

CHEMISTRY THAT MATTERS™



NORYL™ AP2001G POLYOL: ENHANCING MDI-BDO CAST ELASTOMERS

SABIC'S SPECIALTIES BUSINESS



IMPROVING PERFORMANCE IN CAST POLYURETHANE SYSTEMS IN MDI-BDO FORMULATIONS

SABIC's NORYL™ AP2001G polyol in MDI-BDO formulations can provide enhancements in stiffness, toughness and hardness. Additional benefits to these formulations include an increase in cohesive strength and demonstrated retention of physical properties at elevated temperatures. These benefits were observed when compared to standard MDI-BDO and TDI-MOCA formulations. Improvements in chemical and environmental resistance can also be achieved with the inclusion of NORYL AP2001G polyol.



ACHIEVING A UNIQUE BALANCE OF PROPERTIES IN A MODEL CAST POLYURETHANE FORMULATION WITH SABIC'S SPECIALTY ADDITIVE OFFERS:



Improved toughness
and reduced abrasion



Higher temperature
resistance



Increased tensile
strength and elongation



Improved resistance
to solvent, water and
alkaline or acidic water



Improved
modulus

FORMULATION

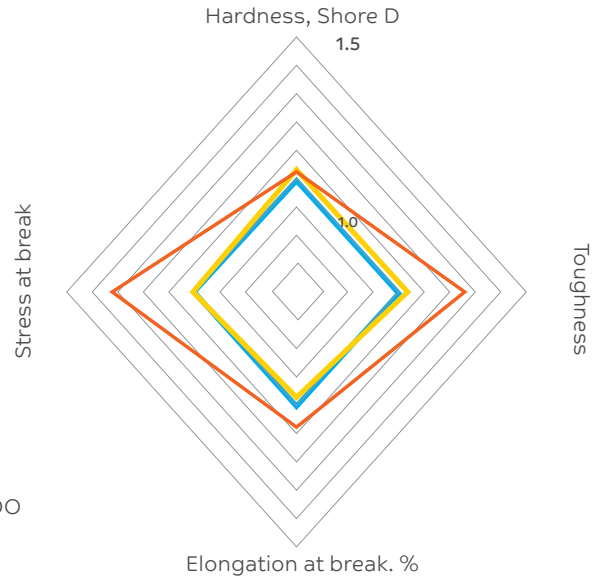
All testing¹ was done in a model formula with prepolymers based on PTMG 2000 polyol and MDI at an NCO concentration of 10% with BDO curing. NORYL AP2001G polyol was used to partially replace PTMG 2000 in the same formula. TDI-MOCA was based on PTMG 1000 prepolymer with an NCO concentration of 6.2% and MOCA curative. All MDI formulas were cured at 80°C under pressure in a mold while the TDI-MOCA formula was cured at 120°C under pressure. NORYL AP2001G polyol increases the gel time in the MDI system which improves processability.

¹ Testing performed by Troy Polymers

PERFORMANCE DATA

RELATIVE PERFORMANCE OF PTMG-BASED CAST PU FORMULATIONS

Adding 5.6% of NORYL AP2001G polyol to a standard MDI-BDO cast PU formulation yielded significantly improved mechanical properties (+8% elongation; +26% tensile strength; +30% toughness and +1.4 shore D points of hardness) at room temperature (20° C).



