

Imagine working with a company that has no boundaries on exploring solutions for *geogrids*

MAYZO

Mayzo Makes It Possible



**Use of Mayzo's Beta
Nucleation Masterbatch in
the Production of
Polypropylene Geogrids**

Outline

- **Introduction to Beta Nucleation**
- **Description of Mayzo Masterbatch**
- **Effect of Mayzo Masterbatch on Geogrid Properties and processing**
- **Enhanced benefits of Mayzo 2nd generation Masterbatch**

Introduction

- **Polypropylene is a semi-crystalline polymer that has three different crystal forms (α , β , and γ)**
- **Nucleating agents (typically α -type) are added to PP to increase the rate of crystallization (faster cycle), improve stiffness & strength, and improve clarity.**
- **There are very few effective beta nucleating agents, and almost no commercial PP resins that are β -nucleated**
- **Beta nucleation can produce very unique PP products**
- **We have developed a β -nucleated masterbatch that can be added to any non-nucleated PP resin to achieve the benefits of beta nucleation.**

Differences Between Alpha and Beta Crystal Phases in PP

Alpha Phase

- **Monoclinic crystal**
- **Melts at ~ 164 °C (HPP)**
- **Most common phase**
- **Many nucleants known**

Beta Phase

- **Hexagonal crystal**
- **Melts at ~ 150 °C (HPP)**
- **Transforms to alpha phase on stretching**
- **Lower yield stress and different drawing behavior**
- **Microvoids if stretched in solid state**
- **Very few known nucleants**

