



Nordel®

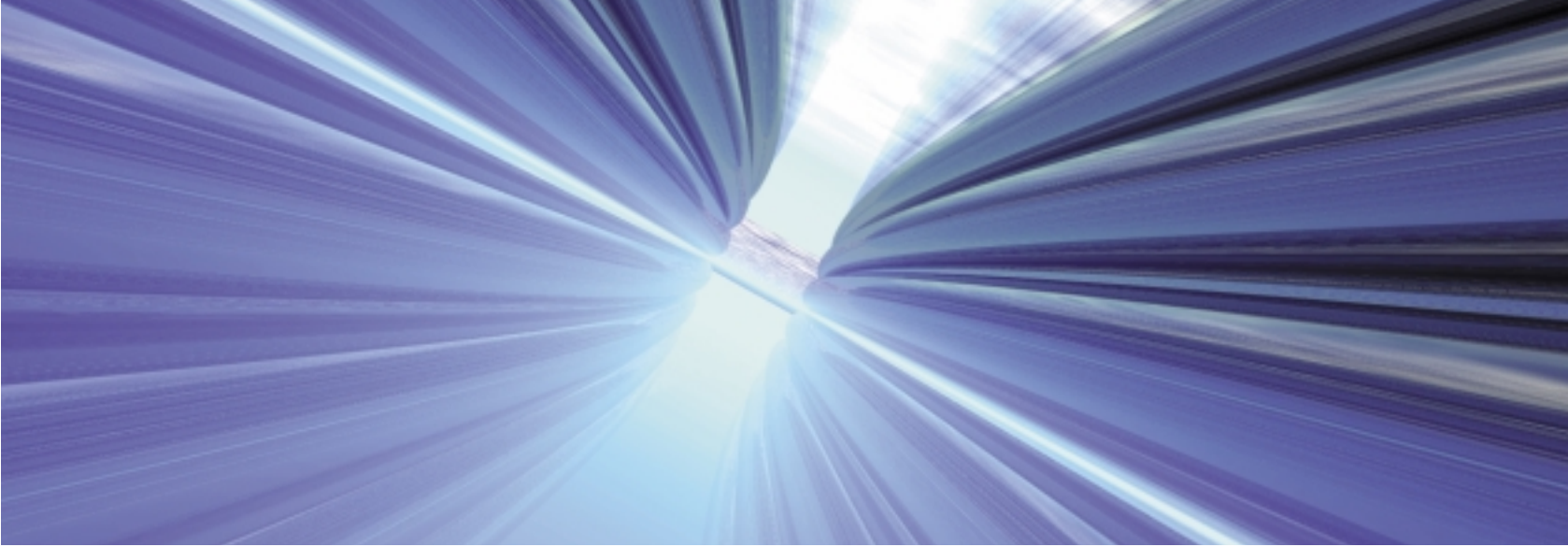
Setting new standards

for processing productivity in EPDM



Nordel®

A Product of DuPont Dow Elastomers



A new era

of EPDM capabilities

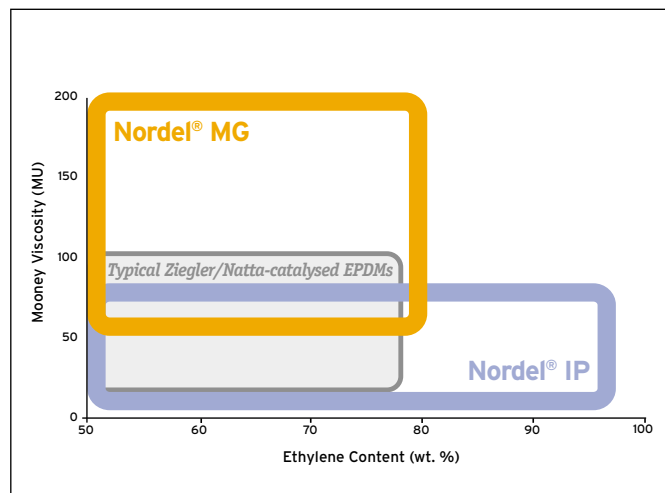
New and innovative technology from DuPont Dow Elastomers is redefining the potential for EPDM products. Nordel® IP products, produced with metallocene catalyst chemistry, set new and higher standards in EPDM performance. Now DuPont Dow has introduced another industry first for EPDM, Nordel® MG. These products are the result of metallocene catalyst chemistry applied to gas phase production of EPDM, resulting in exceptional processing productivity.