- PTMG-MDI/BDO
- PTMG (5.6% AP2001G)-MDI/BDO
- PTMG-TDI/MOCA

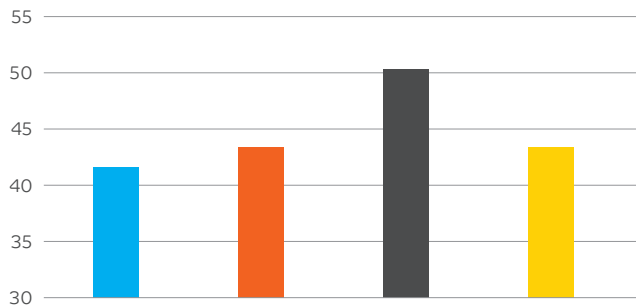
THE POTENTIAL BENEFITS OF THE FORMULATION CONTAINING NORYL AP2001G POLYOL VERSUS STANDARD MDI-BDO INCLUDE (AT ROOM TEMPERATURE):

1 INCREASED HARDNESS

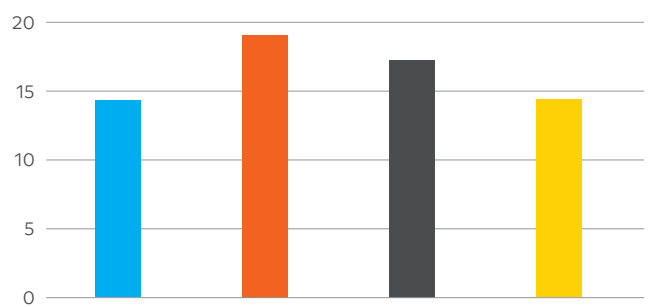
2 HIGHER MODULUS AND TENSILE STRENGTH

3 IMPROVED ELONGATION AND TOUGHNESS AT ROOM TEMPERATURE

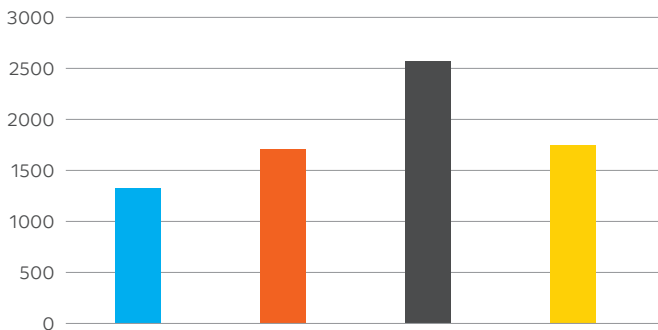
Hardness (Shore D)