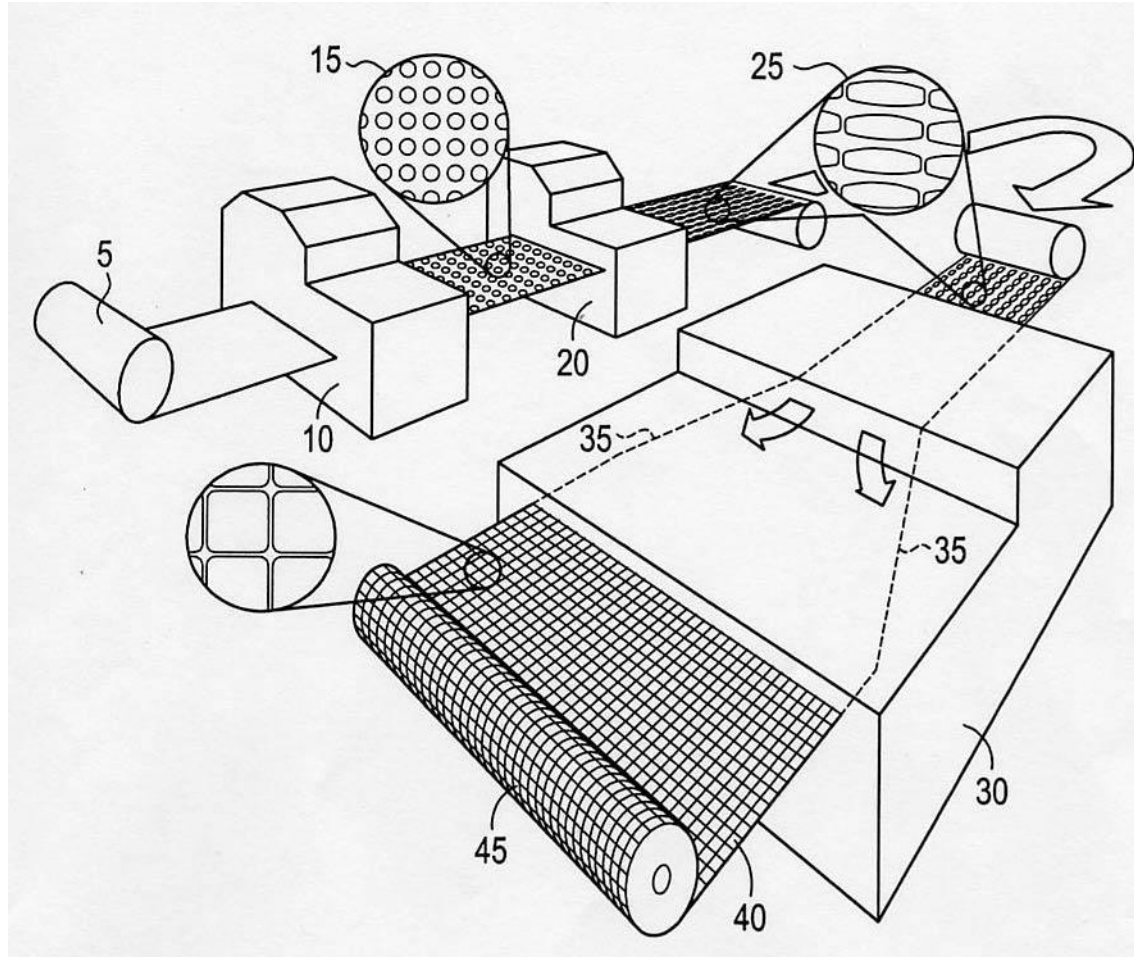


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Mayzo Masterbatch For Geogrid Production - BNX BETAPP-B (1st generation)

- **A Unique Pellet Concentrate that Modifies the Crystallization Behavior of Polypropylene**
- **It alters the drawing behavior of the geogrid so that the un-oriented “node” regions are thinner, and more of the PP is present in the “high strength” oriented strands**
- **The strength and rigidity of the final geogrid is increased allowing a reduction in the basis weight and cost of the geogrid**
- **The perforated sheet can be stretched at higher rates to increase throughput and further reduce costs**
- **Mayzo has applied for US and Foreign patents on this technology**

