



## ESTERS FOR METAL WORKING FLUIDS

### DESCRIPTION

NYCO offers a wide range of speciality esters for the formulation of performance lubricants. These polar base fluids show high surface activity, making them excellent components of metalworking fluids to improve wettability and boost film strength and EP properties.

NYCO's range of esters for metalworking formulations includes mono and diesters, neopolyol esters, water soluble esters, as well as complex esters, of particular interest in severe operations.

Complex esters show some degree of polymerization, imparting outstanding surface activity, lubricating film thickness and EP boosting effect. They are particularly suitable for forming operation fluids.

### NEAT CUTTING OILS

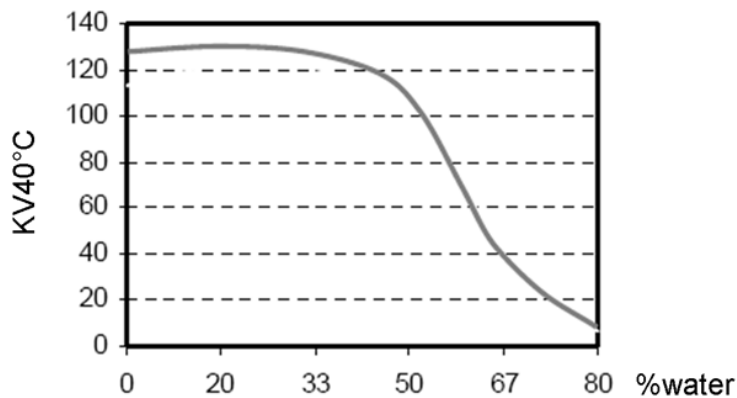
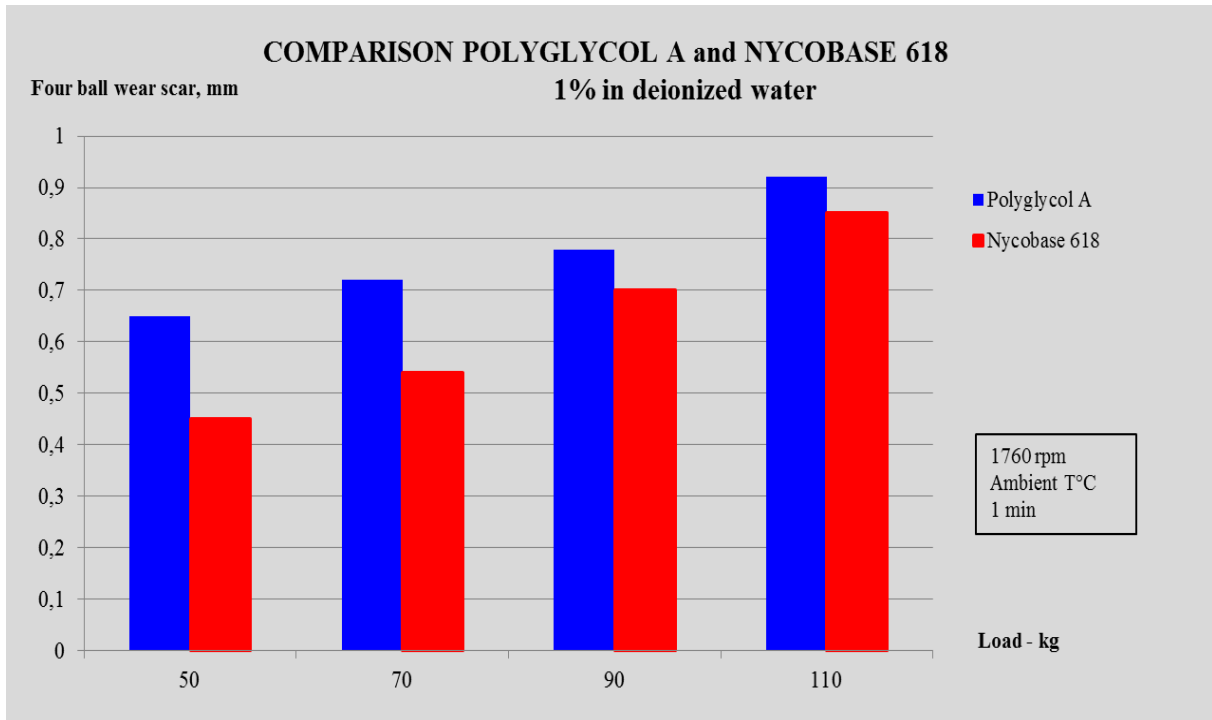
REFERENCE	APPLICATION: REPLACEMENT OF MINERAL OILS, LUBRICITY AND WETTING IMPROVERS
Nycobase 8210 Nycobase ADE	Low viscosity esters (KV40 ~ 8 cSt) with higher flash and fire points than equal viscosity mineral oils. Very good oxidation resistance.
Nycobase ADD Nycobase SEH Nycobase 7300	Low viscosity esters (KV40 ~ 12 cSt) with higher flash and fire points than equal viscosity mineral oils. Very good oxidation resistance.
Nycobase 8311 Nycobase 7450	Medium viscosity esters (KV40 ~ 20 cSt). Saturated Neopolyol esters based on medium to short carbon chains. Resistant to oxidation and good wetting properties on metal surfaces. Can be used to improve additive performance and solubility in low polarity base oils (Group III and PAOs). Good biodegradability.
Nycobase 4045 Nycobase 8851	High viscosity complex esters with enhanced lubricity and dispersion properties; can be mixed with a mono ester to improve wetting effect.

