



MOLYKOTE®

FROM DOW CORNING



Molykote[®] D-96-NTP Anti-Friction Coating (NMP-free version)

durability test on anti-noise test machine

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Objective of the evaluations

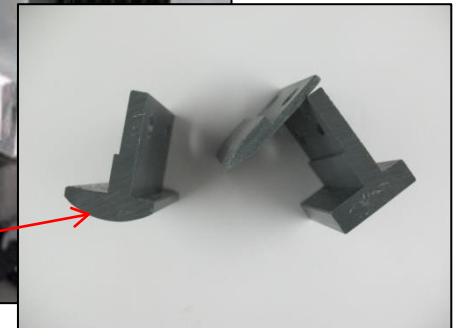
- To verify and validate the long term/service life performance of Molykote® D-96-NTP (NMP-free version) in anti-noise and constancy of coefficient of friction
- For this purpose the AKE noise tester was selected:
 - This tester can measure:
 - the occurrence of variation of the acceleration that originates stick-slip (= noise)
 - the static and dynamic coefficient of frictions (COF):
 - static: during one measuring cycle the highest COF value is detected and considered as the static COF
 - dynamic: is the mean value of all COFs measured in one measuring cycle
- The AKE tester available in Dow Corning is equipped with a new software able of operating durability tests (= 100000 cycles continuous test)
- As service-life test a 100000 cycles long tests was selected

DC anti-noise tester - overview

Specimen holder with strain gages for friction force and load measurement and with acceleration detector for stick-slip measurement

Sliding guide

Selected specimen holder



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Testing parameters

- Material pairing: PC-ABS thermoplastic against PVC-foam foil was selected as a particularly critical pairing in anti-noise (see slide on reference, without Anti-Friction Coating)
 - Molykote® D-96-NTP was applied on the PVC-foam foil and then the foil bonded to the curved holder; the PC-ABS plate was fixed on the linear guide
- Load = 20 N
- Speed (of linear guide) = 2 mm/s
- Stroke = + / - 2.5 mm
- Temperature = room temperature; rel.humidity = 40/60 %
- Test length = 100000 cycles
 - At the given speed the time to run 5000 cycles is almost one shift (8 h per one working day)
 - At the end of each working day the tester was stopped without disassembling the components (not running during night); the test started again on the next working day
 - One measuring cycle takes place every 100 operating cycles (in a measuring cycle acceleration variation and friction forces are measured)

Anti-noise tester results – reference: no AFC

Materialpairing = PC-ABS black panel vs PVC foam foil black		linear guide = PC-ABS black panel round specimen = PVC foam foil black			
Linear guide material	Specimen material				
no AFC	no AFC				
linear guide speed	2 [mm/s]				
linear guide stroke	+ / - 2.5 [mm]	load [N]			
temperature	24 [°C]	10	15	20	30
realtive humidity	67 [%]	run 1	run 1	run 1	run 1
	BI	4.0	4.0	4.0	4.0
	RPZ-value	10	10	10	10
	static COF	1.74	1.51	1.33	1.17
	dynamic COF	1.20	1.07	0.97	0.83
	max. acceleration value [g]	5.7	5.1	6.2	4.1
	impulse frequency [1/mm]	28.4	24.9	18.2	12.8
	number of impulses	274	214	168	118