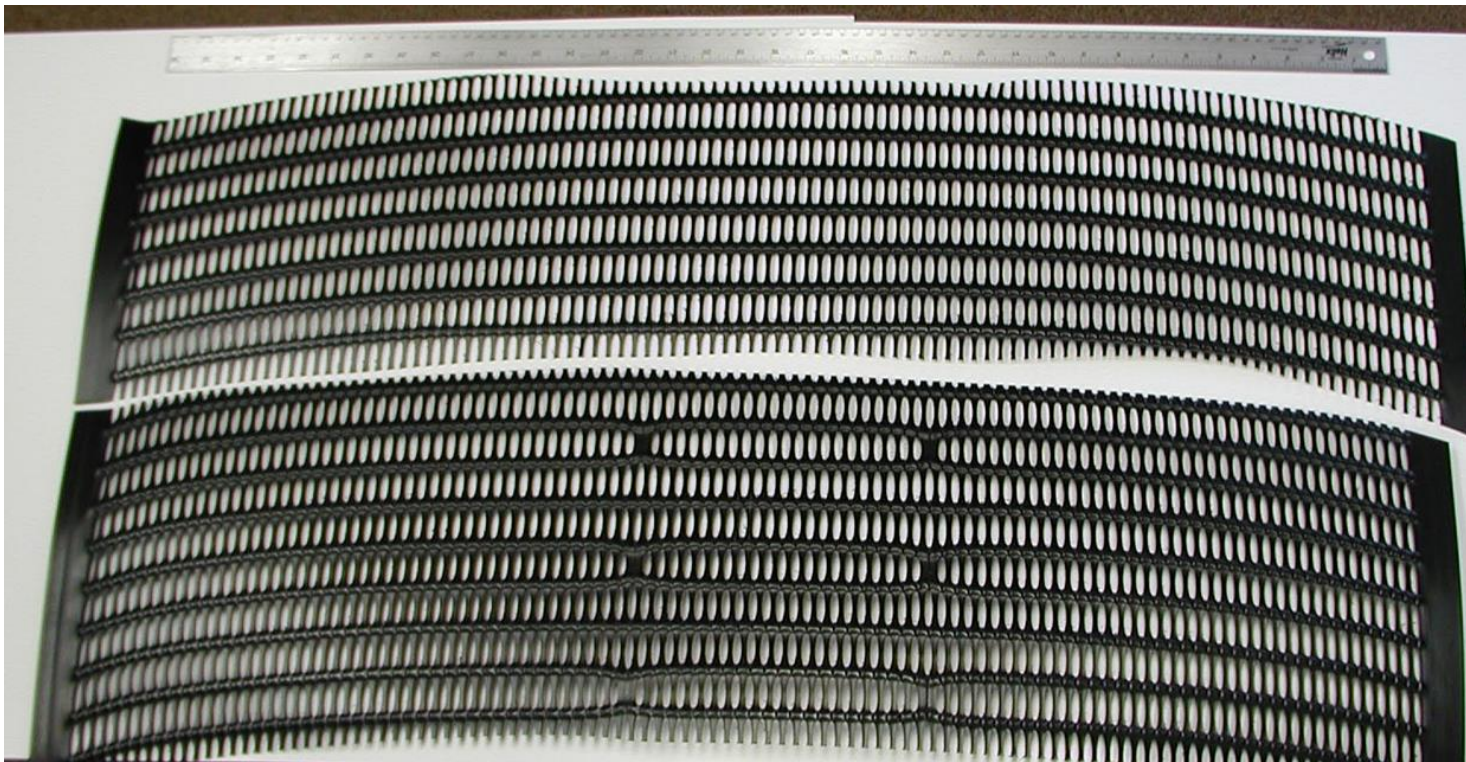
Geogrid Production Process



Effect of Mayzo Additive on Geogrid Processing and Product Appearance

- **More neck-in of grid after MDO step (5-10% width reduction)**
- **Flatter nodes after TDO step**
- **Wider node region after TDO step**
- **Wider ribs after TDO step**
- **Can be oriented at lower temperatures and at faster line speeds**
- **Higher MDO break elongations in final geogrid**