### APPLICATIONS : SYNTHETIC FLUIDS

REFERENCE	APPLICATION: ALTERNATIVE TO PAGs IN SYNTHETIC FLUIDS, IMPROVED LUBRICITY
Nycobase 618	Water soluble complex ester - Good compatibility with hard water and enhanced anti-wear behaviour thanks to long carbon chain structure.



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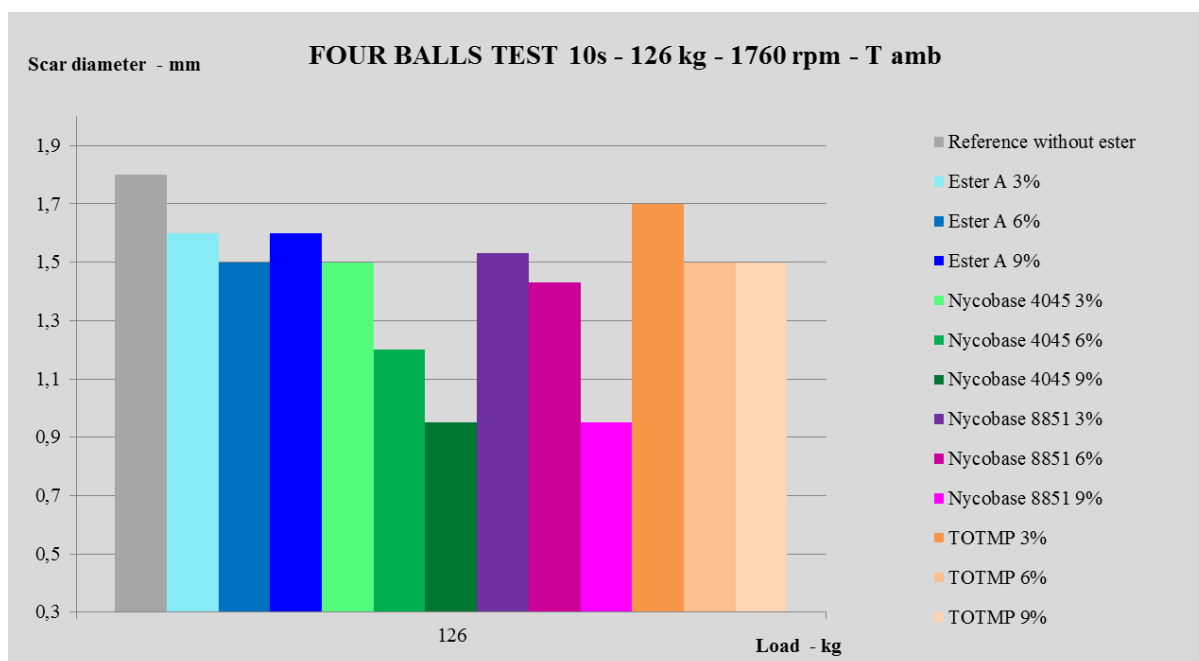
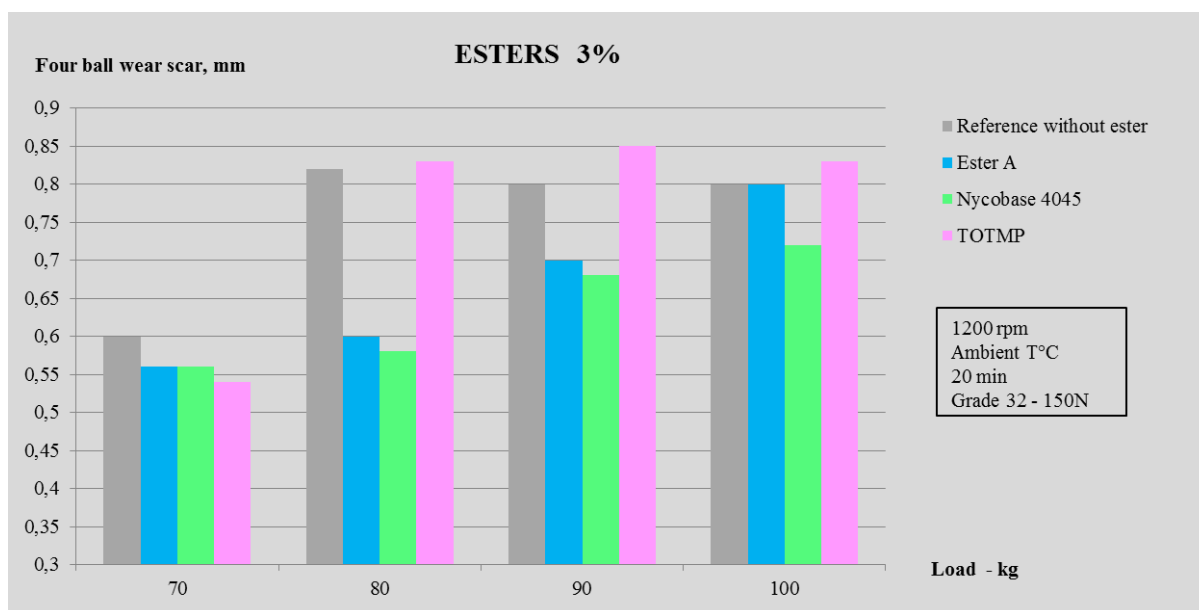


