



# RAILROAD TANK CAR SEALING SOLUTIONS

# **MANWAY & NOZZLE RAILCAR GASKETS**

We provide high performance gaskets for rail tank car manways, components, and flanged connections for a wide range of applications in high temperature, air, water, acids, oils, steam, and various chemical environments.

Our large selection of polytetrafluoroethylene (PTFE), compressed non-asbestos (CNA), fluoroelastomer FKM, Viton®, a wide variety of elastomers and other synthetic rubber product technologies (including EPDM) are guaranteed to provide exceptional sealing properties.

Our Durlon® 9000 sheet material was developed using the most sophisticated manufacturing process in the PTFE gasketing industry. Its extraordinary properties include superior sealability, torque retention and consistency, which offer exceptional value for rail shippers compared to other products that have less universal application, mechanical properties and chemical resistance.

Utilizing a patent pending manufacturing process, the SecureSnap™ technology incorporates the Durlon® 9000 gasketing material sealing features to help insure a tighter seal and superior bolt load retention in less than ideal bolting conditions.

Durlon® 9000 is manufactured in a contaminate-free environment. The process is computer controlled and follows strict quality control procedures, including ISO 9001 certification. Durlon® 9000's advanced production methods allow GRI® and its distribution partners to offer the rail industry billet cutting, which reduces the cost to the shipper and repair operation.

Durlon® 9000 allows for the consolidation of inventory into just one or two materials per fleet. This simplification provides the shipper with a tremendous cost saving on inventory and ensures that the right product is always available.

# **GASKET MATERIALS FOR RAILROAD TANK CARS**

# POLYTETRAFLUOROETHYLENE (PTFE) GASKET MATERIAL

The unique properties of PTFE lend itself well for use in a variety of industrial, manufacturing, and engineering facilities. The superb chemical resistance and tolerance to vast temperature gradients has not only improved the efficiency of many industries, but the safety for the employees that work around those conditions as well.

## Durlon® 9000 & 9000N PTFE

Various shapes of inorganic fillers have been homogeneously blended with pure PTFE resins to give

Durlon® 9000 its physical and mechanical properties. It is suitable for use in steel flanges and will not exhibit the cold flow problems associated with virgin PTFE or the hardness problems of some other filled PTFE products. It cuts easily and separates cleanly from flanges after use. Durlon® 9000 is for use in general industrial applications where resistance to highly aggressive chemicals is required. In addition, the shape of the fillers does not allow wicking which can cause corrosion on flange surfaces.

# COMPRESSED NON-ASBESTOS (CNA) GASKET MATERIAL

Compressed Non-Asbestos is a sealing material consisting of a blend of organic and inorganic chemically resistant fibers and fillers together with an elastomer binder. The type of binder used is a key factor to consider when choosing a Compressed Non-Asbestos sheet for gasketing applications.

Gaskets made from Compressed Non-Asbestos sheets have excellent sealing characteristics, torque retention, heat, and chemical resistance. These types of gaskets are an excellent choice for applications involving water, air, steam, oils, acids,



and general chemicals. Our high performance industrial non-metallic gasket material sheets - Compressed Non-Asbestos contain high-pressure and high-temperature aramid fiber materials that are perfect for sealing, thermal, and mechanical applications (petrochemical, chemical, steam, pulp & paper, pharmaceutical and potable water industries).

### **How does Compressed Non-Asbestos differ from elastomers?**

An elastomer is a polymer which possesses an elastic property. Elastomers are generally thermo-set materials which require curing through heat and pressure with the addition of sulphur or other curing agents. Natural and synthetic rubbers, such as styrene-butadiene rubber (SBR) and Buna-N (NBR), are elastomers.

Compressed Non-Asbestos, in contrast, is a material that combines organic and inorganic chemically resistant fibers and fillers. This type of binder employed gives the sheet the properties of elasticity and flexibility, while the fibers used give the sheet specific sealing characteristics and properties.