Anti-noise tester results – Molykote® D-96-NTP

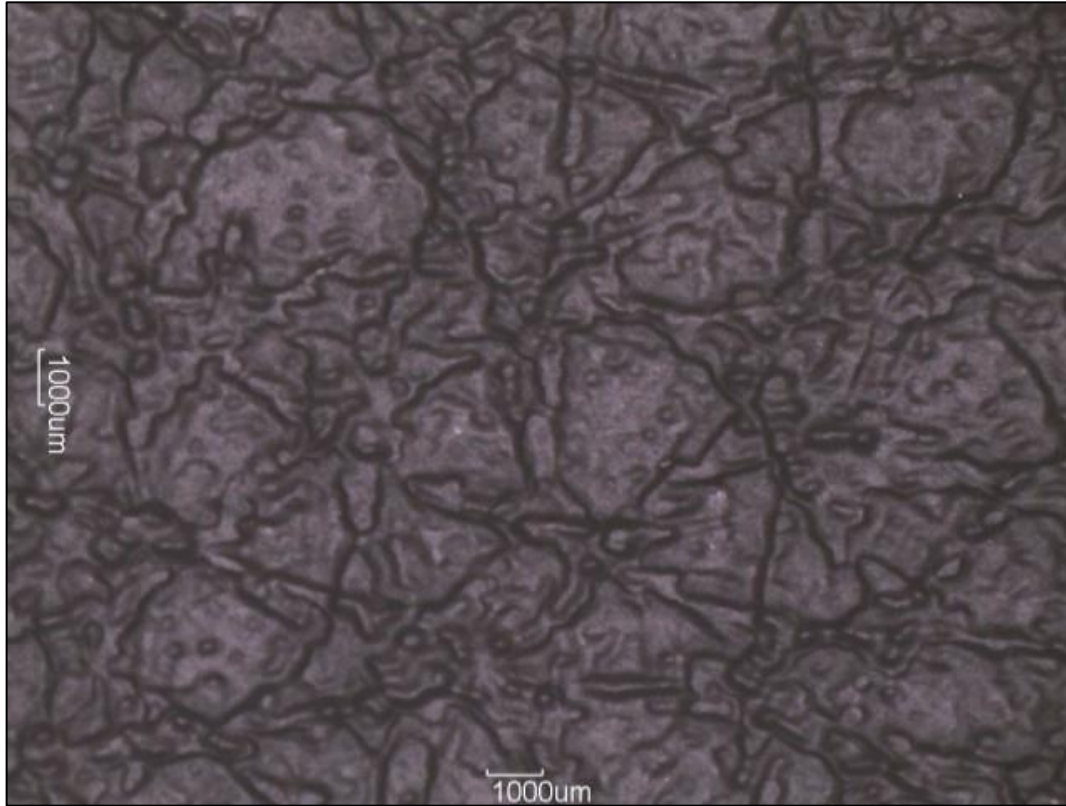
100000 cycles durability test

Materialpairing = PC-ABS black panel vs PVC-foam foil				linear guide = PC-ABS black panel									
				round specimen = PVC-foam foil black									
Linear guide material	Specimen material												
no AFC	Molykote® D-96-NTP	[batch # 6615635]		film thickness = 8/10 µm (mean value)									
linear guide speed	2 [mm/s]												
linear guide stroke	+ / - 2.5 [mm]	load = 20 [N]											
temperature	23/24.2 [°C]												
realtive humidity	40.5/57.6 [%]												
	cycles range (from - to)	0 - 10000	10000 - 20000	20000 / 30000	30000 / 40000	40000 / 50000	50000 / 60000	60000 / 70000	70000 / 80000	80000 / 90000	90000 / 100000		
	date	5-sep-11 / 7-sep11	8-sep-11 / 9-sep-11	12-sep-11 / 14-sep-11	15-sep-11 / 16-sep-11	19-sep-11 / 20-sep-11	27-sep-11 / 28-sep-11	29-sep-11 / 30-sep-11	4-oct-11 / 6-oct-11	7-oct-11 & 17-oct-11	18-oct-11 / 19-oct-11		
	BI	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5		
	RPZ-value	1	1	1	1	1	1	1	1	1	1		
	static COF	0.29	0.28	0.19	0.19	0.19	0.25	0.24	0.24	0.24	0.24		
	dynamic COF	0.13	0.12	0.10	0.10	0.11	0.12	0.11	0.12	0.11	0.12		
	max. acceleration value [g]	0.36	0.42	0.20	0.16	0.22	0.13	0.11	0.16	0.12	0.13		
	impulse frequency [1/mm]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	number of impulses	0	0	0	0	0	0	0	0	0	0		