NORDEL® FAMILY OF EPDM PRODUCTS EXPANDS PERFORMANCE BOUNDARIES

The addition of the Nordel® MG product line complements the proven performance of the Nordel® IP family of products. Nordel® IP improves yield, reduces scrap and provides outstanding polymer cleanliness. Nordel® MG delivers outstanding mixing performance. Together, Nordel® IP and Nordel® MG offer rubber compounders and processors new technology for the next generation of EPDM.

With deep expertise, a broad portfolio of elastomer products and new enabling technologies, DuPont Dow is ushering in a new era of innovation in EPDM. Get ready to reap the benefits of superior performance by putting Nordel® products to work for you!

NORDEL® IP AND NORDEL® MG PRODUCT CAPABILITIES



INSITE™ technology makes **control and precision** a reality

INSITE™ is the patented metallocene catalyst and process technology, from The Dow Chemical Company, that lies at the heart of Nordel®. INSITE™ makes it possible to control molecular design with precision and predictability. This results in polymers that feature the broad range of Mooney viscosity, crystallinity and cure characteristics that are in demand in today's competitive marketplace.

PUSHING THE LIMITS

Catalyst stability and geometry The stability and geometry of the catalyst combined

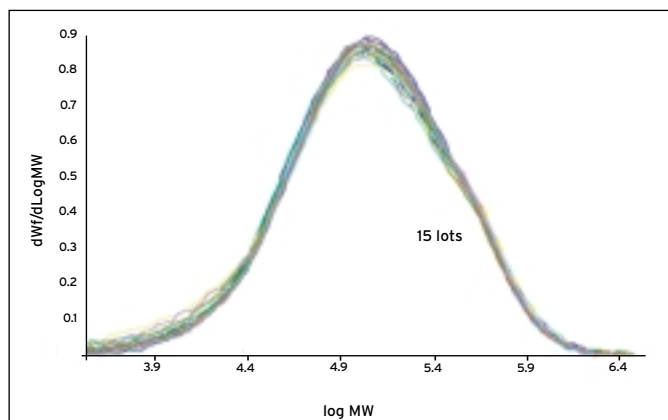
with the flexibility of the DuPont Dow manufacturing processes open new frontiers in molecular design. From very high ethylene-containing polymers to split compositions, DuPont Dow continues to discover new ways to step outside the box of traditional EPDM performance.

Single-site catalyst The polymerization control offered by single-site catalysts enables polymer designers to produce new grades faster than ever before. This speed enables DuPont Dow to bring products to market more

quickly to meet your application needs. The ease of computer modeling with single-site polymerization allows for unprecedented speed from concept to production reality.

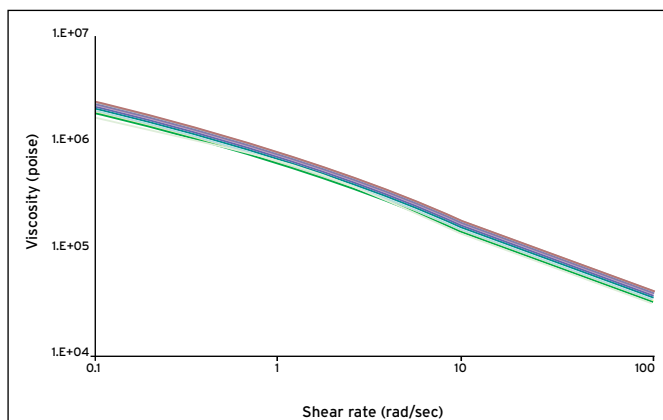
Improved quality standards INSITE™ technology sets new standards for color and appearance through superior catalyst efficiency. This capability enables lower yellowness counts, reduced contamination, and fewer rejects, blemishes or defects, especially in Class A extruded profile applications.

