



**NYCO**

## **FOOD GRADE ESTERS**





# Background

Whenever food products are processed and packaged, the food industry cannot afford the risk of contamination of any kind.

With increasing pressures to ensure the latest regulations and production guidelines are met, it is important that the food industry has reliable supply partners to provide the “know how” and expertise in lubrication.

## H1 registration

H1 is recognised as the international standard for the measurement of a lubricant suitability for incidental food contact.

## HX-1

HX-1 is the standard for ingredient used in the formulation of H1 lubricant



## Why HX-1 esters?

The majority of lubricants meeting H1 requirement are either White Oil or PAO based.

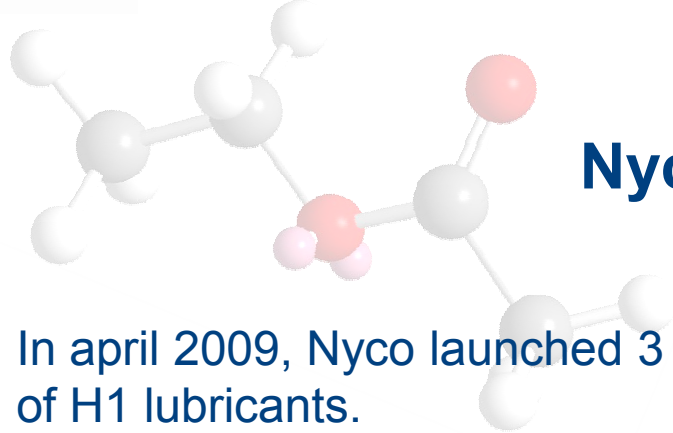
There are some limitations in performance and a gap versus market requirement.

The request for high performance products based on esters and H1 registered is growing.

Nycobond has worked intensively to propose new esters to the lubricants industry and is developing finished lubricants for specific applications (chain oils)



# Nycobase Food Grade Esters



## Nycobase FG series



In april 2009, Nycobase launched 3 esters, HX-1 registered suitable for the formulation of H1 lubricants.

Today 3 esters are available and can be used for the following applications:

- Hydraulic fluids
- Gear oils
- Chain Oils
- Greases

The current offer is also biodegradable and can be used in lubricants meeting European Eco-label requirements.





# Nycobase FG series

Characteristic	Unit	Result			Test method
		NB 30401 FG	NB 30502 FG	NB 43203 FG	
Designation		NB 30401 FG	NB 30502 FG	NB 43203 FG	
- NSF registration number (HX-1)		141593	141591	141592	
- Colour Gardner	-	< 1	< 1	5	ISO 4630
- Density at 20°C	kg/dm <sup>3</sup>	0.943	0.938	1.015	ISO 12185
- Flash point COC	°C	250	270	270	ISO 2592
- Pour point	°C	- 51	- 39	- 27	ISO 3016
- Acid number	mg KOH/g	0.05	0.05	0.10	ISO 6618
- Kinematic viscosity at					
100°C		4.4	4.9	33.2	
40°C		20	23	330	
- 18°C	mm <sup>2</sup> /s	470	560	47500	ISO 3104
- Viscosity Index	-	136	148	142	ISO 2909
- Noack volatility					
1 hour at 250°C - mass fraction	%	4.5	3.2	5	DIN 51581
- Iodine number	g I <sub>2</sub> /100 g	< 1	2	1	ISO 3961
- Water content	mg/kg	200	200	200	NYCO MO-10-001
- Biodegradability	%	79	66	67	OECD 301B
- Renewable carbon content	%	80	80	55	calculation



## Nycobase FG series



Blend of Nycobase 30401 FG and Nycobase 43203 FG permit to have low pour point base stocks ISO VG 22 to ISO VG 320.

Blend of Nycobase 30502 FG and Nycobase 43203 FG permit to have base stocks ISO VG 22 to ISO VG 320 with good evaporation, high flash point and good lubricating properties.

Mixed with additives registered NSF HX-1, Nycobase food grade series permit to obtain lubricants for food incidental contacts categories H1 (you have to submit your formulation to NSF agreement)

HX-1 registered products in NSF White Book are available on NSF website ([www.nsfwhitebook.org](http://www.nsfwhitebook.org))





# Nycobase FG series

## Formulation guideline

Characteristic	Nycobase 30401 FG	Nycobase 30502 FG	Nycobase 43203 FG	D 20°C	KV 100°C	KV 40°C	FP	PP	Bio	RRMC
Unit	%	%	%	kg/dm <sup>3</sup>	mm <sup>2</sup> /s	mm <sup>2</sup> /s	°C	°C	%	%
ISO VG 22 Std	--	100	--	0.938	4.9	22.6	270	-36	66	82
ISO VG 22 LT	100	--	--	0.943	4.4	19.6	257	-51	79	81
ISO VG 32 Std	--	82	18	0,938	6,8	34	270	-39	> 65	77
ISO VG 32 LT	80	--	20	0,956	6,4	32	260	-54	> 65	76
ISO VG 46 Std	--	70	30	0,960	8,5	46	270	-42	> 65	74
ISO VG 46 LT	65	--	35	0,966	8,4	46	265	-54	> 65	72
ISO VG 68 Std	--	55	45	0,971	11,2	68	270	-48	> 65	69
ISO VG 100 Std	--	40	60	0,982	14,7	100	270	-45	> 65	66
ISO VG 150 Std	--	25	75	0,994	19,7	150	270	-39	> 65	62
ISO VG 220 Std	--	12	88	1,004	25,3	220	270	-36	> 65	58
ISO VG 320 Std	--	--	100	1.015	32.2	316	270	-27	67	55

