Der Luft : Technical Instructions on Air Quality Control)

Peak Pressure and Blow Out Test

Leak rate on internal pressure applied.

According to Global oil major's type acceptance test, this test verifies stable sealing performance without leakage and breakage when internal pressure increases beyond 60 bar with minimum gasket seating stress maintained. This test shall meet related industries requirement.

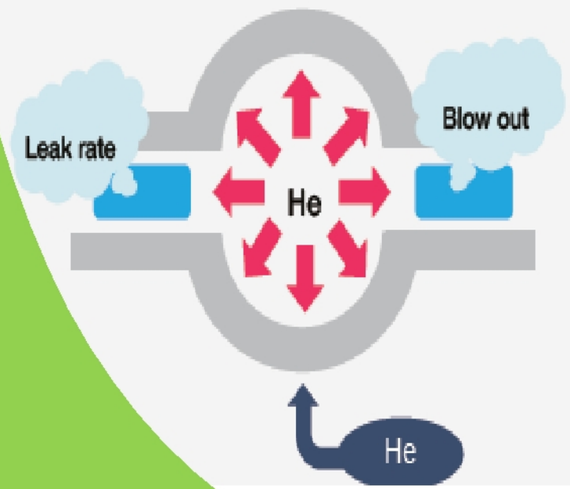
Internal Pressure (He)	Leak rate ($atm.cm_3/s$)
60 bar	2.90×10^{-8}
80 bar	2.65×10^{-4}
100 bar	3.93×10^{-2}

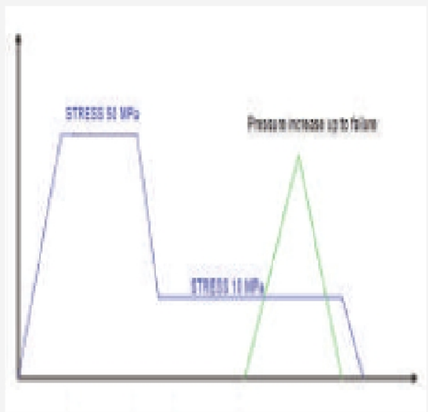
Steam Service

Based on excellent gas permeability, it provides stable sealability in steam applications compared with conventional CNAF. Normally drastic change of thermal or pressure cycling is highly effected on sealability, but high dense inner structure of Eco Friendly Gasket Sheet enhances longer and lower life cycle cost for customers.

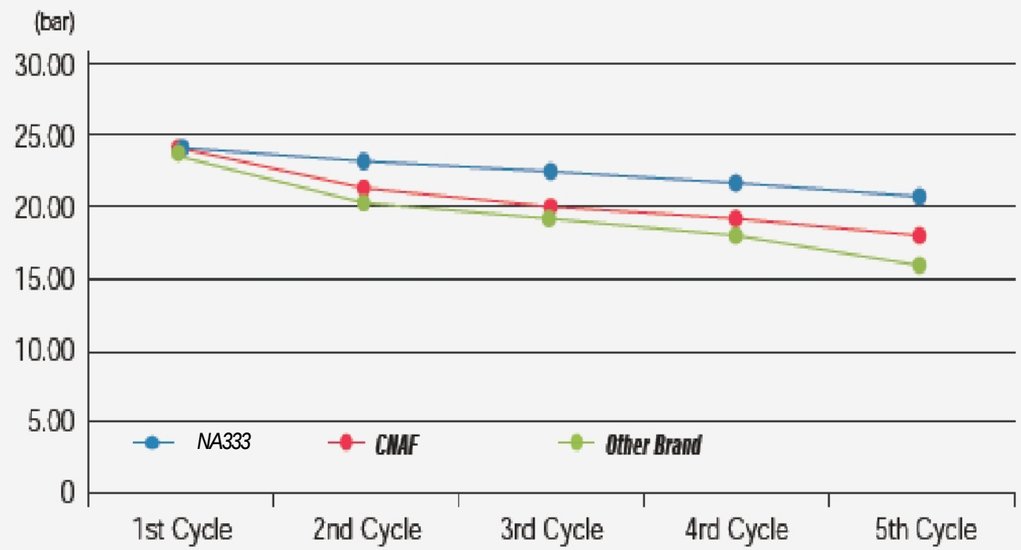
Temperature	250°C
Fluid	Steam, 24 bar
Seating Stress	30 MPa

Blow out Test





Steam Cycle Test



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Durability

Actual field test performed at a chemical plant to confirm excellent durability above specified condition and leakage has not detected at steam line for 1,000 days.

