

Familiar with this situation ?????



Which material I should use?



PE-UHMW 1000 & PE-HMW 5000 Properties Comparison



Distinguishing between PE-HMW 500 and PE-UHMW 1000 is the molecular weight. PE-HMW 500 is a high molecular low pressure polyethylene with a molecular weight approximate 500.000 g/mol, and also called as PE-500. PE-UHMW 1000 (PE-1000) is a high molecular low pressure polyethylene with a molecular weight approximate >3.500.000 g/mol.

Fig. 1 Properties PE-HMW 500 & PE-UHMW 1000

	Dichte Density	Kerbschlagzähigkeit Notched impact strength	Streckspannung Tensile strength at yield	Reißdehnung Break elongation	Verschleißfestigkeit Abrasion resistance	Shore Härte D/ Shore hardness D	Max. Dauergebrauchstemp. Max. cont. temperature	Oberflächenwiderstand Surface resistance	Tafelgruppe Sheet group
Einheit/Unit	[g/cm ³]	[kJ/m ²]	[N/mm ²]	[%]	[%]	[°]	[°C]	[Ω]	
Prüfmethode Test method	ISO 1183 A	ISO 179	DIN EN ISO 527 50 mm/min 23°C	DIN EN ISO 527 50 mm/min 23°C	Sand Slurry Test	DIN 53505		DIN IEC 60093	DIN 16972
Murdotec® 500 natur/farbig natural/coloured	≥ 0,95	≥ 15	≥ 20	> 50	400 ± 20	65	80	> 10 ¹⁴	3
Murdotec® 1000 natur/farbig natural/coloured	≥ 0,92	≥ 170	20	> 50	100 ± 10	63	80	> 10 ¹⁴	2

Source: Murdotec, "High Performance Materials for Engineering".

PE-HMW 500 & PE-UHMW 1000 Properties Comparison



Fig. 2.a. Molecular Weight PE-HMW 500 & PE-UHMW 1000



Fig. 2.b. Wear index PE-HMW 500 & PE-UHMW 1000 Based on Sand Slurry Test

Molecular weight difference affected the properties of PE-UHMW, including: density, impact strength, and abrasion resistance (wear resistance) that shown on Fig 1. The properties differences shown PE-UHMW 1000 advantages over PE-HMW 500, which include:

1. PE-UHMW 1000 density (0.92 g/cm^3) is lighter than PE-HMW 500 density (0.95 g/cm^3) .
2. PE-UHMW 1000 more tough 11 times better than PE-HMW 500 in receiving impact force.
PE-UHMW 1000 impact strength: 170 kJ/m^2
PE-HMW 500 impact strength: 15 kJ/m^2
3. Abrasion resistance (wear resistance) of PE-UHMW 1000 is 4 times better than PE-HMW 500 (based on sand slurry test ISO 15527)
PE-UHMW 1000 wear resistance rate: 100 %
PE-HMW 500 wear resistance rate: 400 %

Due significant properties difference (impact strength and wear resistance) PE-HMW 500 can't replacing PE-UHMW 1000 , which will affect on usage time.

Many engineering application need a good tribology properties. Tribology is the branch of engineering that concerned with interacting surface in relative motion under applied load. Properties of tribological system are wear and friction.

Wear is the progressive loss of material from surface in relative motion with to one another. The wear rate is influenced by test condition; pressure and velocity, and defined as the rate of height loss in a specific wear environment (sand slurry test, block on ring, thrust washer test, etc). The lower wear rate, the better the resistance to wear.

Friction is the resistance to sliding motion between two surface. It is a dimensionless property (μ), varying with velocity, pressure, temperature, lubrication, the roughness and nature of the contacting surface.

PE-UHMW 1000 tribology properties is excellent due its very low wear rate (4 times PE-HMW 500) and low coefficient of friction (15), and very suited for engineering application in harsh environment including: coal hopper, dump truck, or conveyor.

In engineering application that need excellent sliding properties including trybology properties, material that can meet this requirement is only PE-UHMW 1000.

PE-HMW 500 known in Indonesia market is not the real PE-500, but mostly PE-HD (High Density Polyethylene) with molecular weight is way below of 500.000 g/mol (between 250.000 g/mol – 400.000 g/mol). This PE-HD is made by Asian Countries like China, Korea, and Taiwan.

Since PE-HD molecular weight is below of PE-HMW 500 molecular weight, the properties will be very weak compared with PE-UHMW 1000. Many people thought that PE-HMW 500 or PE-HD strength is only a half of PE-UHMW 1000 strength, but actually the difference is very significant as explained below:

- PE-UHMW 1000 more tough 11 times than PE-HMW 500, and 17 times toughness than PE-HD (impact strength: 10 kJ/m²).
- PE-UHMW 1000 wear resistance 4 times better than PE-HMW 500 and PE-HD

This condition worsen by no explanation or education for customer about difference between PE-UHMW 1000, PE-HMW 500, and PE-HD by it's seller or distributor.