Physical Properties	7900* / 7925* / 7950*	8500*	9000 / 9000N**	9200**
Composition	Aramid-Inorganic/NBR	Aramid-Inorganic/NBR	Inorganic Filler with Pure PTFE Resins	Barium Sulfate Filler with Pure PTFE Resins
Color	Off White/Lt Green/Blue	Green	Blue/White	Granite White
Temp: Min Max Continuous, Max	-73°C (-100°F) 371°C (700°F) 260°C (500°F)	-73°C (-100°F) 371°C (700°F) 287°C (548°F)	-212°C (-350°F) 271°C (520°F) 260°C (500°F)	-212°C (-350°F) 271°C (520°F) 260°C (500°F)
Pressure, max, bar (psi)	83 (1,200)	103 (1,500)	103 (1,500)	103 (1,500)
Density, g/cc (lbs/ft³)	1.7 (106)	1.7 (106)	2.2 (138)	2.5 (156)
Compressibility, %	7-17	8-16	8-16	8-16
Recovery, %	40	50	40	35
Creep Relaxation, %	20	20	30	30
Tensile Strength, MPa (psi)	11 (1,600)	13.8 (2,000)	13.8 (2,000)	13.2 (1,920)
Sealability ASTM 2378 (Nitrogen)	0.05 cc/min	0.03 cc/min	0.01 cc/min	0.01 cc/min

<sup>\*</sup>Much effort has gone into improving the anti-stick release agents of all (CNA) Compressed Non-Asbestos Durlon® products. All Durlon® CNA gasket materials have passed the MIL-G-24696B Navy Adhesion Test (366°F/48 hrs).

\*\*Independent testing has shown the fillers in the Durlon® method to be more homogeneously blended than calendered or layered filled PTFE gasket materials, giving Durlon® filled PTFE's more consistent physical and mechanical properties without voids, separation and chemical compatibility problems found in the layered construction method.

Style	Certifications
7900, 7925, 7950	California Proposition 65, RoHS Reach Declaration
8500	California Proposition 65, RoHS Reach Declaration, API 6FB Fire Test with avg. temp >650°C, 30 mins, 40 bar, 1 ml (inch/min.) max allowable leakage, Conforms to the FDA requirements of 21 CFR 177.2600.
9000	RoHS Reach Declaration, ANSI/API 607 Fire Test*** 6th Ed., Zero leakage, Approved material for WRAS (Water Regulations Advisory Scheme), USP Class VI 121°C (250°F) for 30 min., TA-luft (VDI Guideline 2440), ABS-PDA & Pamphlet 95, the chlorine institute, DNV-GL, (EC) 1935/2004 & EU (10/2011), and conforms to FDA requirements of 21 CFR 177.1550 for food and drug contact.
9000N	RoHS Reach Declaration, USP Class VI 121°C (250°F) for 30 min., Approved material for ABS-PDA & Pamphlet 95, the chlorine institute, DNV-GL, (EC) 1935/2004 & EU (10/2011), and conforms to FDA requirements of 21 CFR 177.1550 for food and drug contact
9200W	RoHS Reach Declaration and approved material for ABS-PDA & Pamphlet 95, the chlorine institute, DNV-GL and TA-luft (VDI Guideline 2440). BAM oxygen service: gaseous & liquid up to 260°C (500°F) at 52 bar (754 psi), and conforms to FDA requirements of 21 CFR 177.1550 for food and drug contact.



Durlon® 9000 and 9000N are made with Teflon™ fluoropolymer. Teflon™ is a trademark of The Chemours Company FC, LLC

\*\*\*6 inch Class 300. The test fixture was subjected to an external flame of 875°C (1607°F) average for 30 minutes. The measured leakage was 1.8 ml/min, where the max allowable limit is 1200ml/sec.

**Note:** ASTM properties are based on 1/16" sheet thickness, except ASTM F38 which is based on 1/32" sheet thickness. This is a general guide only and should not be the sole means of accepting or rejecting this material. The data listed here falls within the normal range of product properties, but should not be used to establish specifications limits nor used alone as the basis of design. For applications above Class 300, contact our technical department.

Warning: Durlon® gasket materials should never be recommended when both temperature and pressure are at the maximum listed. Properties and applications stated are typical. No applications should be undertaken by anyone without independent study and evaluation for suitability. Never use more than one gasket in one flange joint and never reuse a gasket. Improper use or gasket selection could cause property damage and/or serious injury. Data reported is a compilation of field testing, field service reports and/or in-house testing. While the utmost care has gone into publishing the information contained herein, we assume no responsibility for errors. Specifications and information contained within are subject to change without notice. This edition cancels and obsoletes all previous editions.