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PVC-foam foil – non coated

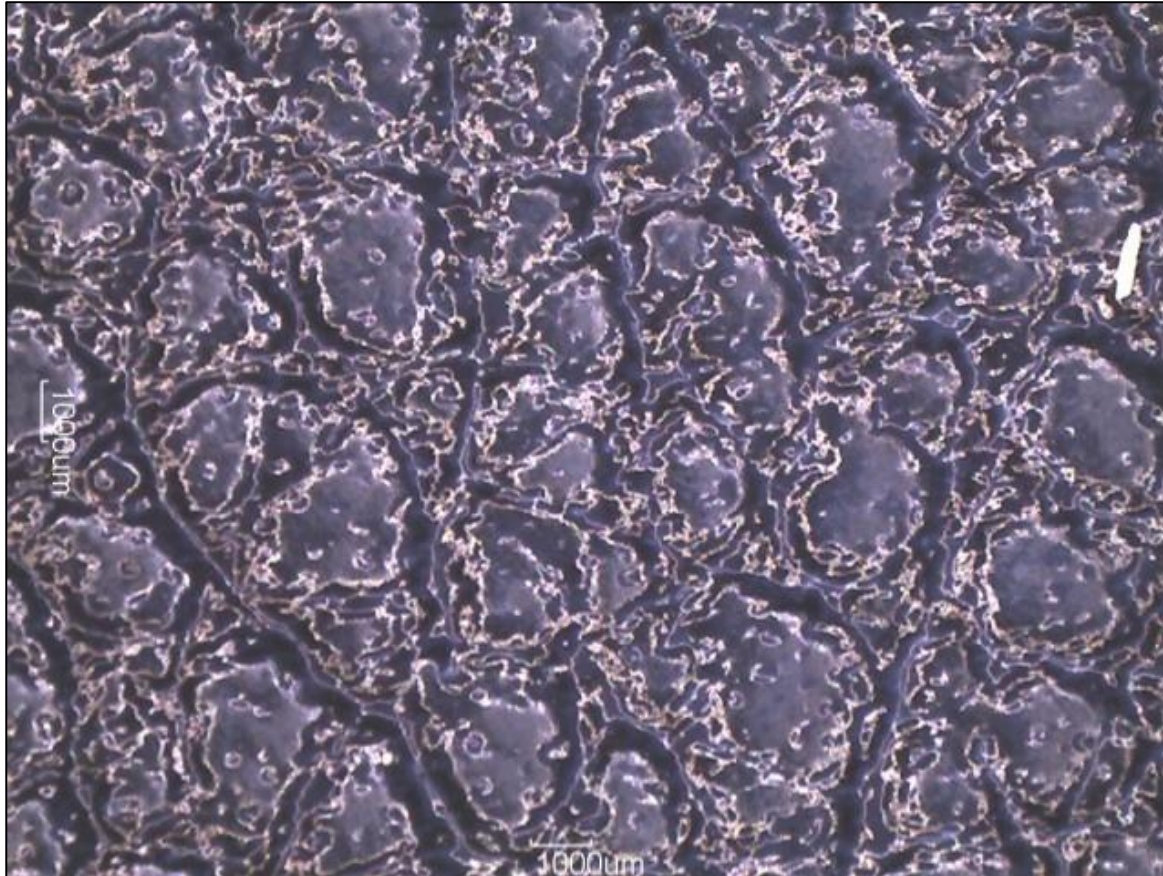


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PVC-foam foil – coated with Molykote® D-96-NTP