OutPerforated Sheet after MD Stretching line

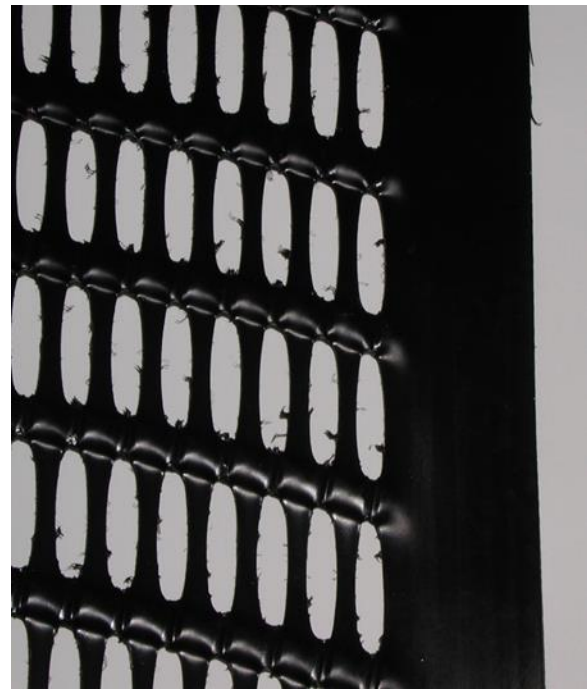


**Without
Beta**

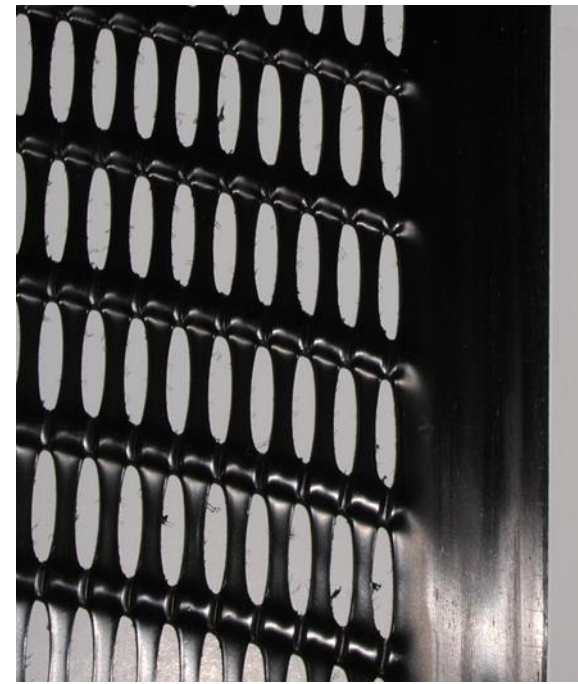
With Beta