## THE CHALLENGE:

A potential problem with a standard AAR-1 manway gasket is that the conventional design has to be precisely made with tight tolerances to fit snugly into a dovetailed groove so that it remains in place once installed. When this does not happen the potential for NARs is heightened. The required tolerances for these conventional style gaskets are difficult to achieve, and create quite a bit of scrap during the manufacturing process. In addition, if the ID is too small, installation becomes difficult if not impossible. On the other hand, if the ID is too large the gasket will easily fall out of the groove and into the manway nozzle. The result of this happening will cause leaks, splashes, and other releases from an improperly secured manway cover.



For Physical Properties and Certifications of SecureSnap™ gasket material, refer to the Durlon® 9000 information provided on page 5.

# THE SOLUTION:

The increased flexibility of the SecureSnap™ manway gasket enables the user to install the gaskets more quickly than the conventional gasket. The tabs allow for the SecureSnap™ manway gasket to easily snap into the dovetail groove. Thus, the time required to install the SecureSnap™ gasket is significantly less than the time required to install a standard manway gasket.

## THE BENEFITS:

The flexibility of the SecureSnap™ manway gasket also renders the gaskets more versatile than the conventional gasket. The SecureSnap™ gasket will accommodate more than one style of manway system (dependent on end user approval) meaning that distributors can stock one size of gasket for multiple manway designs, therefore reducing inventory and overall cost.

Gasket Factors	1/16"	1/8"
m	2.2	4.6
Y psi (MPa)	1,937 (13.4)	1,639 (11.3)
G <sub>b</sub> psi (MPa)	639 (4.4)	495 (3.4)
a	0.220	0.262
G <sub>s</sub> psi (MPa	55 (0.379)	65 (0.448)

# FLUOROELASTOMER FKM, VITON®, ELASTOMERS **& OTHER RUBBER PRODUCTS**

We provide high performance industrial rubber molded gaskets for rail tank car manways, components, and flanged connections. Our large selection of fluoroelastomer elastomers and other synthetic rubber product technologies are guaranteed to provide exceptional sealing properties for a wide range of applications and various commodities.

Our technicians will work with your company to customize materials that meet all specifications in the colors and durometers necessary. All products undergo rigorous testing processes through every level of production and final leakage detection. Our extensive knowledge of compression molding techniques as well as our state-ofthe-art research and development facility allow us to provide innovative and extensive sealing solutions that are practical and adhere to international safety protocols and standards. We pride ourselves on the production of durable and high-performance rubber molded parts for the most challenging applications.

All molded gasket materials are manufactured in conformance to our Quality Management System and are subjected to rigid testing and quality controls.



# **MOLDED GASKET CAPABILITIES**

### SIZES:

# **MATERIALS: Viton®**

FKM

**EPDM** 

- AAR-1
- TRN-1
- Collar Lid Style
- Max size up to 26.5" OD
- NBR/Buna (Nitrile)
- Neoprene
- Available in various colors, hardness and thickness. Other material grades and FDA compliant materials are also available.
- We offer private branding (tooling may be required).
- Ouick turn-around times.
- Applicable material batch test reports available upon request.



Physical Properties	Viton® A / FKM	Viton® B / FKM	EPDM	NBR / Buna
Composition	66% Fluorine	68% Fluorine	-	-
Color	Black / Brown	Black	Black	Black / White
Temp: Min Max	-17°C (0°F) 204°C (400°F)	-17°C (0°F) 204°C (400°F)	-30°C (-22°F) 150°C (302°F)	-35°C (-31°F) 120°C (248°F)