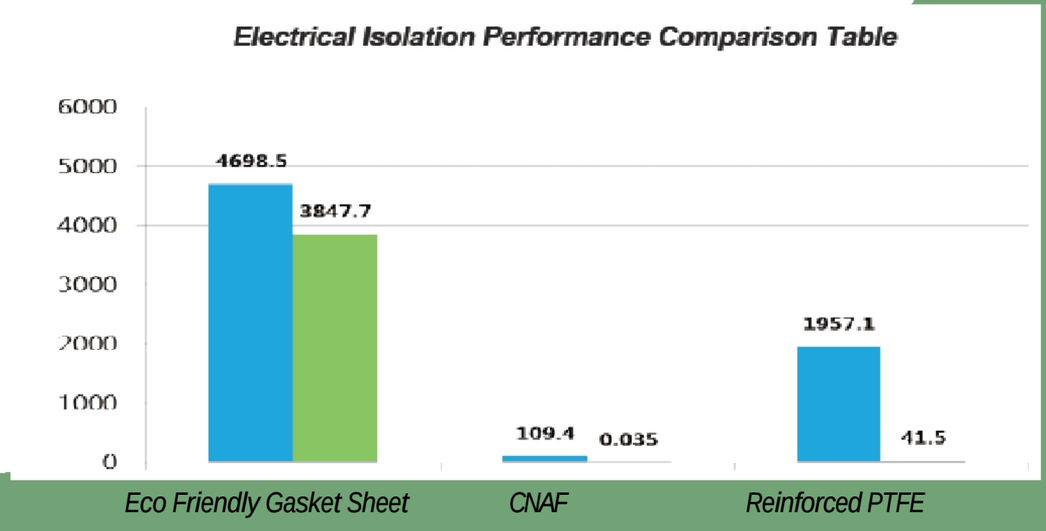
Temperature	160°C
Fluid	Steam, 7 bar
Seating Stress	30 MPa

Insulation Properties

In accordance with authorized institute, Eco Friendly Gasket Sheet demonstrates out- standing results in electrical isolation performance. Compare to testing result against conventional CNAF and reinforced PTFE materials, Eco Friendly Gasket Sheet has the highest level of electrical isolation performance in ambient and water dipping condi-

Test Method	Test Material	Insulation Resistance (MΩ)
Room Temperature Test Temperature : 21.0 ± 3°C Humidity : 42.0 ± 10%	Eco Friendly Gasket Sheet	4698.5
	CNAF	109.4
	Reinforced PTFE	1957.1
Clean Water Dipping Test Dipping Time : 1 hour	Eco Friendly Gasket Sheet	3847.7
	CNAF	0.035
	Reinforced PTFE	41.5

Test	Unit	Ref. Std.	Eco Friendly Gasket Sheet
Insulation Resistance	Ω	ASTM D257	3.02×10^{12}
Volume Resistance	Ω , cm	ASTM D257	4.65×10^{14}
Dielectric Strength	kV/mm	ASTM D149	13.39
Tangent & (ε') 1kHz, 2mm thickness	-	ASTM D150	0.004
Dielectric Constant (ε") 1kHz, 2mm thickness	-	ASTM D150	13.39

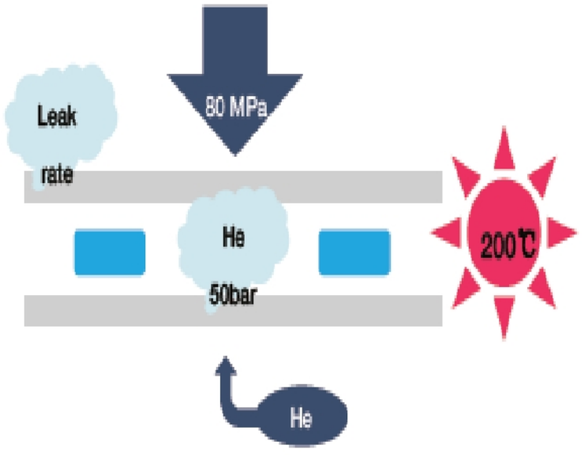


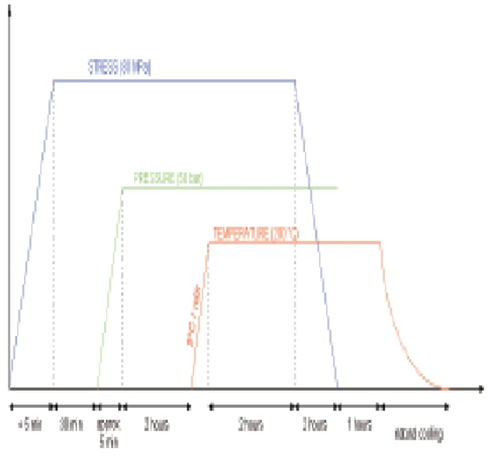
Stress Relief

With superior heat resistance of Eco Friendly Gasket Sheet, above test result demonstrates excellent sealability in critical conditions (high temperature & pressure but reducing seating stress). This strength has shown stable sealing advantage on relief bolting stress at high temperature condition.