CONTROL OF MOLECULAR WEIGHT DISTRIBUTION
Overlays of Nordel® IP 4570 MWDs



The molecular weight distribution of Nordel® IP is consistent from lot to lot, reducing variability for rubber processors.

RHEOLOGICAL CONSISTENCY OF 70 MOONEY VISCOSITY NORDEL® IP
(190°C, 8% Strain, 15 Samples)



Rheological consistency achieved via INSITE™ technology enables repeatable processing performance.



Extraordinary consistency

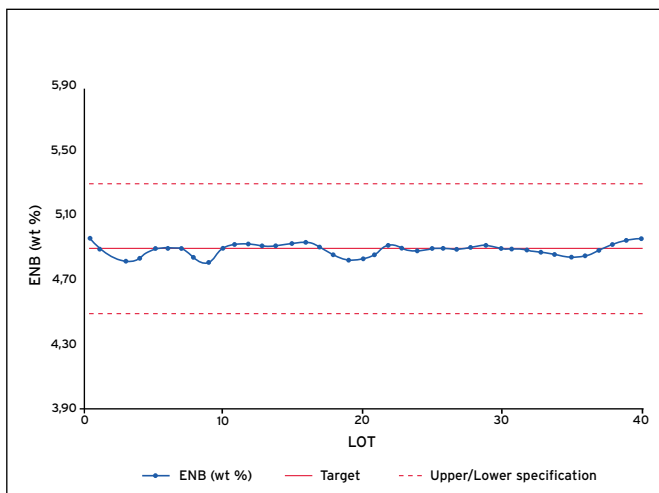
time after time

REDUCING VARIABILITY

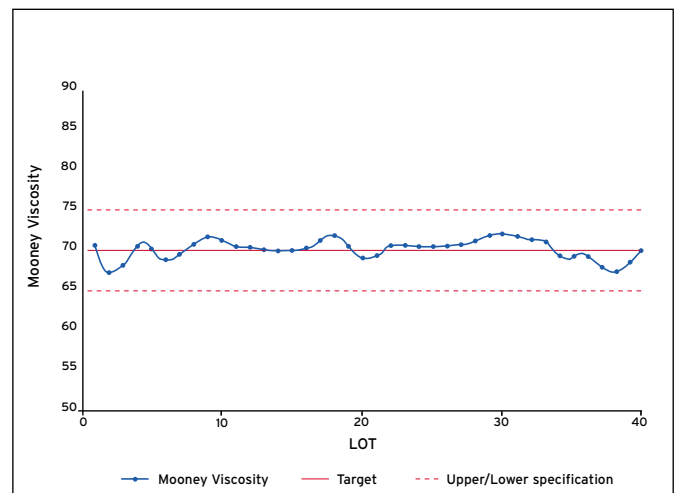
The INSITE™ metallocene catalyst and processes enable DuPont Dow to tightly control molecular architecture. With consistent molecular weight distribution, predictable rheology and uniform, consistent ENB incorporation, Nordel® IP sets the industry standard for product consistency in four ways:

- Consistent polymer reduces set-up times and process profile adjustments
- Smooth, consistent and predictable processing reduces product variability and scrap generation
- Reduced cure variability as a result of consistent ENB incorporation delivers predictable finished part performance
- Repeatable color matching. The lot-to-lot consistency of the base polymer enables standardization of color concentration incorporation for plastic modification applications.

**NORDEL® IP - TIGHTLY CONTROLLED ENB CONTENT
NORDEL® IP 4770**



**NORDEL® IP - CONSISTENT MOONEY VISCOSITY
NORDEL® IP 4770**



IMPROVED PROCESSING LOT-TO-LOT CONSISTENCY OUTSTANDING CLEANLINESS

Nordel® IP delivers

next generation

predictability and performance

As the first family of commercially available metallocene-based EPDM materials, Nordel® IP can deliver process, performance and product advantages that conventional competitive EPDM materials simply do not match.