Close-up of MD Stretched Sheet

No Beta Masterbatch

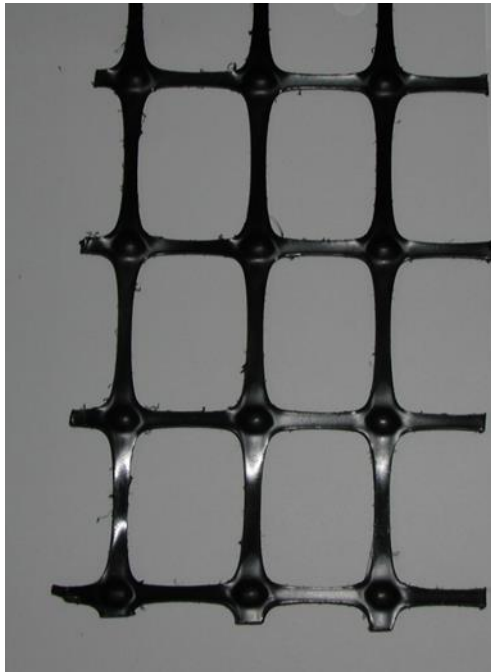


With Mayzo Beta Masterbatch

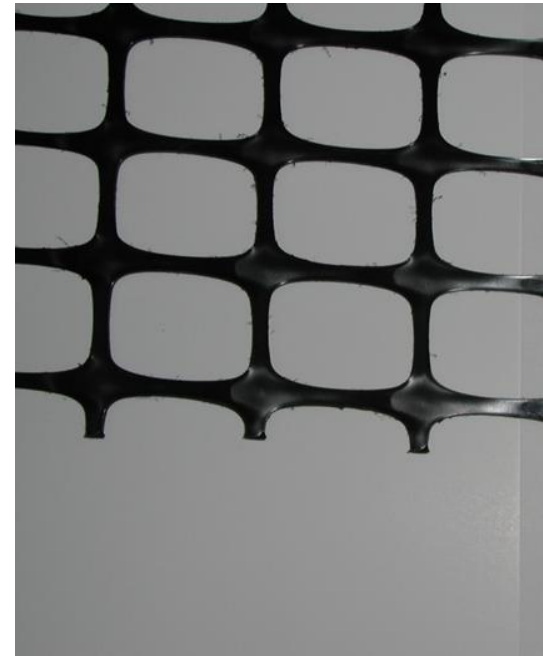