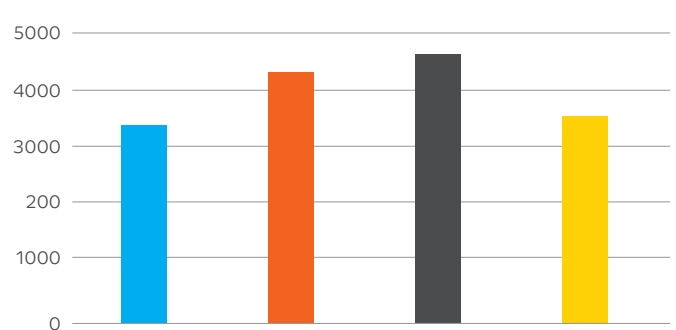
Toughness, J



Stress at 100% elongation, psi



Stress at break, psi

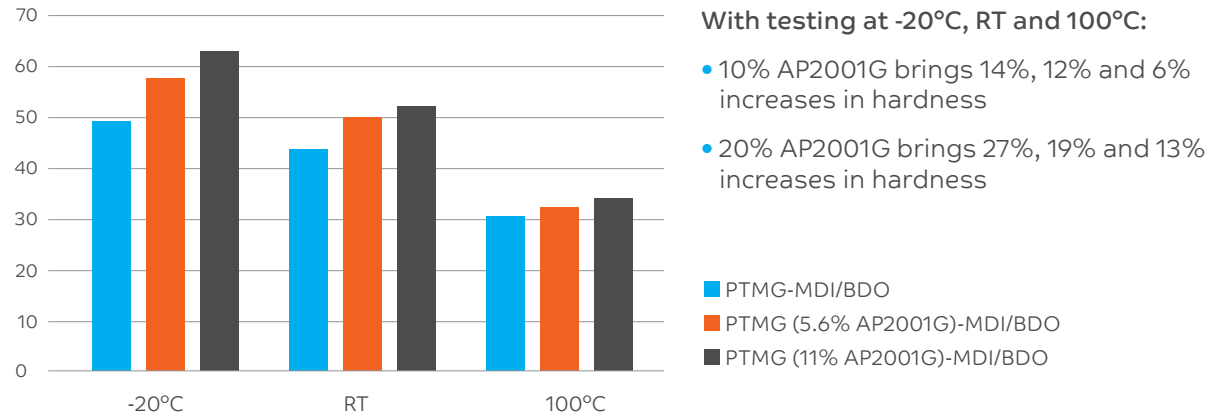


- PTMG-MDI/BDO
- PTMG (5.6% AP2001G)-MDI/BDO
- PTMG (11% AP2001G)-MDI/BDO
- PTMG-TDI/MOCA

COMPARISON OF ELASTOMER HARDNESS OVER A TEMPERATURE RANGE

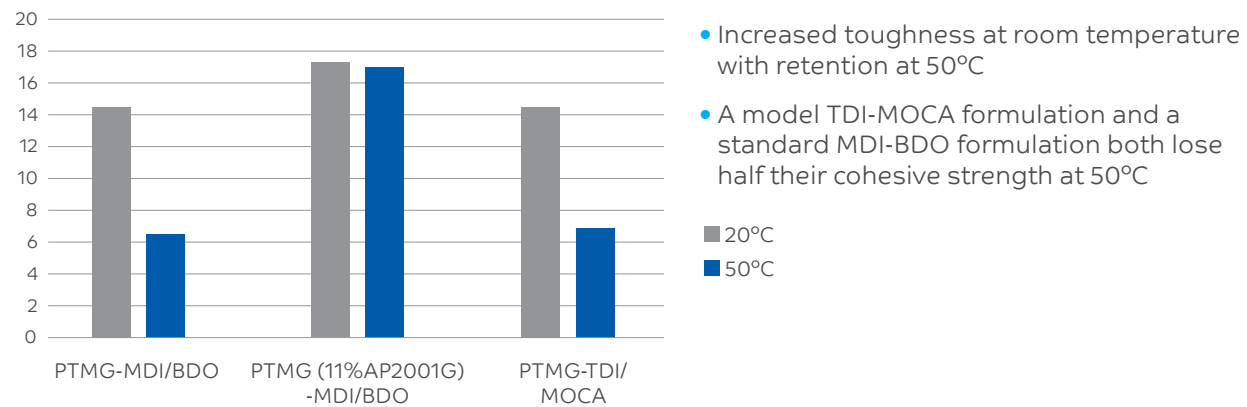
The increased hardness of the formulation containing NORYL AP2001G polyol is retained over a wide temperature range.

Shore D Hardness



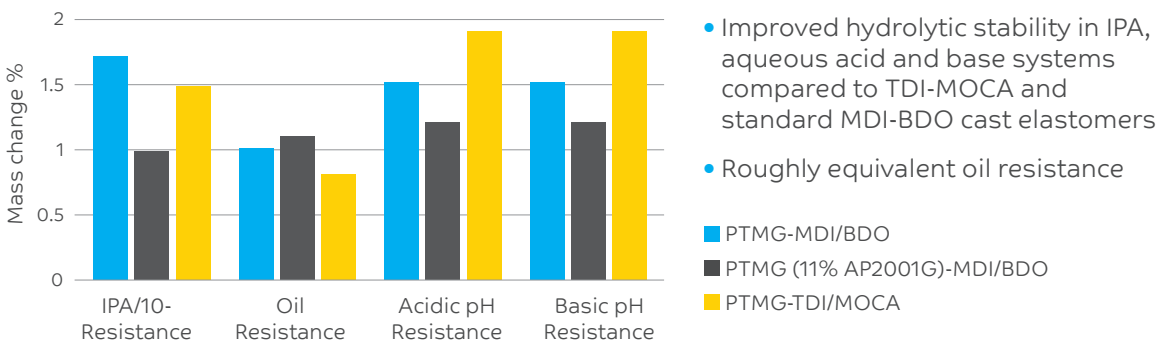
NORYL AP2001G polyol blended with PTMG 2000 in an MDI-BDO formulation shows:

Toughness J, f(Temperature)



Solvent resistance testing using formulations based on MDI-BDO with NORYL AP2001G polyol shows:

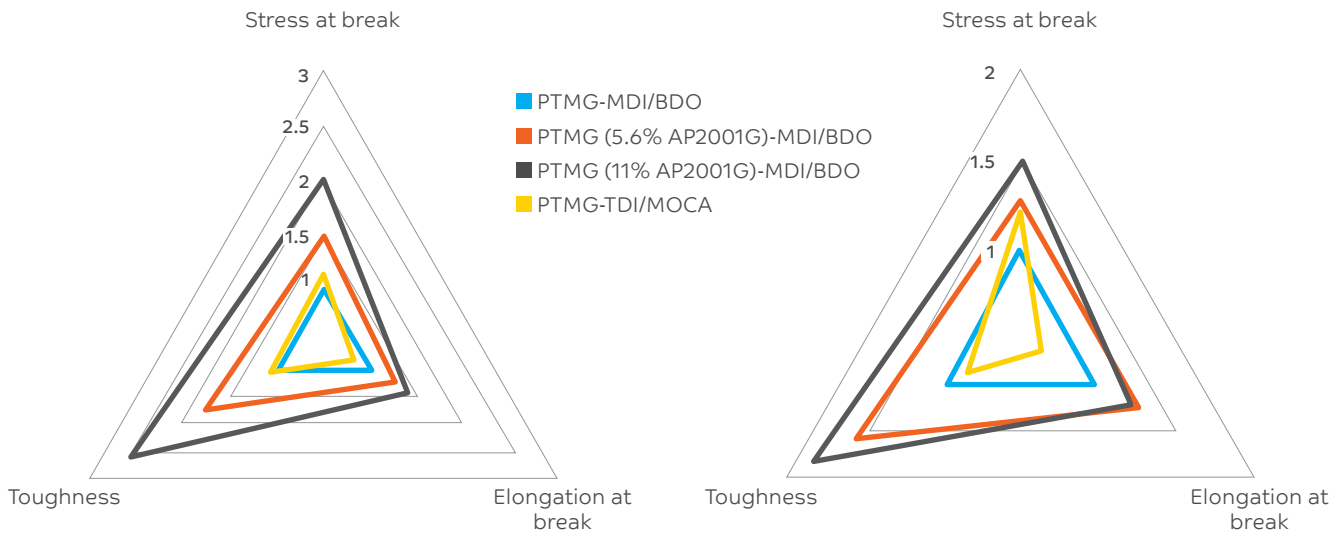
Environmental Resistance



The potential benefits of the formulation containing NORYL AP2001G polyol at 50°C and 70°C versus standard MDI-BDO and TDI-MOCA include:

Relative property comparison at 50°C

Relative property comparison at 70°C



- Increased tensile strength (+45% to 100%)
- Increased elongation (+25% to 40%)
- Increased toughness (+75% to 250%)

- Increased tensile strength (+30% to 50%)
- Increased elongation (+20% to 25%)
- Increased toughness (+60% to 85%)

POTENTIAL APPLICATIONS

SABIC's new NORYL™ AP2001G aromatic polyol can enhance hardness and toughness performance of MDI-BDO cast polyurethanes at high temperatures up to 70°C, which potentially allows MDI-BDO cast PU to be used in extreme conditions, such as for oil and gas exploration, gasketing and mining applications.



COATED PIPES



ROLLERS



TIRES AND WHEELS



GASKETS / O-RINGS

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