

# Polycard XFN<sup>TM</sup>

Renewable Aromatic Polyols from Agricultural By-Products



## Properties:

- ✓ Formulation flexibility
- ✓ Aromatic multifunctional polyols
- ✓ Self catalytic Mannich
- ✓ High miscibility with standard polyols and blowing agents
- ✓ High reactivity and low exotherm
- ✓ Improved surfactant properties
- ✓ Increased flame-retardancy
- ✓ High Bio-content



Applications include:

Bio-based rigid and flexible foam formulations

Durable coatings, adhesives & sealants

Hardener for cast urethanes



Physical-chemical Properties	Aromatic Multifunctional		Mannich		Specialty	
	POLYCARD XFN 50	POLYCARD XFN 53	POLYCARD XFN 150M	POLYCARD XFN 425M	POLYCARD XFN 100	POLYCARD XFN FA300
Color	Amber					
Hydroxyl Value (mg KOH/g)	175-190	175-190	510-540	425-440	320-340	468
Functionality	4-5	6-8	3	3	2 (diol)	2.7
Viscosity 25°C (cps)	900-2,000	40,000-50,000	5,500 - 9,000	3,000-6,000	~4000	4,000 - 8,000
Density (g/mL)	0.95	0.99	1.04	1.04	0.99	0.99
Water content (%)	≤0.2					
Bio-Content %	95	95	73	75	90	~78*
Global Warming Potential <sup>(2)</sup> (kg CO <sub>2</sub> /kg)	- 5.8	-5.6	- 3.1	-3.2	- 4.5	ND

<sup>(1)</sup> Biobased Determination using C-14 test ASTM-D6866-08. \*CALCULATED

<sup>(2)</sup> GWP is the total amount of equivalents of Carbon Dioxide released. Determined through a cradle to gate LCA following ISO 14040 Series Standards.

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## High Functionality Aromatic Polyols

XFN 50 is a medium viscosity polyol with a 4 functionality that can replace aromatic polyether and polyester polyols in insulation and structural foam, adhesives, sealants and pre-polymer structures.



XFN 53 is a high viscosity, high functionality polyol that can be used as an additive for increased flame resistance in foam formulations or used in advanced urethane prepolymers.

## Mannich Polyols

XFN 150 is bio renewable version of the common 350x mannich. Designed primarily for spray foam formulation, it offers very fast cream time and improved cell structure, thanks to its surfactant effect. Other uses include amine catalyst replacement in urethane formulations.



XFN 425 is replacement for the 425x mannich. Both polyols feature low viscosity and display high degree of moisture resistance and are especially effective in 2lb foam systems.

## Specialty Polyols

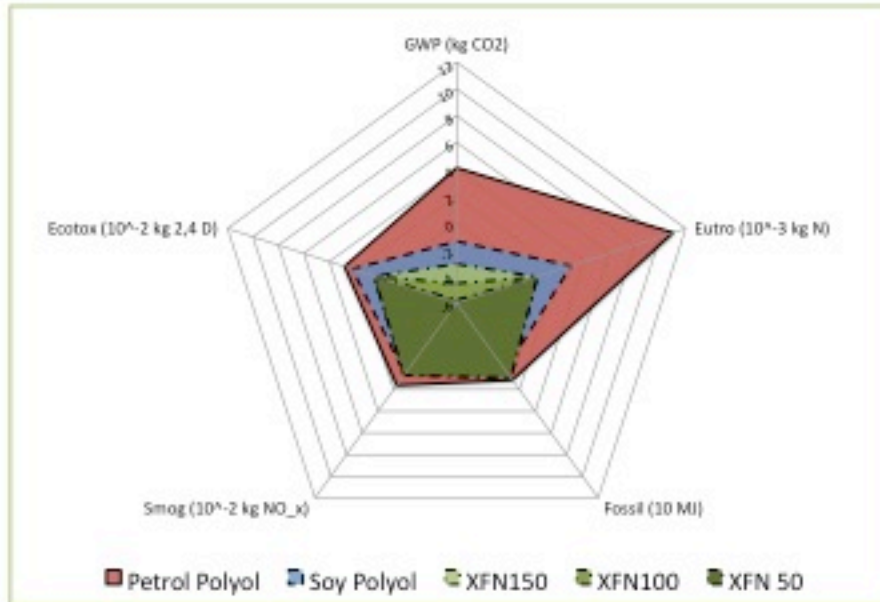
XFN 100 is bio renewable diol structure with a primary and a secondary hydroxyl. It can be used as an additive for load modification in MDI Flexible foam formulation, resulting in lower density systems. XFN 100 is also used in pre-polymer isocyanate structure for applications ranging from flexible and rigid foams, elastomers and adhesives.



XFN FA300 is variant of XFN100, specifically designed to work as load modifier in High Resilience Flexible (HRF) foam for automotive seating applications.



# Life Cycle Analysis (LCA) for Polycard XFN series:



*Cradle to gate life cycle analysis of Polycard products. Study was conducted on the basis of Soy based products life cycle assessment performed by Omnitech International on behalf of United Soy Bean Board.*

## Case Study for pipe insulation with Polycard XFN-150 mannich polyol

**40 parts Polycard XFN-150** | 60 parts polyether-polyol/glycerol-based polyols  
 10-20 parts phosphate ester flame retardant | 1.5-2.5 parts water  
 3-5 parts catalyst (tin-based and tertiary amine) | 10-14 parts blowing agent  
 Cream time: 4-7 sec., String time: 12-18 sec.  
 Density (sprayed): 3.5-5 lb/ft<sup>3</sup>, Density (free rising): 2.2-2.6 lb/ft<sup>3</sup>



DIN4102/BS 476

### Improvement in mechanical, FR & Bio properties:

Compressive strength at yield:	56.9 ± 5.2psi (0.4 MPa) (↑ 24%)
Strain at yield:	3.7 ± 0.5 (↓ 32%)
Modulus:	1692 ± 265 psi (12 MPa) (↑ 25%)
FR Test DIN4102:	B1 (difficult to ignite/often self extinguishing)
Foam Bio-content:	13.5% (calculated)

XFN-150 formulation



Original formulation