# **Durlon® - BOLT TIGHTENING WORK SHEET**

Location/Identification:	Nominal Bolt Size:
Gasket Contact Surface Finish on Flange:	Lubricant Used:
(Initial each step in space provided below.)	
1. Visually examine and clean flanges, bolts, nuts and wa	shers. Replace components if necessary.
2. Install new gasket. DO NOT USE MULTIPLE GASKETS.	
3. Lubricate bolts, nuts, AND flange surface AROUND BOL	.T HOLES.
4. Number bolts in cross-pattern sequence according to t	the appropriate sketch below.
5. Install nuts. HAND TIGHTEN nuts all around until snug.	NEXT, using a torque wrench PRE-TIGHTEN BOLTS to 10-20 ft-lbs torque using
the cross-pattern tightening sequence below.	
6. Check gap for uniformity.	
	e in the sketch below to hand tighten, pre-tighten and for Rounds 1, 2, and 3.
Each tightening sequence in the sketch below constitu	tes a "Round."
8 0	(8) (8) (9)
	(5)
( <del>4</del> )	(4) (9)
(6)	3/ (8) 3/
2 0	2 0 0
Target Torque:ft-lbs (from torque table)	
LUBRICATE, HAND TIGHTEN, PRE-TIGHTEN, then TIGHTEN, bolts in s	
Pre-Tighten - Hand Tighten, then 1/4 Turn with hand wre	
Round 1 - Tighten toft-lbs (30% of tar	- , ,
Round 2 - Tighten to ft-lbs (60% of tar Round 3 - Tighten to ft-lbs (100% of tar	- • •
Round 3 - Tighten to ———— It-ibs (100% of ta	arget torque)
Check gap around the circumference between each of these round	s, measured at every other bolt. If the gap is not reasonably uniform around the
circumference, make the appropriate adjustments by selective bol	
	NAL, clockwise tightening sequence at 100% of Final Torque (same as Round 3
above), for at least one complete round. If necessary, continue unti	il no further nut rotation occurs at 100% of the Final Torque value for any nut.
Final Pound (entional) PETAPALIE after 4 to 24 hours A large pera	entage of the short-term bolt preload loss occurs within twenty-four hours after
initial tightening with most occurring after four to five hours. This	-
mittal tightching with most occurring after four to hoc hours. This	Round 1660v613 till3 1033.
TIGHTENING METHOD USED:	
Hand Wrench Manual Torque Wrench	Hydraulic Torque Wrench
Impact Wrench Other	
Joint Assembler:	Date:
For questions contact GRI Technical Services at (713) 856-9445, or tech@durlor	1.com

# **Durion® - TYPICAL TANK CAR TORQUE VALUES**

		Ge	eneral Pur	pose Cars				
Component Material		0.1	Gasket Material/Dimensions		Fasteners	Torque (ft-lbs)		
	Material	Style	Thk.	OD	ID	No. / Dia / Grade	K = 0.15	K = 0.17
		AAR-1	1/8"	21-5/8"	19-1/2"	8 / 1" / A307	185	210
	Durlon® 9000	AAR-1	1/8"	21-5/8"	19-1/2"	6 / 1" / A307	185	210
	(Hard Dims)	AAR-1	1/8"	21-5/8"	19-1/2"	6 / 7/8"/ 1045	135	152
Manway Cover		TRN-1	1/8"	21-11/16"	19-5/8"	6 / 7/8" / A449	210	240
	*Viton®	AAR-1	1/4"	21-11/16"	19-1/2"	8 / 1" / A307	70	80
	(Elastomeric Dims)	TRN-1	1/4"	21-1/2"	19-1/4"	6 / 7/8" / A449	70	80
		-	1/8"	17-1/8"	15"	12 / 1" / A193-B7	535	600
Cover Flange	Durlon® 9000	-	1/8"	17-3/4"	16-3/4"	12 / 3/4"/ 5	205	230
		-	1/8"	16-1/8"	14"	12 / 1" /A193-B7	535	600
		1"	1/8"	2-5/8"	1-5/16"	4 / 1/2" / A193-B7	40	45
	D. I. (2000)	2" RF	1/8"	4-1/8"	2-3/4"	4 / 5/8" / A193-B7	120	140
Air / Liquid Valves	Durlon® 9000	2" FF	1/8"	4-1/8"	2-3/4"	4 / 5/8" / A193-B7	140	155
		3"	1/8"	5-3/8"	4-1/8"	4 / 5/8" / A193-B7	140	155
		-	1/8"	3-3/8"	2-1/2"	4 / 3/4" / A193-B7	125	140
Gauge Device	Durlon® 9000	-	1/8"	9-1/4"	7-3/8"	4 / 3/4" / A193-B7	250	280
		T/G	1/8"	2-1/4"	1-1/2"	4 / 5/8" / A193-B7	80	95
		-	1/8"	5-3/8"	4-1/8"	4 / 3/4" / A193-B7	200	225
Safety Valve	Durlon® 9000	-	1/8"	9"	8-1/4"	8 / 5/8" / A193-B7	110	125
Bottom Outlet		T/G	1/8"	8-1/2"	7-1/2"	8 / 3/4" / A193-B7	190	210
	Durlon® 9000		1/8"	7"	5-1/4"	4 / 5/8" / A193-B7	140	160
		BOV / Outlet	1/8"	8-3/8"	5"	4 / 5/8" / A193-B7	140	160