LT = low temperature

RRMC = renewable raw materials content



## Nycobase FG series

The use of Nycobase 43203 FG with HX1 anti oxidant additives leads to a suitable high temperature chain oils formulation for 200-200°C temperature range

Preliminary laboratory work have been done using standard coking test and dish test to evaluate high temperature properties





# Nycobase FG – HT Chain oils

## • Test 1 : Coking - Method: CEC-L-027-A-06

- Description: A drop of oil placed on an inclined AG5 aluminium plate is heated between a cold point and a hot point for a specified duration
- Equipment:





## Nycobase FG – HT Chain oils

- Coking (continued)

- **Conditions:**

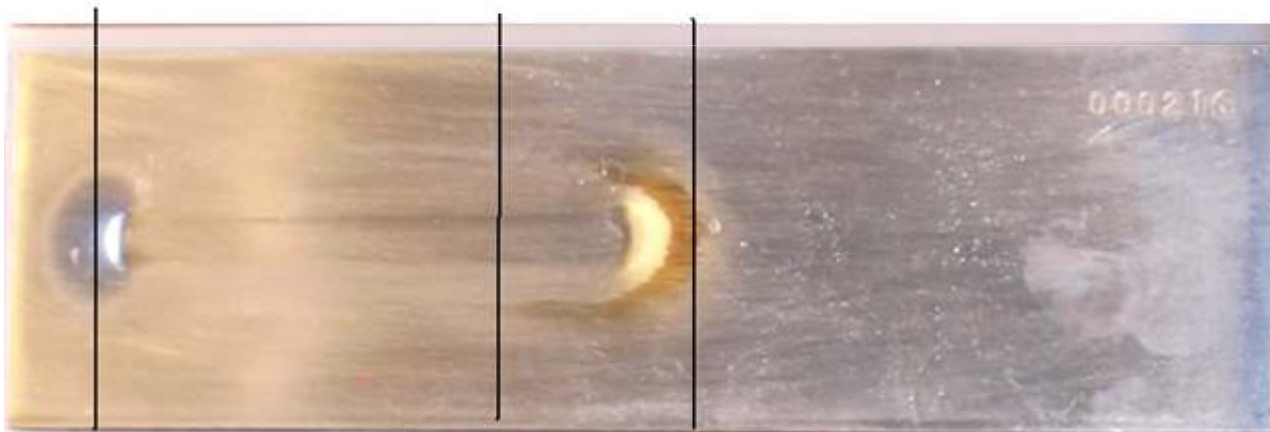
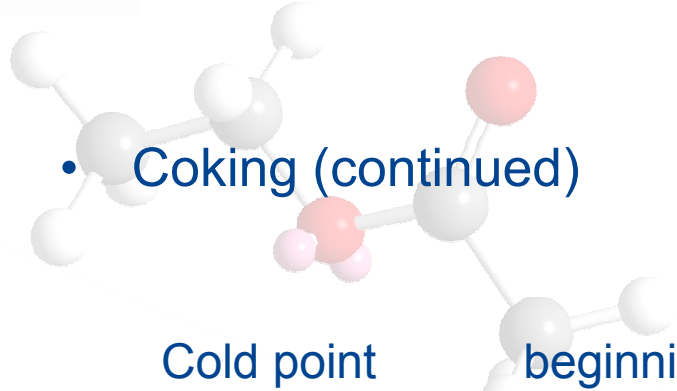
- Oil quantity: 0.6 cm<sup>3</sup>
- Plate inclination: 1° to the hot point
- Cold point temperature: variable
- Hot point temperature: variable
- Duration: 90 minutes

- **Measurements:**

- Deposit temperature appearance
- Deposit type (gum. varnish. coke. etc.)
- Merit: merit A (hot area). merit B (cold area). average of merit. Merit (0 to 10) is calculated with a scale and a colour chart.



# Nycobase FG – HT Chain oils





## Nycobase FG – HT Chain oils

- **Test 2 : Evaporation and residue on dish:**

- **Method:** An oil quantity is weighted on an aluminium dish and placed in a ventilated oven.
- **Conditions:**
  - Dish diameter: 7 cm
  - Oil quantity: 10 g
  - Temperature: variable
- **Measurement:**
  - Duration to the starting polymerization.
  - Evaporation.
  - Deposit appearance.





# Nycobase FG series – HT Chain oils

## Coking test

- Temperature gradient 200°C – 250°C:
- Temperature gradient 250°C – 300°C:

	NB 43203 FG+ HX-1 AO
Viscosity at 40°C	320
Deposit apparition temperature °C	246
Merit	9.78
Deposit	Varnish

	NB 43203 FG+ HX-1 AO
Viscosity at 40°C	320
Deposit apparition temperature °C	<250
Merit	5
Deposit	Gum

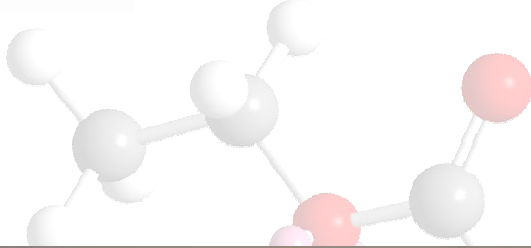
## Evaporation dish test (200°C)

Polymerisation starts after 500 h and leaves 65% deposit

**Results are comparable to standard results obtained with high temperature chains oils (not H1) based on neopolyol esters → Possible use in the 200°C-250°C temperature range**



# Nycobase FG series – HT Chain oils



**Nyco experimental**



**Mix Trimellitate/Neopolyol ester  
Competitor product**