- Improved processing for improved performance
- Extraordinary uniformity and lot-to-lot consistency deliver highly reproducible and predictable results
- Outstanding cleanliness for improved part aesthetics



Nordel® IP can
save time and money
 while increasing throughput

Nordel® IP is produced as uniformly sized pellets. The semi-crystalline grades retain this pellet geometry. Compared to conventional EPDM in compacted bale form, Nordel® IP products deliver unique processing advantages - saving time and expense by increasing throughput.

REACHING THE TARGETED DEGREE OF MIXING FASTER

Polymer design and the pellet form enable faster mixing cycles compared to mixes made with EPDM in compacted bale form. Customer plant trials using tangential mixers have shown mixer throughputs increased by over 17%. With the intermeshing mixers, throughput benefits comparable to the increase in fill factor have been demonstrated.

MAKING BULK-HANDLING POSSIBLE

The pellet form of the semicrystalline grades enables bulk material handling and all of the operating efficiencies that these systems deliver.

INCREASING MIXER LOADING

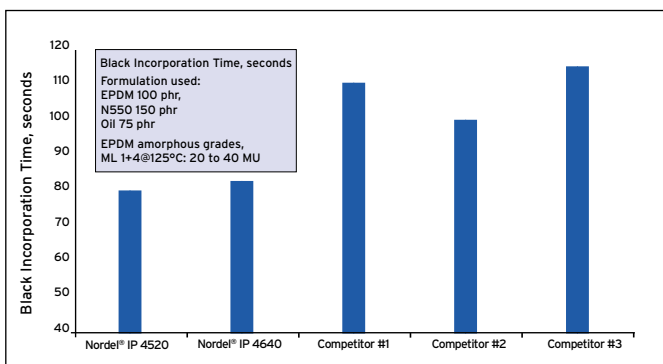
The pellet geometry also facilitates increased load factors. More polymer can be added into the mixer on any given run, effectively increasing the batch size. In many operations, this results in increased mixing capacity and higher mixing throughput. In customer plant evaluations, Nordel® IP processed significantly better if the fill factor was increased by 5 - 10% in tangential mixers and by 3 - 7% in intermeshing mixers.

BALANCING PERFORMANCE AND PROCESSABILITY

Nordel® IP delivers excellent characteristics beyond the mixer. These characteristics balance the needs of performance and processability, including:

- Better flow for higher yields and better surface finishes
- Improved extrudability for more intricate product shapes; consistent die swell
- Reduced cure variability permitting process conditions to be dialed in and maintained
- A broad processing window, facilitating ease of set-up and continuous production.

NORDEL® IP - FASTER MIXING





Exceptional purity & cleanliness

EXCEPTIONAL PURITY

Nordel® IP sets new standards for purity. Typical features include:

- Extremely low catalyst residues
- Very low metals content
- Very low yellowness index

EXCEPTIONAL CLEANLINESS

For polymer modification applications that require both consistent colorability and attractive visual aesthetics, the cleanliness of Nordel IP® enables:

- Reliable color-matching
- Reduced color concentrate costs as a result of the low yellowness of the base polymer
- Deeper, richer colors and improved surface consistency

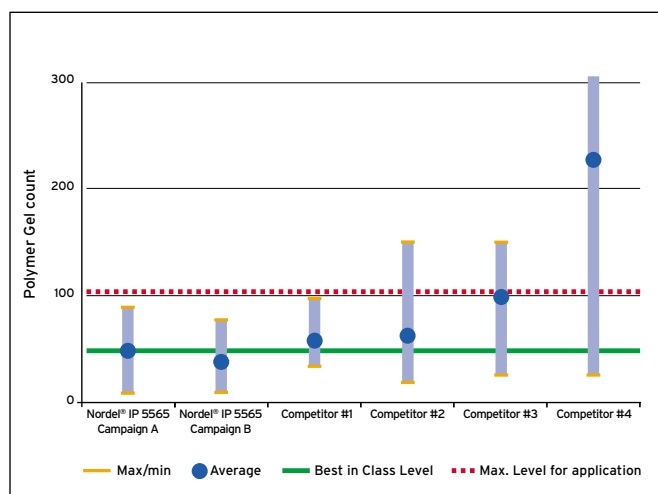
The desirable traits of cleanliness, low odor and low yellowness index are exhibited by all grades of Nordel® IP so that customers receive an EPDM product that leads the industry in cleanliness and purity.

