Technical data brochure

Desmodur® MX100 + Baytec® DX100 + Baytec® XL100
Covestro's dedicated solution for mining grinding mill linings

Covestro developed a dedicated Desmodur® system matching the specific requirements of grinding mill linings.
- Good impact resistance
- Excellent tear resistance with nick
- Excellent abrasion resistance

Introduction
Over the whole mining process, whether the minerals are hard or soft, small or large, more or less abrasive, wet or dry, wear will always be around. Using cast elastomers from Covestro proved to be a cost-effective and efficient method to protect the devices subject to different wear conditions: they enable to lower the total cost and enhance the efficiency in terms of output and lifetime.

In that purpose, Covestro developed a dedicated Desmodur® based cast polyurethane system intented for the manufacturing of the grinding mill linings. It allows an extended protection of the mill from the means used to crush and to grind the bigger aggreagates. It therefore maximizes the equipement availability by reducing the number of maintenance operations.

Component characteristics
All components of the system, Desmodur® MX100, Baytec® DX100 and Baytec® XL100 are solid at room temperature. They process at temperature below 70°C.

Component information
The Desmodur® MX100 is a quasi prepolymer based on diphenylmethane diisocyanate (MDI) and a polyester polyol. The Baytec® MX100 is a polyester polyol. The Baytec® XL100 is an alcohol based chain extender.

CHEMICAL NATURE OF THE COMPONENTS

Desmodur® MX100	MDI - Polyester
Baytec® DX100	Polyester formulated polyol
Baytec® XL100	Alcohol formulated chain extender

CHARACTERISTICS OF THE COMPONENTS

	Unit	Desmodur® MX100	Baytec® DX100	Baytec® XL100
NCO percentage	%	16.40 (±)	-	-
Physical appearance at room temperature	-	solid	solid	solid
Processing temperature	°C	40	70	40
Viscosity at room temperature	cps	900	600	10
Specific gravity at processing temperature	-	1.17	1.16	1.10

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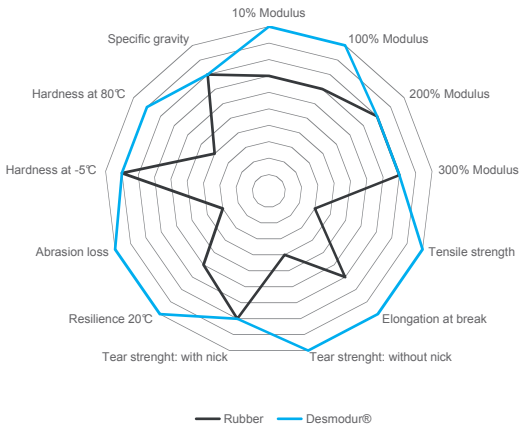
Mechanical properties
Developed to withstand the harsh conditions endured in grinding mill, the linings made of Desmodur® MX100 based system show excellent resistance to wear. Pushing the limits of Cast Polyurethane, Covestro developed this dedicated Quasi-MDI-Ester based system to outperform Rubber in the lining applications. Furthermore, this system demonstrates in fact an excellent behavior in the whole scope of elastomeric properties.



MECHANICAL PROPERTIES			
Hardness at 20°C	**DIN 53505**	**75 A (*)**	**Shore**
10% Modulus	DIN 53504	1.4	MPa
100% Modulus	DIN 53504	4.2	MPa
200% Modulus	DIN 53504	6.5	MPa
300% Modulus	DIN 53504	10.7	MPa
Tensile strength	DIN 53504	58	MPa
Elongation at break	DIN 53504	650	%
Tear strength: without nick	ISO 34-1	123	kN/m
Tear strength: with nick	ISO 34-1	58	kN/m
Resilience	DIN 53512	51	%
Abrasion loss	ISO 4649	26	mm^3
Abrasion loss with 0.3% AAA	ISO 4649	14	mm^3
Compression set (22 h / 70 °C)	ISO 815-1	29	%
Hardness at -5°C	DIN 53505	78 A	Shore
Hardness at 80°C	DIN 53505	75 A	Shore
Specific gravity		1.24	

* Depending on process conditions, curing and post curing temperature, hardness may vary with a derivation of ± 3 Shore A.

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Wear resistance properties

Grinding mill linings require an excellent resistance to wear, a combinaison of resistance to tear, abrasion and impact. The aggregates to grind have sharp angles and the means to cruch them can be harmful for the mill. To date, most of the linings were made with Rubber. However, Covestro developped a dedicated cast polyurethane system outperfoming Rubber in this application.

The mechanical properties of the Desmodur® MX100 based system represent the ultimate solution compared to Rubber. Moreover, it is especially performing in the required properties of grinding mill linings.

REMARKABLE WEAR RESISTANCE PROPERTIES

				Grinding mill liner rubber 73 Shore A	Desmodur® MX100 based system 75 Shore A
Tear strength	Tear strength without nick	kN/m	ISO 34-1	52	123
	Tear strength with nick	kN/m	ISO 34-1	59	58
Resilience	Resilience at 20°C	%	DIN 53512	29	51
	Resilience at 60°C	%	DIN 53512	31	79
	Resilience at 80°C	%	DIN 53512	30	82
Abrasion	Abrasion loss	mm^3	ISO 4649	50	26
	Abrasion loss	mm^3	ISO 4649	50	14 (with anti-abrasion additive at 0.3%)

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Processing

Like many MDI based prepolymers, the Desmodur® MX100 based system from Covestro has low-viscosity components that do not require extensive heating and can therefore be mixed at low temperature. Varying these three components provides access to elastomers with a wide range of hardness values.

They also offer the possibility to adjust the reactivity through the catalyst choice and ratio and are therefore suitable for the casting of large parts.

PROCESSING	
Hardness at 20°C	**75 Shore A**
Desmodur® MX100 processing temperature	40 °C
Baytec® DX100 processing temperature	70 °C
Baytec® XL100 processing temperature	40 °C
Parts by weight of Desmodur® MX100	100
Parts by weight of Baytec® DX100	125
Parts by weight of Baytec® XL100	8.2
Catalyst SD25.1 % / total (by weight) catalyst at the head	0.40 %
Catalyst SD25.2% / total (by weight) catalyst at the head	0.30 %
MOLDING AND CURING	
Mold temperature	85 – 100 °C
Pot life (400g mixture in a non heated pot)	3 min 30
Demolding time	30 min
Post-curing	16 hr – 80 °C

Processing tip: choosing the appropriate primer

Covestro provides efficient bonding solutions. The company performed several tests to determine the appropriate primer for the setting of the grinding mill liner on the metal substrate. Covestro identified two solutions:

- PM9T - PM9B is a two-component bonding agent that will bond cast polyurethanes to metals. PM9T - PM9B bonding agent has excellent hydrolysis, oil, solvents and corrosion resistance and is normally used where severe conditions are to be found. The product will bond at temperatures above 80°C.
- PB 4U is a monocomponent bonding agent which allows a good adhesion between cast polyurethane systems on metal substrates.

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