Before durability test

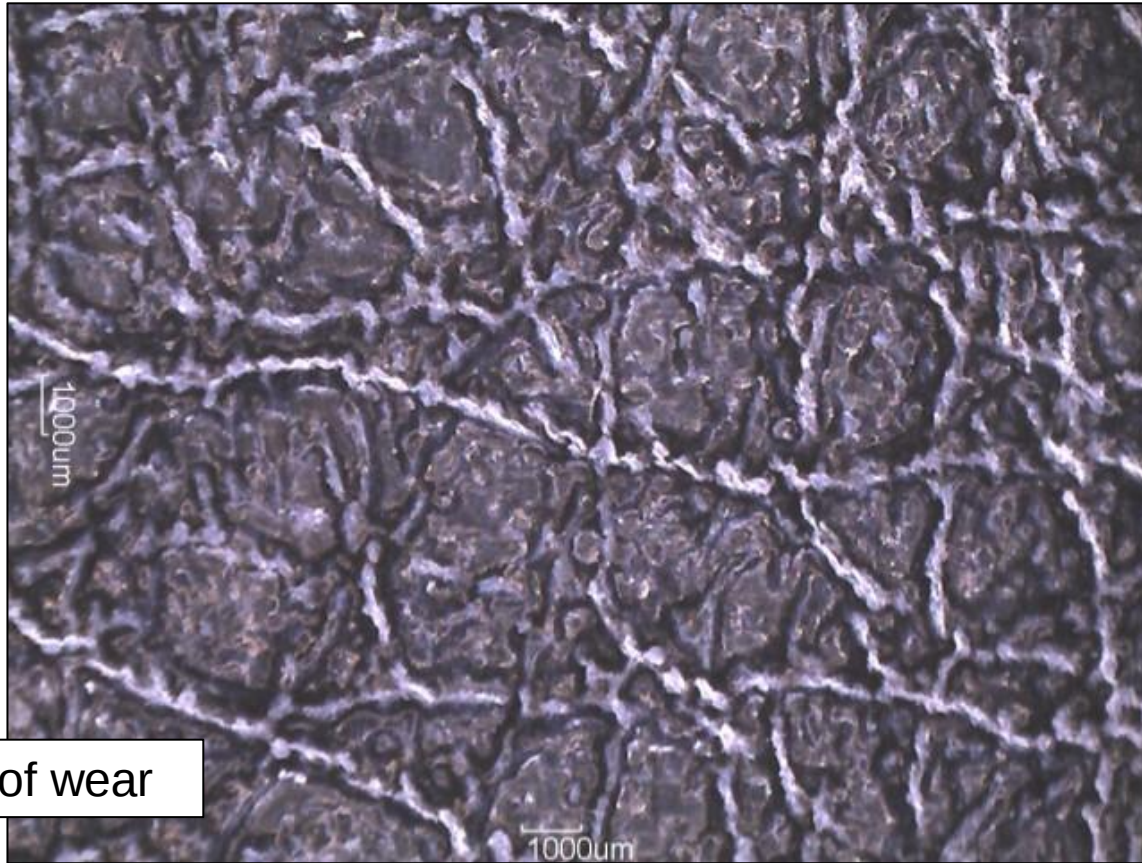


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PVC-foam foil – coated with Molykote® D-96-NTP

After 100000 cycles durability test



No signs of wear

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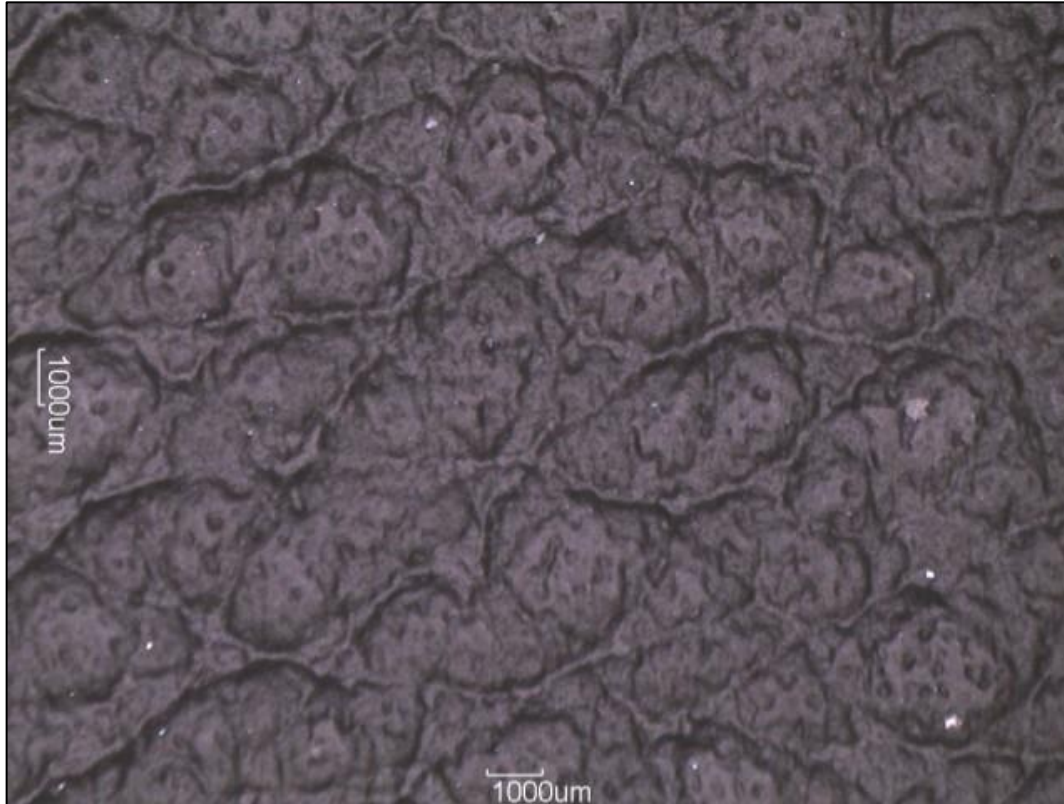
Anti-noise tester results – competitive product based on wax as solid lubricant