Geogrid Made With and Without Mayzo Beta Masterbatch

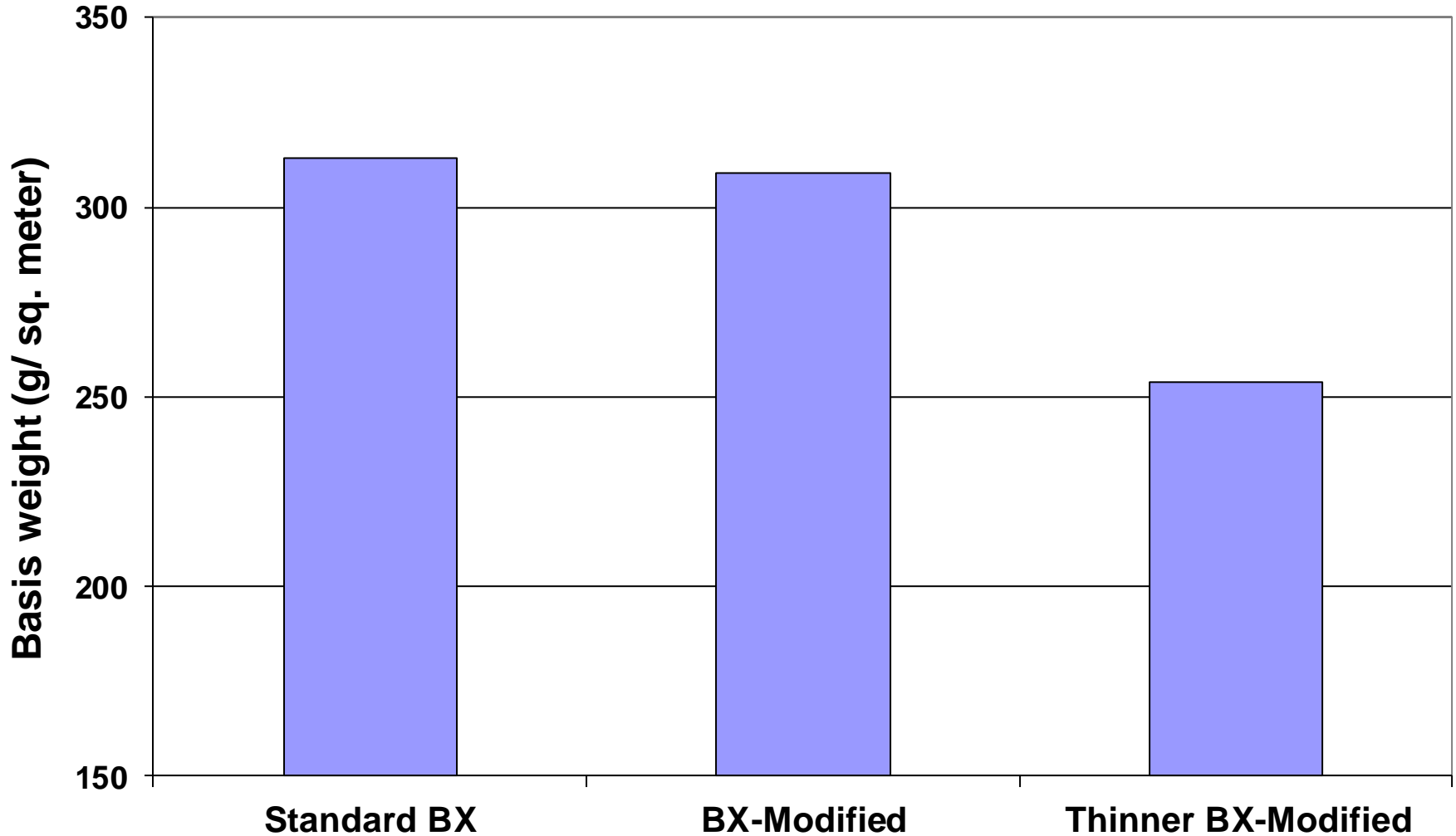
No Beta Masterbatch