CUTTING BOARD

PE-HMW 500 applied for cutting board on home appliance.

PE-HMW 500 cutting board widely used in slaughterhouse or restaurant kitchen due it's wear resistance, not absorb moisture and food safe material.

PE-HMW 500 cutting board have a long usage time compared than other cutting board material.

Fig. 3.a. Cutting Board



Fig. 3.b. Hospital Impact Strip



Fig. 3.c. Ice Stadium Impact Strips



Fig. 3.d. Fender Construction

IMPACT STRIP

PE-HMW 500 applied for impact strip on hospital, ice stadium, and fender construction.

Purpose of PE-HMW 500 application as impact strip in hospital and ice stadium is to receive or absorb light impact, to prevent injury, or building damage by impact .

Application as impact strip for fender construction is to prevent building damage or forklift or other industrial equipment.

PE-UHMW 1000 Application



Fig. 4.a. Hopper/Bin Liner

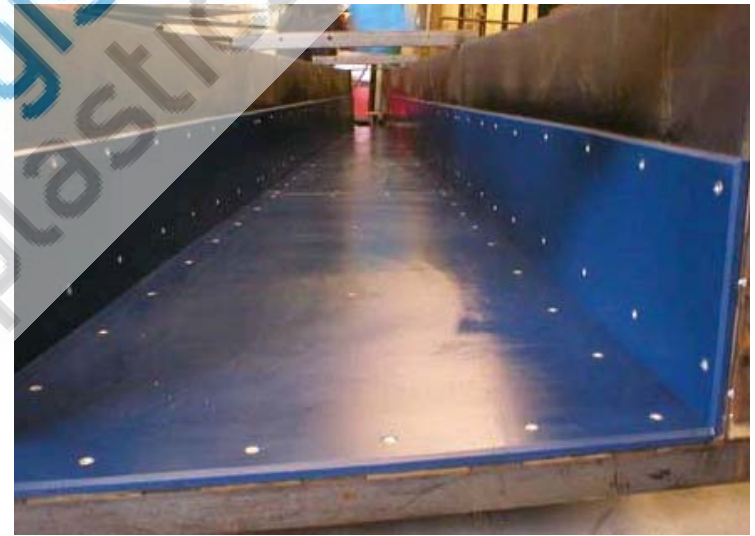


Fig. 4.b. Chutes Liner



Fig. 4.c. Dump Truck Liner

MINING EQUIPMENT LINER

Corrosive and wear are common problem in mining industry. Many equipment used in harsh environment to handle bulk material such: coal, dirt, gravel, and sand.

PE-UHMW 1000 as known have an excellent corrosive and wear resistance, used widely as lining on mining equipment such as: hopper liner, dump truck liner, chutes liner and excavator bucket liner.



Fig. 4.d. Excavator Bucket Liner

PE-UHMW 1000 as liner on hopper and chutes is solution for flow problem in handling bulk material (rat holing, funneling, bridging, arching), due PE-UHMW 1000 very low of coefficient of friction and wear rate.

Same condition stand for dump truck and excavator bucket, PE-UHMW 1000 prevent material sticky and affected on cost saving.

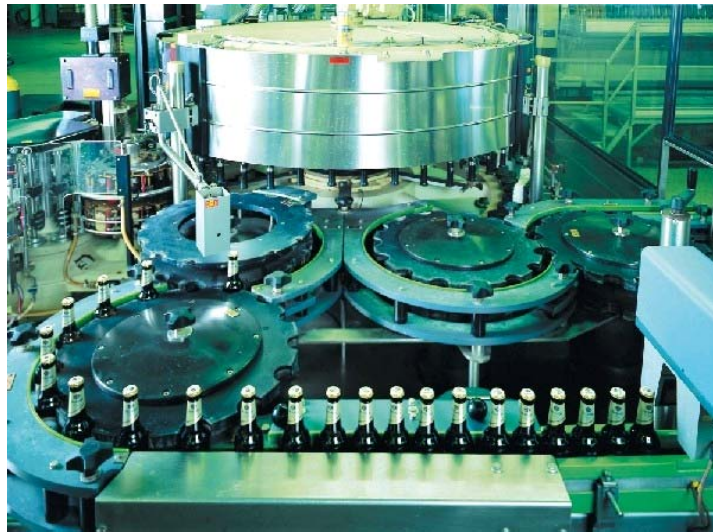


Fig. 4.e. Conveyer for Beverages



Fig. 4.f. Conveyer Guider Gears

CONVEYOR SYSTEM

Many various industry using conveyor system, that we can find easily PE-UHMW 1000 application. Sliding properties is the main properties that conveyor system need, including: low coefficient friction (smooth surface), high impact strength (toughness), and low wear rate.

Food safe material also needed in food industry that using conveyor system. PE-UHMW 1000 is the right material for this condition, as known PE-UHMW is food safe material with good sliding properties and can run in dry condition (no need lubrication).