Materialpairing = PC-ABS black panel vs PVC-foam foil		linear guide = PC-ABS black panel	
		round specimen = PVC-foam foil black	
Linear guide material	Specimen material		
no AFC	competitive product B	film thickness = 6 µm (mean value)	
linear guide speed	2 [mm/s]		
linear guide stroke	+ / - 2.5 [mm]	load = 20 [N]	
temperature	23.7 [°C]		
relative humidity	44.4 [%]		
cycles range (from - to)		0 - 250	
date		21-sep-11	
BI		4.0	
RPZ-value		10	
static COF		0.67	
dynamic COF		0.49	
max. acceleration value [g]		2.36	
impulse frequency [1/mm]		10.03	
number of impulses		92	

**After only 250
cycles
durability test**

PVC-foam foil – coated with competitive product

Before durability test

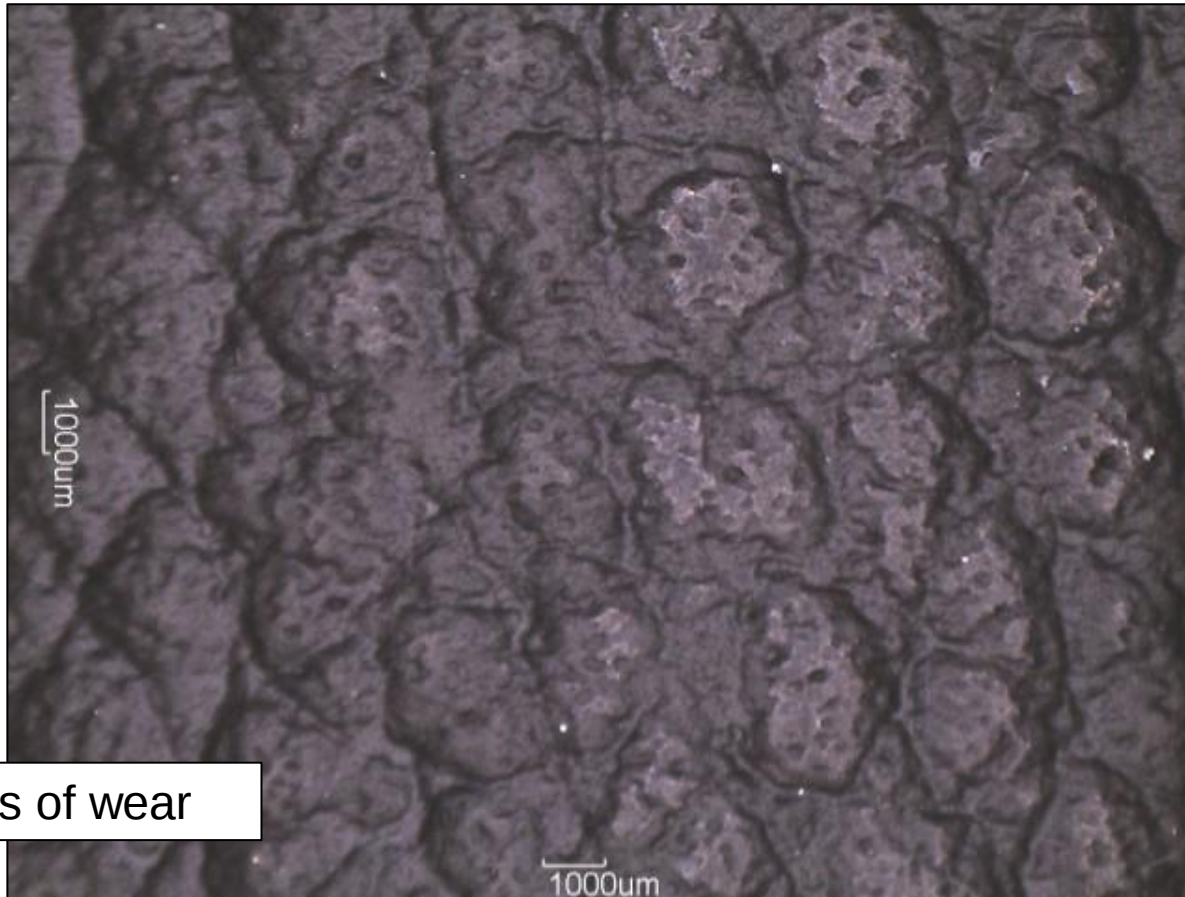


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PVC-foam foil – coated with competitive product

After only 250 cycles durability test



Signs of wear

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Summary of the investigations

- Molykote® D-96-NTP (NMP-free version) can withstand a durability test of 100000 continuous cycles on anti noise tester of company AKE in:
 - Anti-noise performance
 - Reduced and constant static and dynamic coefficient of friction
 - Resistance to sliding wear
- Other competitive coating available on the market based on waxes as solid lubricant can not show the same performance

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