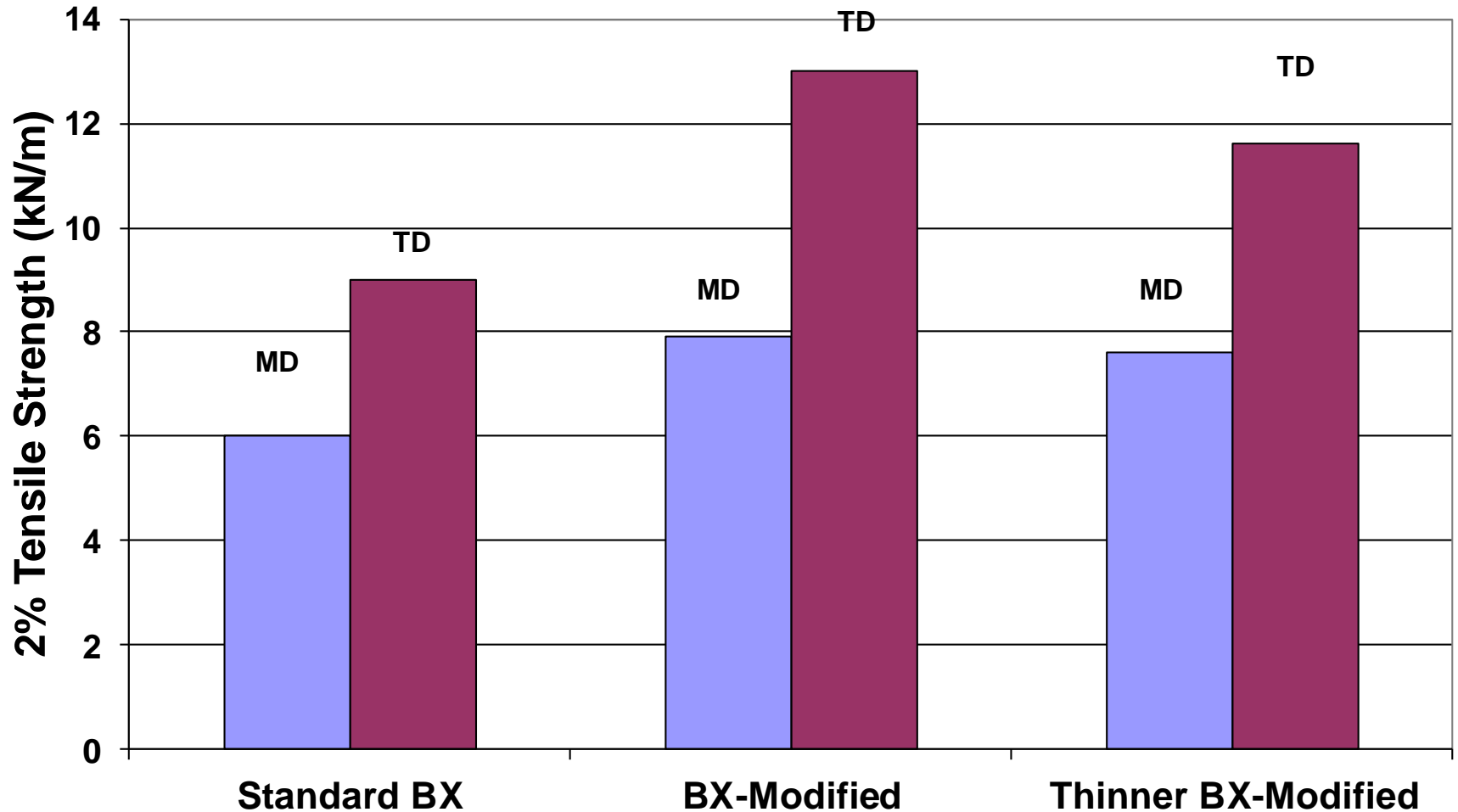
With Mayzo Beta Masterbatch



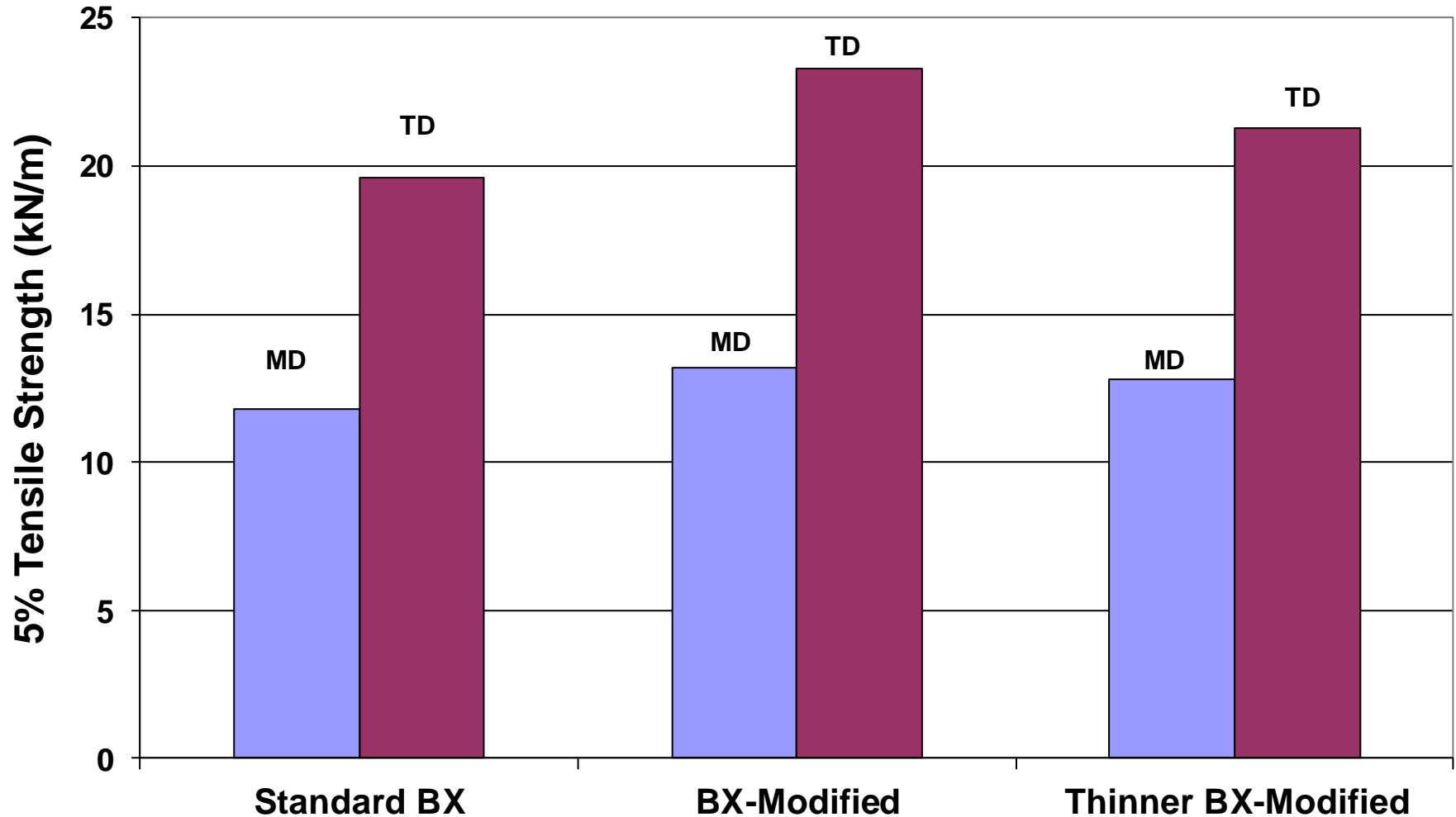
Basis Weight Comparison of Biaxially Oriented Geogrids