Number of bolts, bolt grade and lubrication can vary. \*Contact GRI Technical Services for additional information. Revised May 2017

Pressure Cars								
		Gasket Material/Dimensions			Fasteners		Torque (ft-lbs)	
Component	Material	Thk.	OD	ID	Size	Grade	Never-seize type lube	Halocarbon, or Copper lube
18" Manway		1/8"	20-1/4"	19-1/4"	1-1/8"	A320-L7	550	485
20" Manway	Durlon® 9000	1/8"	22-1/4"	21-1/4"	1-1/8"	A320-L7	600	530
22" Manway		1/8"	24-1/4"	23-1/4"	1-1/8"	A320-L7	660	580
		1/8"	2-1/4"	1-1/2"	5/8"	A320-L7	85/95 (C)	75/83 (C)
Angle Valve / Gauging Device (C)	Durlon® 9000	1/8"	2-1/4"	1-1/2"	3/4"	A320-L7	168/185 (C)	130/144 (C)
		1/8"	4"	3-1/4"	3/4"	A320-L7	168/185 (C)	130/144 (C)
PRD/Safety (C)		1/8"	2-1/4"	1-1/2"	3/4"	A320-L7	168/185 (C)	130/144 (C)
	Durlon® 9000	1/8"	4-3/4"	4"	3/4"	A320-L7	168/185 (C)	130/144 (C)
		1/8"	6-3/4"	6"	7/8"	A320-L7	273/300 (C)	212/233 (C)

K = 0.15 represents a nickel anti-seize type lubricant. K = 0.17 represents moly anti-seize type lubricant. K = 0.132 represents a copper anti-seize type lubricant. (C) designates torque using a crow's foot wrench. For torque worksheets by component or car set, contact GRI Technical Services.

# **Durlon® - GASKET INSTALLATION**

# NON-PRESSURE CAR HINGED & BOLTED MANWAY EYEBOLT TIGHTENING PROCEDURE

Customer:			Tank Car No.	
			5	
AAR Manway Style:		Gasket Dimensions:		
			(Refer to GRI/TFC MW Gasket Style/Size C	hart)
Gasket Material (Durlon® CNA & PTFE ma	· <del>-</del>		•	
(Circle One):	Durlon® 9000 Durl	on® 9600 Durlon® 85	500	
Eyebolt Grade: (Circle One): A307	A449 A193-B7 A	193-B8/B8M Class 2	Eyebolt Diameter:	
Lubrication Used:		A	ssembly Torque:	

# **ASSEMBLY SEQUENCE**

Assembly requires a minimum of 5 steps:

- Pre-tightening. Hand tighten lubricated eyebolts then 1/4 turn with a hand wrench.
- Three star pattern tightening sequences in either a 6-bolt or 8-bolt pattern, increasing the torque in each sequence per the chart on the right.
- A rotational pass at full torque to equalize the stress on each eyebolt.
- Optional. Retorque after 4-24 hrs.

**WARNING:** Bolts must be tightened in the cross-pattern tightening sequence, employing the incremental rounds of tightening as prescribed in this procedure. If this is not done, the flanges may become out of parallel relative to each other, an indicator of nonuniform gasket loading and potential joint leakage.

Manway Bolt Tightening Sequence			6 Eyeholts		8 Eyeholts	
Handle 3	Handle Handle		Hand-tight then 1/4 turn		Hand-tight then 1/4 turn	
	8003	30%	1st Sequence	30%	1st Sequence	
6 (0 0)5	40007	60%	2nd Sequence	60%	2nd Sequence	
4 2	6 2	100%	3rd Sequence	100%	3rd Sequence	
Hinge 6-Bolt	Hinge 8-Bolt	100%	Rotational	100%	Rotational	

Retorque after 4 to 24 hrs. A large percentage of the short-term bolt preload loss occurs within 24 hours after initial tightening with most occurring after 4 to 5 hours. This Round recovers this loss. Failure To Pre-Tighten The Nuts Result In Flanges That Are Not Parallel, And Could Result In Possible Leakage.