LOW GEL AND CONTAMINATION

The high catalyst efficiency of Nordel® IP production leads to very low catalyst residue and metals content. This yields a clear polymer with very low contamination and gel levels. Polymers made with Nordel® IP can be produced on a consistent basis with a very low gel level. In fact, when the polymer gel count of Nordel® IP is compared to competitive products, Nordel® IP meets best-in-class standards.



POLYMER GEL COUNT IN NORDEL® IP 5565 VS COMPETITIVE GRADES



Nordel® MG is the first
metallocene-based, gas phase
 EPDM rubber

DuPont Dow has expanded its EPDM offerings with Nordel® MG grades that combine the production advantages of the gas phase process with the technical advantages of metallocene catalysts. This advancement in EPDM production technology yields new products with unmatched processing economics. Rubber processors will benefit from:

- Easier and faster mixing
- Reduced compound cost
- Increased productivity and yields
- Higher quality products
- Potential for bulk handling and continuous compounding

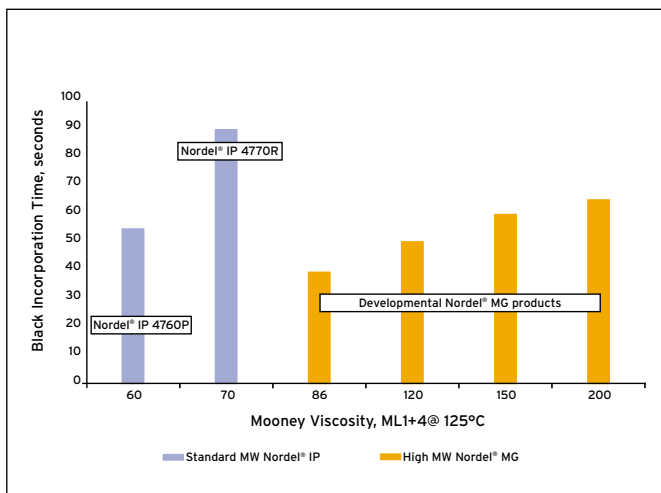
INCREASE PRODUCTIVITY IN MIXING OPERATIONS

The granular form of Nordel® MG more efficiently fills the mixing volume and allows an increase in fill factor from 5 to 10%. Because bale breakdown is eliminated, and because some of the carbon black is already incorporated into Nordel® MG, the time needed for compound mixing can be reduced by up to 30%. The end result is high quality compounds at substantially higher throughput and reduced energy costs.