Tightness	Reading leak rate on 10 MPa stress point
A Leak = 5 x 10^{-3} stress applied On the gasket <= (MPa)	5x 10^{-5} atm.cm^3/s
Stress applied on the gaskets Up to tightness failure <=(MPa)	(stress 10 MPa applied)

Stress Relief Test





Low Seating Stress

With special UMCS*, Eco Friendly Gasket Sheet shows outstanding stability at low seating stress where achieving standard torque is not possible in actual assembling construction fields.

	Test Result		
Specimen	Eco Friendly Gasket Sheet	CNAF	
Seating Stress (MPa)	20	20	40
N2 Leakage Test (10 bar)	No Leak	Leak (permeation)	No Leak
Hydraulic Test (31 bar)	No Leak	No Leak	No Leak

Deformation

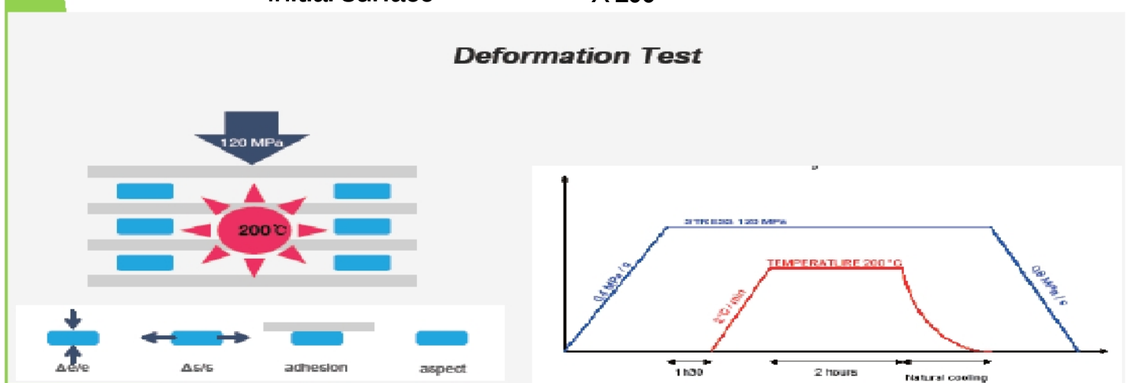
Simultaneously applied condition of high seating stress 120MPa and 200°C, Eco Friendly Gasket Sheet has strong physical properties and less deformation while testing verification of gasket thickness, surface change and breakage.

△e/e = thickness decrease rate (%)

$$\frac{\text{Reference thickness} - \text{final thickness}}{\text{Reference thickness}} \times 100$$

△s/s = Surface increase rate (%)

$$\frac{\text{Final surface} - \text{initial surface}}{\text{Initial surface}} \times 100$$



Test Result

Test Name	Criteria	Gasket 1	Gasket 2	Gasket 3	Acceptance
e/e	Max 20%	17.38	16.4	17.52	Yes
s/s	Max 20%	21.57	22.6	21.43	Yes

Removability

Eco Friendly Gasket Sheet has designed to considering low maintenance costs. Performance testing under the condition of 120MPa and 200°C. Eco Friendly Gasket Sheet has shown excellent and easy removability with no adhesion on the flange surfaces. This contributes to cost saving and flange protection.