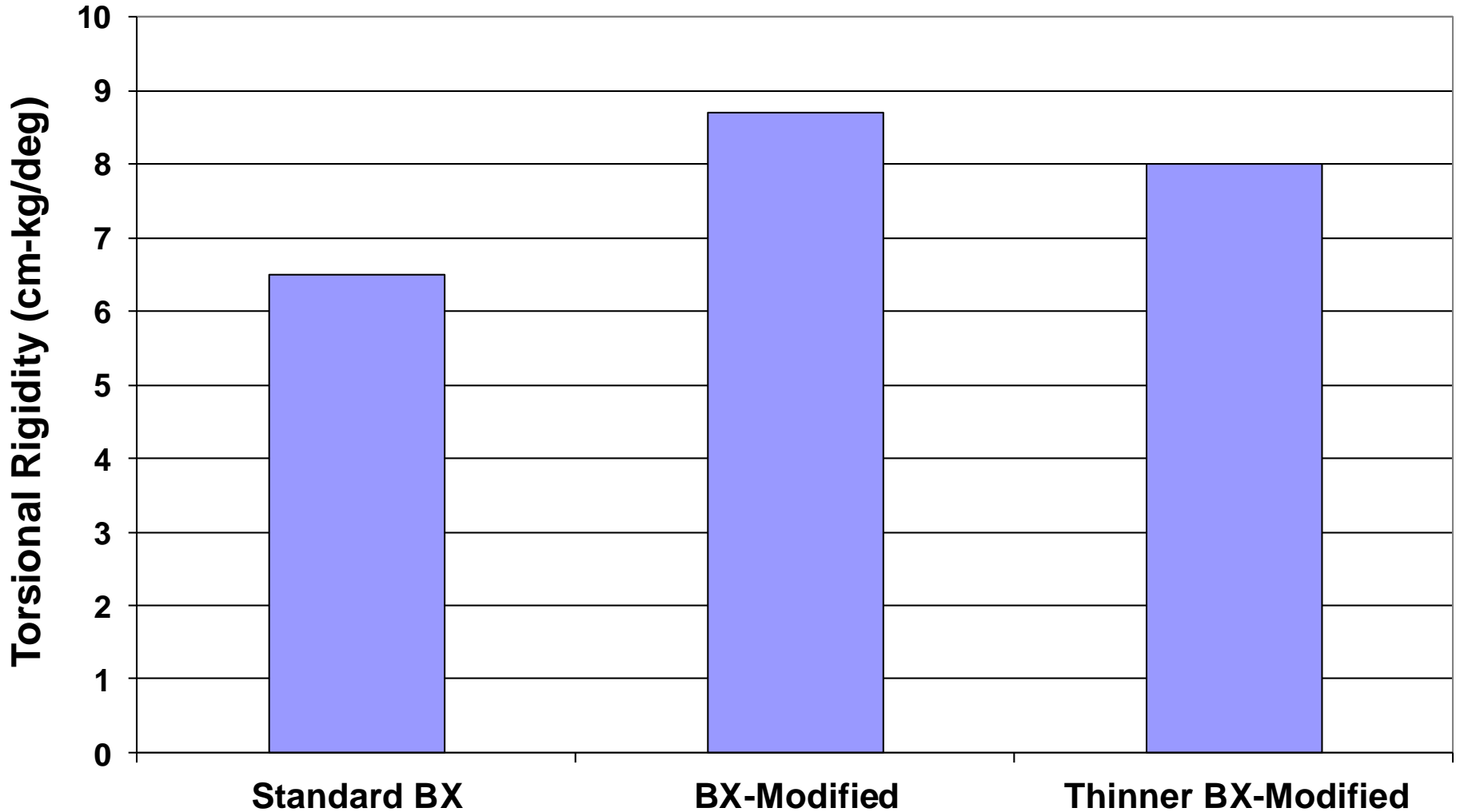
Tensile Strength of Geogrids at 2% Elongation



Tensile Strength of Geogrids at 5% Elongation



Torsional Rigidity of Biaxial Geogrids



Advantages of Mayzo's Beta Nucleation Masterbatch For Geogrid Production

- **Improved Drawing Capability (smaller node regions & wider, thicker strands)**
- **Higher Tensile strength**
- **Higher Torsional Rigidity**
- **Significant Product down-weighting (up to 20% down-weighting demonstrated)**
- **Higher line speeds (up to 50% increase demonstrated)**