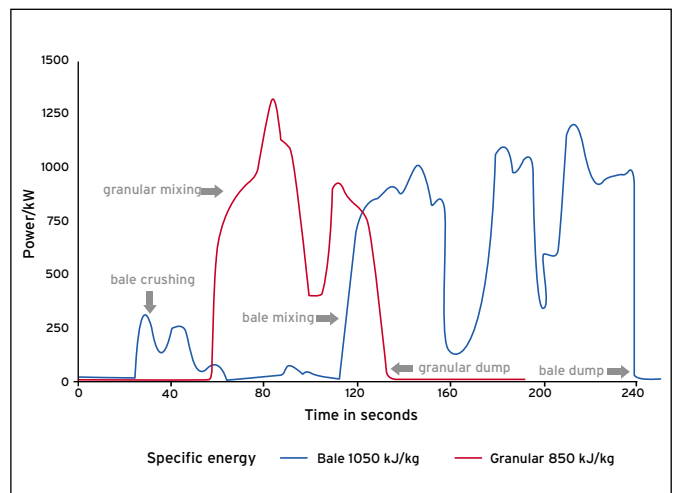
OFFERING VERY HIGH-MOONEY EPDM

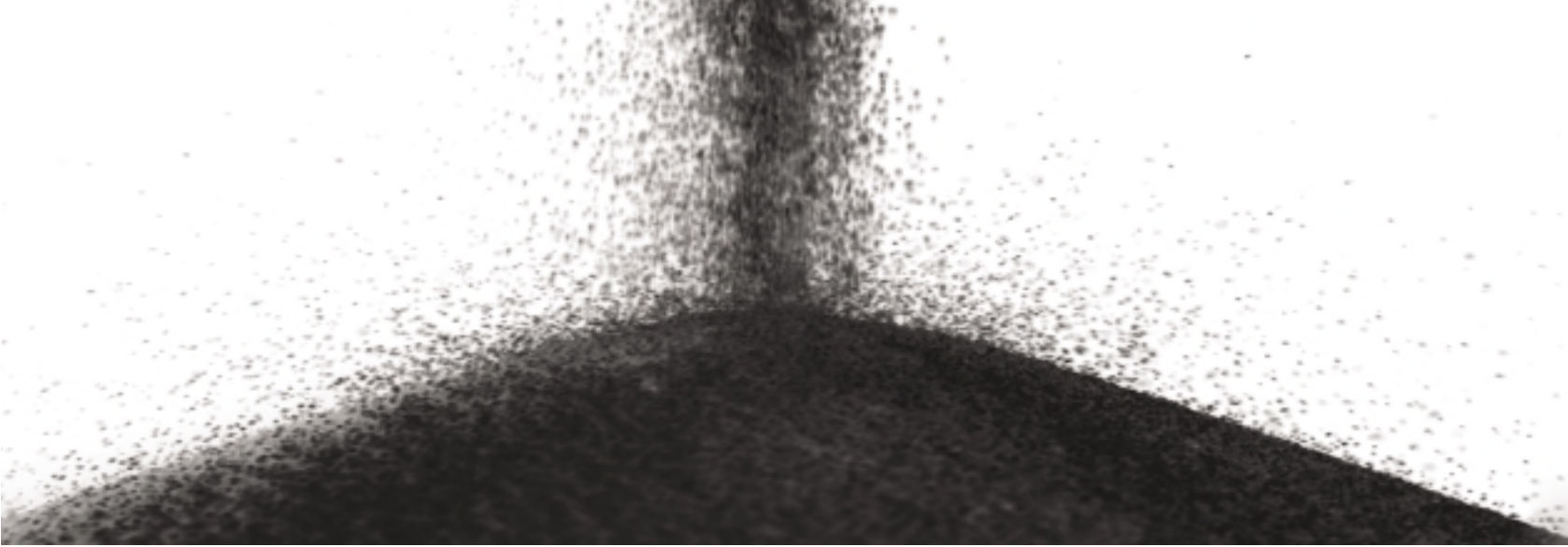
The gas-phase reaction process and granular form of Nordel® MG allows for the creation of polymers with a Mooney viscosity greater than 100 (ML1+4 at 125°C) without oil extension. The presence of carbon black and the granular form facilitate oil absorption. The result is that, unlike oil-extended EPDM, very high viscosity Nordel® MG needs no prior oil extension to facilitate mixing. Custom mixers and parts manufacturers alike will appreciate having the option to use Nordel® MG in the dry form as well as having the flexibility to add their own oil to manipulate processing characteristics and cost.