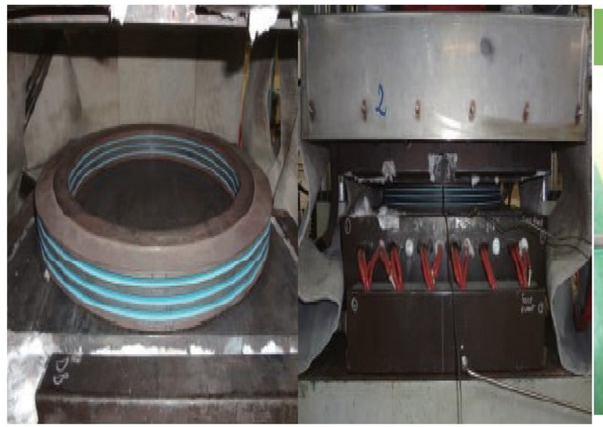
Removability for Heating Cycle Test

High temperature and pressure test

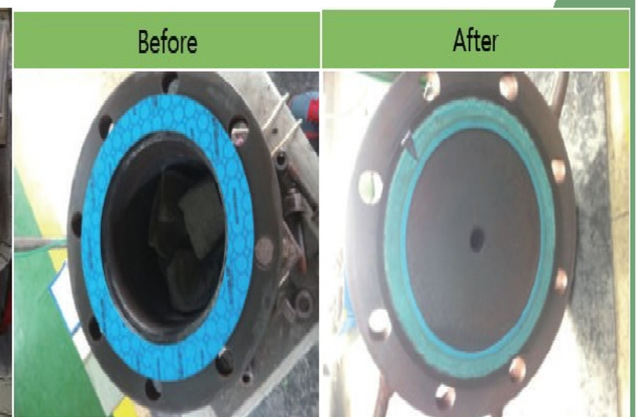
200°C x 96 hours : 1 cycle x 4 days

(10 hours heating + 14 hours cooling)

Item	Removability (surface check)
Eco Friendly Gasket Sheet	Seating & Removability ***** Easy removal and no creep and deformation
Brand "A"	Seating & Removability **** Easy removal and no creep and deformation
Brand "B"	Seating & Removability *** Easy removal and no creep and deformation



Condition: High seating stress 120Mpa, 200℃
Test Result : No Adhesion



Outstanding surface quality of Eco Friendly Gasket Sheet has an exceptional removability without anti-stick surface treatment. Unique surface roughness fulfill less deformation, good adaptability for flange irregularities.

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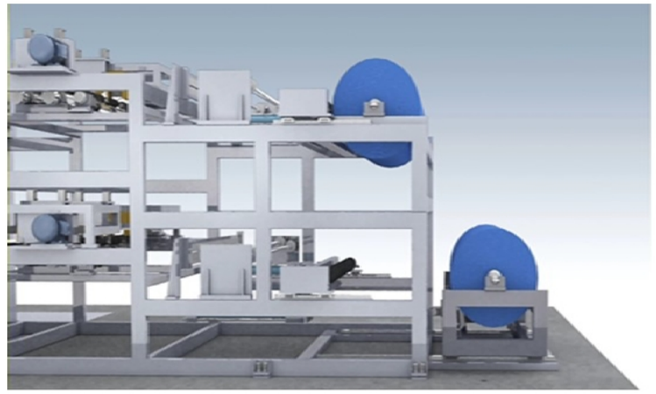
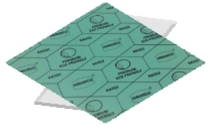
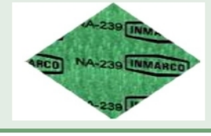
Sheet in Roll—by MECS 1st in the world



Thickness	Width	Length
0.8—3.2mm	50" (1270mm) 60" (1500mm)	50" (1270mm) 60" (1500mm) 3m-20m

SECS : Slit Edge Coiling System MECS : Mill Edge Coiling System

Water Absorption Rate

TEST SAMPLE INFORMATION		
Sample Name	Sample Name Used in the Analysis	Sample Picture
Eco Friendly Gasket Sheet	Koptri-1662186-1	
NA-239	Koptri-1662186-2	

WATER ABSORPTION RATE RESULTS				
Test Item	Sample Name	Unit	Method	Result
Koptri-1662186-1 Water Absorption Rate	Eco Friendly Gasket Sheet	%	ASTM D570	0.22
Koptri-1662186-2 Water Absorption Rate	NA-239	%	ASTM D570	9.10

WATER ABSORPTION RATE RAW DATA		
Test Item	Run	Water Absorption Rate (%)
Koptri-1662186-1 Eco Friendly Gasket Sheet	1	0.23
	2	0.22
	3	0.21
	4	0.22
	5	0.22
	sd	0.01
	cv	2.90
	Average	0.22

WATER ABSORPTION RATE RAW DATA		
Test Item	Run	Water Absorption Rate (%)
Koptri-1662186-2 NA-239	1	9.10
	2	8.76
	3	9.32
	4	9.57
	5	8.76
	sd	0.36
	cv	3.90
	Average	9.10

Productivity

Specially designed by UMCS* process contributes to remarkable improvement in high productivity and excellent die-cutting ability as against conventional CNAF*.