Joint Assembler:	Da	te:

For questions contact GRI Technical Services at (713) 856-9445, or tech@durlon.com

Warning: These materials should never be recommended when both temperature and pressure are at the maximum listed. Properties and applications shown are typical. No application should be undertaken by anyone without independent study and evaluation for suitability. Never use more than one gasket in one flange joint, and never reuse a gasket. Improper use or gasket selection could cause property damage and/or serious personal injury. Data reported in this brochure is a compilation of field testing, field service reports and/or in-house testing. While the utmost care has gone into publishing the information contained herein, we assume no responsibility for errors. Specifications and information contained in this brochure are subject to change without notice. This edition cancels and obsoletes all previous editions.

## THE SEAL

The purpose of a gasket is to create a static seal between two stationary flanges. The seal itself is created by achieving the proper compression on the gasket causing it to flow into the imperfections on the surface of the flange. This results in a tight, unbroken barrier, impervious to the fluid being contained.

In many instances, a good seal is obtained through the limited "swell" caused by the reaction of the inside edge of the gasket material with the fluid being contained.

A certain amount of swell is desirable, as long as it reaches an equilibrium and does not reach a condition of degradation where the gasket begins to breakdown. In many instances, the fluid being contained may "cauterize" the inside edge of the gasket and "seal off" the gasket from further fluid penetration.

## **BOLTING**

Bolted flange connections are only as good as the fastener system being used and unfortunately the fastener system is often overlooked within the system. The majority of fastener systems being used in the industrial world are threaded. The fastener system consists of at least the bolt/stud and the nut but it is recommended to also include washers.

The application and distribution of torque can be improved through the use of washers under the head of the bolt and between the flange and nut. Washers effectively reduce the friction between the turning surfaces of the nut and bolt head to the flange, thus translating into a more accurate load being applied to the gasket. For standard applications it is recommended to use through-hardened washers, in order to prevent washer galling.

Bolting should be of sufficient strength to achieve proper compression of the gasket, to not only seal the joint, but to maintain the seal without exceeding the yield strength of the bolts being used. The torque values in our torque tables

(pg. 10) are based on using ASTM A193 Grade B7 studs and 2H heavy hex nuts lubricated with never seize.

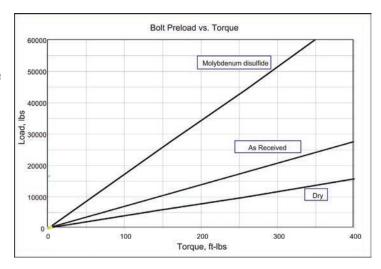
Since sheet gasket materials have micro pores, they must be sufficiently compressed to reduce porosity. Without adequate compression the system pressure can force the contained fluid into the gasket and degrade it. Therefore, when installing the gasket it is important that good technique be followed including cleaning the flanges, inspecting the flange face and the bolts and bringing the flanges together parallel and in stages. Many field problems arise from improperly installed gaskets. Refer to the Bolt Tightening Worksheet (pg. 8) for more information on installation procedures.

## THE EFFECT OF BOLT LUBRICATION

Bolt lubrication greatly affects the torque values used when installing gaskets. To achieve the same gasket compression, a much higher torque value is required for a dry bolt versus using an effective lubricant such as molybdenum disulfide.

In a dry bolt up, or where an inefficient lubricant is used, the effort used in tightening is overcome by the frictional forces between the bolts and nuts and to a greater extent between the nuts and nut facings.

This can result in a lower gasket load and inadequate stress on the bolts, which can result in torque loss and eventual leakage in service. (see graph below)





www.igasketplus.com

igasket® plus is a simple, intuitive interface used by engineers and service technicians in the field.

Based on a variety of user inputs, a list of compatible Durlon® gaskets is generated using temperature, pressure, fluid and flange type.

Please refer to the igasket app for chemical resistance information.





# **EsecureSnap**™



# DURLON® SEALING SOLUTIONS

# PRODUCT DEVELOPMENT

Our product development team is tirelessly working on the next innovative Durlon® fluid sealing solution for critical service applications.

Durlon® Sealing Solutions have been designed, laboratory and field tested before they are introduced into the industries we serve so that we are confident that these products perform well, every time. That is the Durlon® commitment to you, our valued customer.

Visit www.durlon.com to locate some of the specialized industries we serve and related information specific to your industry. We value your interest in our group of companies and look forward to working with you.