GRANULAR FORM OF NORDEL® MG RESULTS IN FASTER MIXING



GRANULAR FORM REDUCES POWER CONSUMPTION AND COSTS





One-of-a-kind granular form

improves handling and mixing

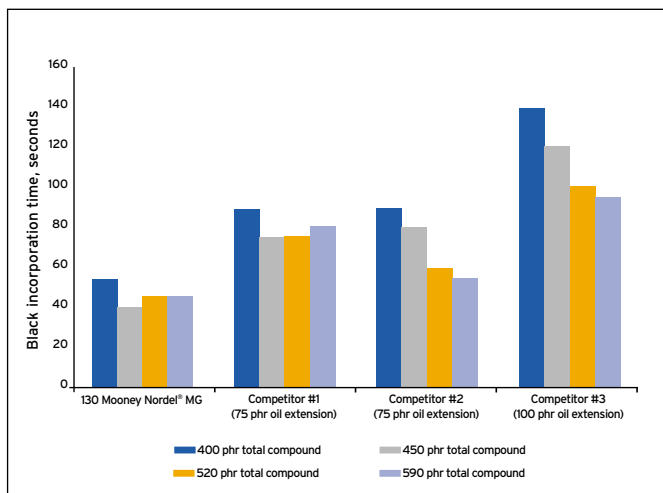
Thanks to the unique, granular form of Nordel® MG products, compounders can save from 10 to 30% in mixing cycle time. Nordel® MG mixes and handles easier and faster than baled EPDM forms. Testing performed in DuPont Dow laboratories validates that Nordel® MG is faster mixing than competitive EPDM.

The free-flowing granules enable bulk handling in Flexible Intermediate Bulk Containers (FIBC) for easier shipment, storage and usage. The granules are easy to use with automated weighing equipment and batch mixers, which results in lower manpower costs. Nordel® MG also eliminates an entire step in continuous mix compounds because no bale grinding is needed to granulate the rubber.

MORE MIX FLEXIBILITY

The granular form of Nordel® MG enables bulk handling and better mixing. The new product line is highly processable, designed to minimize mixer seizure even at the highest Mooney viscosity levels. This translates to increased flexibility for compounders who can take advantage of the ability to lower compound costs with higher filler-to-oil extension.

NORDEL® MG MIXES FASTER THAN COMPETITIVE, HIGH-MOONEY, OIL-EXTENDED EPDM





Nordel[®] MG

Attributes and Applications

Nordel[®] MG sets new standards for processing efficiency in EPDM, which expands the window of applications. Finished goods range from hoses and weatherstrip to roofing membranes and TPVs.

NORDEL [®] MG	
Feature	Benefit
Free-flowing, granular form	<ul style="list-style-type: none"> • Potential for automated material handling • Facilitates easier mixing, lower discharge temperatures and single pass mixing • Better dispersion of compounding ingredients • Opens new opportunities for continuous mixing without additional grinding • Reduced manpower needs/usage • Particle size ideal for blending with polyethylene pellets
High Mooney viscosity	<ul style="list-style-type: none"> • Outstanding mixing including fast cycle times • Highly extendable, low cost formulations can replace 60 - 70 Mooney competitive products • Can displace oil-extended EPDMs with more favorable compound economics • Dry blending possibilities
Consistency	<ul style="list-style-type: none"> • Lower scrap rate downstream • Higher production yields without defects
Packaging in FIBCs and "inclusion" melt bags	<ul style="list-style-type: none"> • Reduces disposal cost of packaging

APPLICATIONS
<p>Automotive</p> <p>Weatherstrip</p> <ul style="list-style-type: none"> • extruded dense compounds • corner moldings • window seals <p>Hose</p> <ul style="list-style-type: none"> • radiator • heater • windshield wiper fluid <p>Anti-vibration</p> <ul style="list-style-type: none"> • muffler hanger <p>Tire (in blends with NR/BR)</p> <ul style="list-style-type: none"> • sidewalls • motorcycle treads
<p>Roofing</p> <ul style="list-style-type: none"> • Membranes
<p>Other applications</p> <ul style="list-style-type: none"> • bicycle tires • container seals • garden hoses • tarp straps • air ducts • electronic condenser caps • TPVs

TECHNICAL SUPPORT FOR ACHIEVING OPTIMUM RESULTS

Depend on DuPont Dow for the support you need to achieve optimum results in the shortest possible time. Our worldwide TS&D expertise can help you with:

- Process development
- Application testing
- New application development



Visit www.dupont-dow.com/nordel

Requests for further information from countries or regions not listed below should be sent to the respective headquarters.