Nycobase 618 is soluble in all proportions in soft and hard water.



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The below graphs show comparisons between boosting effect of TMPTO, polymeric ester A, and Nycobase 4045 or 8851 complex esters, in a fully formulated neat oil.





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### APPLICATIONS: SEMI SYNTHETIC FLUIDS AND EMULSIONS

REFERENCE	APPLICATION: LUBRICITY AND ANTIWEAR ADDITIVES IN MICRO AND MACRO EMULSIONS
Nycobase ADT Nycobase ADD Nycobase SEH	Easily emulsifiable diesters in replacement of mineral oils; enhanced hydrolytic stability and some foam limiting properties thanks to the branched structure.
Nycobase 8311 Nycobase 7300	Saturated esters as a substitute for sunflower and rapeseed oil or TMP trioleate with better oxidation resistance.
Nycobase 4045 Nycobase 8851	High viscosity complex esters with enhanced lubricity and dispersion properties; can be mixed with a mono ester to improve wetting effect.

### APPLICATIONS: FORMING

REFERENCE	APPLICATION: IMPROVEMENT OF SURFACE ASPECT IN DEFORMATION AND FINE BLANKING OPERATIONS
Nycobase 3608	High molecular weight di-ester with good wetting and lubricity properties (KV100 ~ 100 cSt)
Nycobase 4045	Complex ester with good compatibility with mineral oils (KV40 ~ 400 cSt)
Nycobase 8851	Same as NB 4045 with higher degree of saturation when low iodine value is critical (KV40 ~ 500 cSt)
Nycobase 8898	Same as NB 8851 with higher viscosity (KV40 ~ 1200 cSt)
Nycobase 6001	Same as NB 4045 with a very high viscosity (KV40 ~ 10 000 cSt)

