# Improved thick nylon film performance: Novadyn™ DT/DI transparent nylon

## Face any of the following challenges?

## Start a discussion with INVISTA

- Does your application require a thick nylon 6 film with high transparency?
- Do you need to lower crystallization rates to improve processability and properties in nylon 6 film?
- Would you like to decrease crystallinity of traditional nylons or nylon copolymers?
- Would you benefit from an improved oxygen and water vapor barrier in a nylon film?
- Could you benefit from a lower-cost alternative to current transparent nylons?
- Would you like to replace a nylon copolymer with a nylon 6 blend, creating the ability to tailor product performance?

### Performance [1]

Novadyn™ DT/DI enables manufacture of thick nylon 6 films.[2]

Novadyn™ DT/DI significantly improves the transparency and lowers the haze of thick nylon 6 films.[3]

Novadyn™ DT/DI blends with nylon 6 have outstanding oxygen and water vapor transmission rates.[3]

Novadyn™ DT/DI enables lower film processing temperatures.[4]

### Cost effectiveness

INVISTA is committed to becoming the transparent nylon cost leader, building upon its integrated low-cost raw material position.

Novadyn™ DT/DI gives nylon monofilament and fiber producers the ability to economically customize properties by modifying crystallinity.

### Recycled content

Novadyn™ DT/DI's unique combination of properties is derived from DYTEK® A Amine, a monomer which is used in many high performance polyamides. DYTEK® A Amine is typically 99% pure and manufactured from recovered and refined materials that would otherwise be burned with heat recovery, giving Novadyn™ DT/DI at least 43% recycled content.[5]

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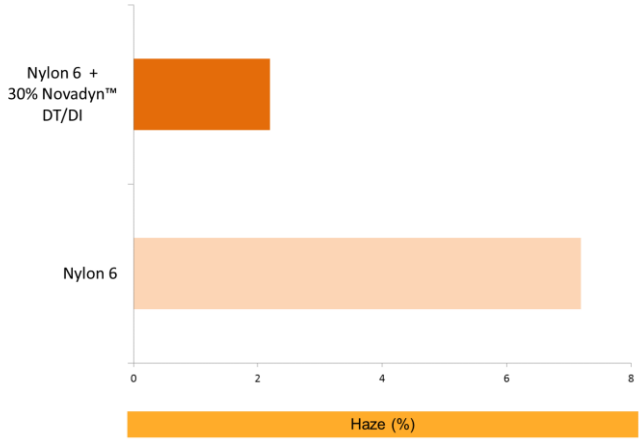
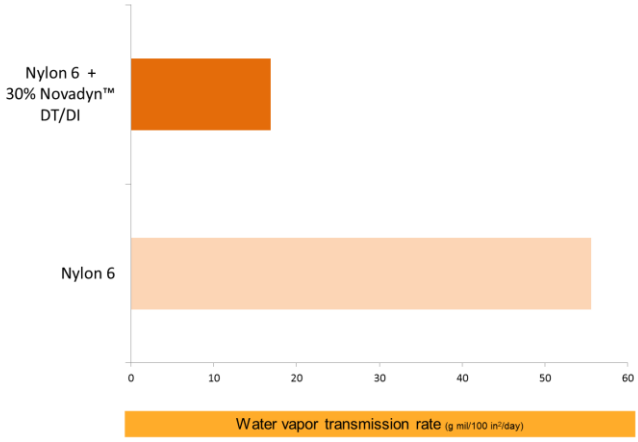
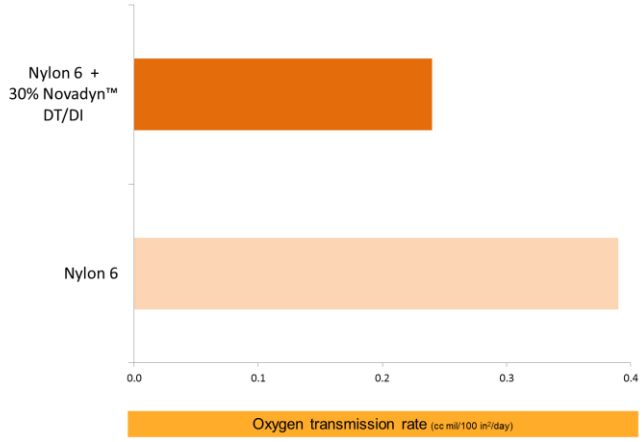
[1] Test results from laboratory blown film line.
[2] Nylon 6 film greater than 3 mil could not be produced (unstable bubbles). 4 mil film containing nylon 6 with 30% Novadyn™ DT/DI was produced in a stable process.
[3] Property comparison of 3 mil film. Haze per ASTM E1164, transparency per visual observation.
[4] 30% Novadyn™ DT/DI lowered nylon 6 processing temperature by 45°F
[5] Recycled content is defined by ISO 14021, section 7.8.

# Improving Nylon 6 blown film



## Thick film property comparison: Nylon 6 versus Novadyn™ DT/DI blend[6]

| Property | TEST METHOD | Nylon 6 | Nylon 6 + 30% Novadyn™ DT/DI |
|---|---|---|---|
| Haze (%) | ASTM E1164 | 7.2 | 2.2 |
| Color L*<br>Color a*<br>Color b* | ASTM E1164 | 96.1<br>0.03<br>0.59 | 96.3<br>0.03<br>0.40 |
| Oxygen transmission rate (cc mil/100 $in^2$/day) | ASTM D3985 | 0.39 | 0.24 |
| Water vapor transmission rate (g mil/100 $in^2$/day) | ASTM F-1249 | 55.6 | 16.8 |
| Dart impact mean failure force (cm g) | ASTM D3029 | 16,100 | 4,400 |
| Tearing force, machine direction (grams force) | ASTM D1922 | 131 | 99 |
| Stress at yield, machine direction (psi) | ASTM D638 | 6,130 | 6,570 |
| Stress at yield, transverse direction (psi) | ASTM D638 | 5,900 | 7,330 |
| Strain at yield, machine direction (%) | ASTM D638 | 0.263 | 0.165 |
| Strain at yield, transverse direction (%) | ASTM D1922 | 0.228 | 0.162 |

[6] Test results from laboratory blown film line. 3 mil film samples were conditioned at 23°C ±2°C / 50% ±10% RH for over 40 hours

## Other potential uses for Novadyn™ DT/DI in extrusion applications (other than nylon 6 blends)

- Blend additive for nylon 66 applications, to potentially control crystallinity, improve processability, and lower processing temperatures.
- Blend additive for other copolyamides to improve clarity or other properties related to degree of crystallinity
- Potential neat resin for extrusion applications include:
  - Mono or co-extruded blown film (blister, flat film, cast film), tubes, and sheet
  - Applications which require transparency and high chemical resistance, potentially replacing polycarbonate with a low-cost transparent nylon.
  - Sheet applications requiring good scratch resistance.
  - Applications requiring good intermediate-temperature heat resistance. Novadyn™ DT/DI has a Tg of 145 ºC.

INVISTA sells base resin Novadyn™ DT/DI. Novadyn™ DT/DI is a highly versatile polymer, with other uses in monofilament, fiber, and injection molded applications. It is used in both transparent applications and as a polyamide blend additives that boosts conditioned properties, glass transition temperature and other properties. For further information please refer to the Novadyn™ DT/DI technical data sheet and the Novadyn™ HPPA website.



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**FOR SAMPLES AND FURTHER INFORMATION**
1.800.231.0998 | nisp@invista.com | Novadyn.INVISTA.com

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