By applying PE-UHMW 1000 on conveyor system, it is can assure your production will run smoothly and clean.



Fig. 4.g. Conveyor Roller

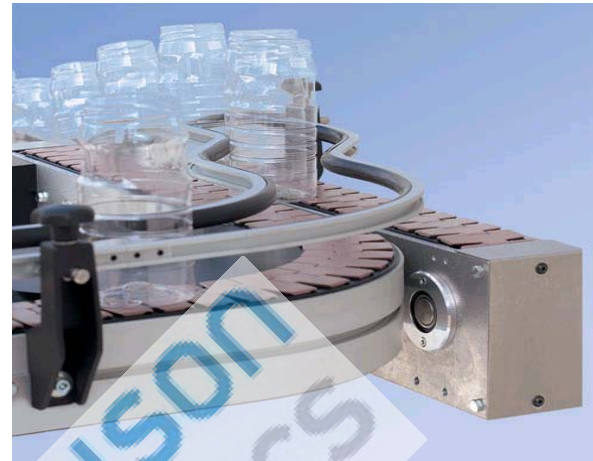


Fig. 4.h. Bottles Conveyor Pad



Fig. 4.i. Conveyor Chain Guides



Fig. 4.j. Starter Motor Assembly Conveyor



Fig. 4.d. Sliding Panels for Pier Protection

PE-UHMW 1000 as sliding panels for pier protection is replacing metal that easy corrosive and build damage on ship, or replacing wood that easy to wear and broken.

PE-UHMW 1000 overcome metal as sliding panels for pier protection due its good impact absorbing, and low wear rate.

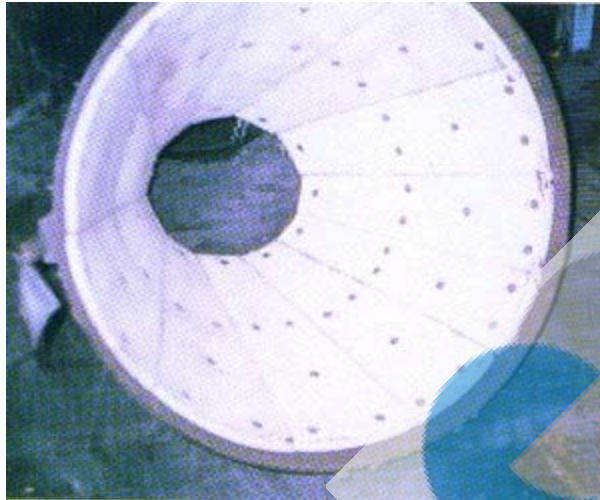


Fig.4. Coal hopper for power plant

Coal hopper need to be lining with PE-UHMW liner to prevent bulk material flow problem.

Inlet diameter : 5400 mm

Outlet diameter: 700 mm

Height: 7500 mm

Need PE-UHMW sheet with thickness 12 mm,
dimension: 3000 mm x 1000 mm (32 sheet).

PE-UHMW 1000

Price: Rp. 225.000,-/kg **

Density: 0.92 g/cm³

Weight : 33.12 kg/sheet

Total Price = 32 x 33.12 x Rp. 225.000,-
= Rp. 238.464.000,-

Estimated usage time (wear): 35 years *

*Source: Dotmar, " Matrox High Performance Polymer Lining "

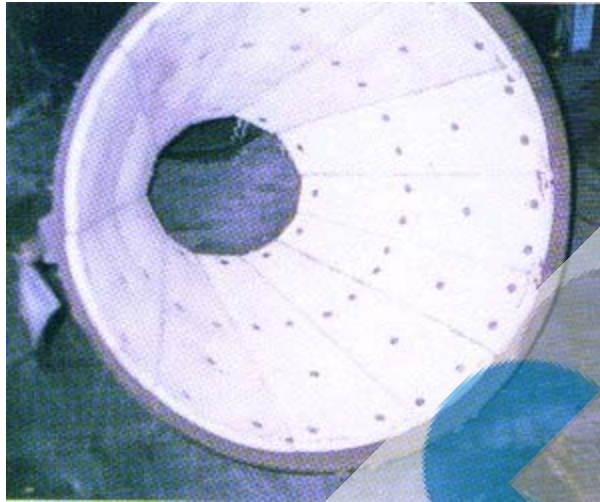


Fig.4. Coal hopper for power plant

PE-HMW 500

Price: Rp. 125.000,-/kg **

Density: 0.95 g/cm³

Weight : 34.2 kg/sheet

Total Price = 32 x 34.2 x Rp. 125.000,-
= Rp. 136.800.000,-

Estimated usage time (wear): 8 years (1/4 of PE-UHMW 1000).

CONCLUSION:

PE-UHMW 1000 is more expensive than PE-HMW 500, but the usage time is 4 times than PE-HMW 500. This means, PE-UHMW 1000 more profitable than PE-HMW 500.

**Price is not prior subject , just illustration.



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