GLOBAL HEADQUARTERS

DuPont Dow Elastomers L.L.C.
300 Bellevue Parkway,
Wilmington, DE 19809 USA
Tel. +1 800 853 5515
+1 302 792 4000
Fax +1 302 792 4450

EUROPEAN HEADQUARTERS

DuPont Dow Elastomers S.A.
2, chemin du Pavillon
CH-1218 Le Grand-Saconnex
Geneva, Switzerland
Tel. +41 22 717 4000
Fax +41 22 717 4001

SOUTH & CENTRAL AMERICA

HEADQUARTERS
DuPont Dow Elastomers Ltda.
Alameda Itapecuru, 506 - Sala 12
Alphaville - Barueri - SP
CEP 06454-080 - Brazil
Tel. +55 11 4166 8978
Fax. +55 11 4166 8989

ASIA PACIFIC HEADQUARTERS

DuPont Dow Elastomers Pte Ltd.
1 Maritime Square #10-54
World Trade Centre
Singapore 099253
Tel. +65 6275 9383
Fax +65 6275 9395

Austria

Dolder GmbH
Brucknerstrasse 6/2/5A
A-1040 Wien
Tel. +43 1 504 21 80
Fax +43 1 504 21 93

Finland

Oy Algol AB
Nuutisarankatu 15
FI-33900 Tampere
Tel. +358 3 314 00 200
Fax +358 3 266 0212

Italy

Dolder-Massara
Via Caduti Bollatesi 38/b
I-20021 Bollate (MI)
Tel. +39 02 350081
Fax +39 02 38300725

Spain

Safic-Alcan España, S.A.
Division Isisa
Rocafort, 241-243
E-08029 Barcelona
Tel. +34 93 322 04 53
Fax +34 93 410 69 78

Benelux

N.V. Sepulchre S.A.
19, av. des Nénuphars
B.P. No.6
B-1160 Bruxelles
Belgium
Tel. +32 2 672 23 35
Fax +32 2 673 67 82

France

Safic-Alcan, Département
DuPont Dow Elastomers
3, rue Bellini
F-92806 Puteaux Cedex
Tel. +33 1 46 92 64 32
Fax +33 1 46 67 04 42

JAPAN

DuPont Dow Elastomers Ltd.
Dempa Bldg 3F, 11-15
Higashi-Gotanda 1-chome
Shinagawa-ku, Tokyo 141-0022
Japan
Tel. +81 3 3444 5161
Fax +81 3 3444 5140

Sweden

Nordica Elastomers AB
Hamntorget 1
P.O. Box 10104
s-43422 Kungsbacka
Tel. +46 300 73 250
Fax +46 300 73 251

Denmark

Nordica A/S
Pilestraede 43
Postbooks 2241
DK-1019 Kobenhavn K
Tel. +45 3315 2855
Fax +45 3315 2161

Germany

DuPont Dow Elastomers GmbH
DuPont Strasse 1
D-61343 Bad Homburg
Tel. +49 6172 87 13 55
Fax +49 6172 87 13 51

Portugal

Safic-Alcan Portugal Lda.
Rua D. Marcos da Cruz 1351
P-4455-482 Perafita
Tel. +351 22 999 82 90
Fax +351 22 996 39 27

Switzerland

Dolder AG
Immengasse 9
CH-4004 Basel
Tel. +41 61 326 66 00
Fax +41 61 322 47 81

The information set forth herein is furnished free of charge and is based on technical data that DuPont Dow Elastomers believes to be reliable. It is intended for use by persons having technical skill, at their own discretion and risk. Handling precaution information is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Since conditions of product use and disposal are outside of our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any material, evaluation of any compound under end-use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate or a recommendation to infringe on any patents. **Caution:** Do not use in medical applications involving permanent implantation in the human body. For other medical applications, discuss with your DuPont Dow Elastomers customer service representative and read Medical Caution Statement H-69237.

Nordel® is a registered trademark of DuPont Dow Elastomers.
INSITE™ is a trademark of The Dow Chemical Company.

Copyright © 2002 DuPont Dow Elastomers. All rights reserved.

(09/02) Printed in USA.
NDS-H90140-00-A0902



DuPont Dow elastomers