### MAIN FEATURES OF NYCO ESTERS FOR METALWORKING APPLICATIONS

ESTER	WETTING	DETERGENCY	EP-AW BOOST	MECHANICAL RESISTANCE	FILM THICKNESS	SOLVENCY
Nycobase 618	XX	X		X		XX
Nycobase 8110	XXX	XX				XX
Nycobase 8210	XXX	XX				XX
Nycobase ADT- ADD	XX	X		X		X
Nycobase SEH - ADE	XX	X		X		XX
Nycobase 7300	XX	X		X		XX
Nycobase 7450	X			XX	XX	X
Nycobase 8311	X			XX	XX	X
Nycobase 4045 - 8851			XXX	XXX	XXX	
Nycobase 8898 - 6001			XX	XXX	XXX	



## ESTERS FOR METAL WORKING FLUIDS

### SELECTION GUIDELINES

ESTER	NET CUTTING	NEAT DEFORMATION	EMULSIONS	SYNTHETICS	VANISHING OILS	PRELUBES	MQL
Nycobase 618			X	XXX			
Nycobase 8110	X	X	X		X	X	X
Nycobase 8210	X	X	X		X	X	X
Nycobase ADT - ADD	XX		XX				
Nycobase SEH - ADE	XX	X	XX		X	X	X
Nycobase 7300	XX	X	XX		X		
Nycobase 7450	XX	X			X		
Nycobase 8311	XXX	XX	XX		XX	XX	XXX
Nycobase 4045 - 8851	XX	XXX	XX		XX	XX	XXX
Nycobase 8898 - 6001	XX	XXX			XX	XX	X

TYPICAL %	NET CUTTING	NEAT DEFORMATION	WATER SOLUBLE	SYNTHETICS	VANISHING OILS	PRELUBES	MQL
Typical ester % depending on performance level	2 - 10	10 - 50	5 - 70	0 - 20	2 - 25	2 - 10	100

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### SELECTION GUIDELINES

ESTERS	TYPE (**)	NEAT CUTTING	DEFORMATION	WATER BASED SYNTHETICS	EMULSIONS MICRO EMULSIONS	PROPERTIES	KV 40	VI	DENSITY	POUR POINT	FLASH POINT	HYDROXYL NUMBER	SAPONIFICATION INDEX	TOTAL ACID NUMBER
						Test method	ISO 3104	ISO 2909	ISO 12185	ISO 3016	ISO 2592	ASTM E222B	ISO 6293	ISO 6618
						UNIT	mm <sup>2</sup> /s	-	kg/dm <sup>3</sup>	°C	°C	mg KOH/g	mg KOH/g	mg KOH/g
REFERENCE	MAIN APPLICATIONS					TYPICAL RESULTS								
Nycobase 618	SE			xxx			139	170	1.1	0	263	214		0.61
Nycobase 8110	MOE	x	x		x		3.2	-	0.86	-69	151	0.5	210	0.02
Nycobase ADE	DIE	xxx			x		7.7	125	0.92	< -60	200	0.8	300	0.02
Nycobase 8210	NPE	xxx			x		8.3	144	0.91	-40	206	0	300	0.02
Nycobase SEH	DIE	xxx			x		11.6	155	0.91	< -60	224	0.5	260	0.03
Nycobase ADD	DIE	xxx			x		13.7	148	0.92	< -60	220	0.7	270	0.02
Nycobase 7300	NPE	xxx			x		14	128	0.96	-66	233	1.6	360	0.01
Nycobase 7450	NPE	xxx			x		20.2	128	0.99	-57	248	1.3	428	0.01
Nycobase 8311	NPE	xxx	x		x		22.6	149	0.94	-38	267	1.2	291	0.02
Nycobase ADT	DIE	xxx			x		26.6	136	0.91	-54	234	3	220	0.02
Nycobase 3608	DIE	xx	xxx		x		100	138	0.91	-47	300	0	140	0.04
Nycobase 8851*	CXE	x	xxx		x		510	160	0.95	-33	280	9	278	0.05
Nycobase 4045*	CXE	x	xxx		x		424	155	0.95	-33	257	9	270	0.03
Nycobase 8898*	CXE	x	xxx				1200	177	0.95	-24	280	12.9	295	0.02
Nycobase 6001*	CXE	x	xx				10000	243	0.95	-9	286	12	224	0.05

(\*) May appear hazy at low temperature; solubility can be improved by mixing with a low viscosity ester.

(\*\*) MOE: Mono-ester, DIE: Di-ester, NPE: Neopolyol ester, CXE: Complex ester, SE: Special ester