

PROCESSING OILS

FOR TYRE MANUFACTURERS



PARAMO

MES 15 PRODUCT DESCRIPTION

The process oil named MES 15 is an oil designed as a softener for the production of SBR rubbers and their mixtures used for modern tyres manufacture. It is a dark-green, medium viscosity oil type obtained by solvent extraction refining. By its chemical composition, this oil belongs to the group of medium aromatic softeners – toxicologically safe process oils.

The raw material for the MES oil production is vacuum distillate. The distillate contains paraffins that must be removed from the oil in order to improve its pour point value.

The dewaxing process is conducted in the solvent dewaxing unit, where by the use of methyl ethyl ketone and toluene solvents the paraffins are removed. The pour point of such oil fluctuates at about -6 °C. Another process for the improvement of oil properties is solvent refining. In this unit, polycyclic aromatic hydrocarbons are removed up to the limit required by Directive 2005/69/EC of the European Parliament. In these terms, therefore, the content of all specified PAHs must be under 10 ppm and the content of benzo(a)pyrene under 1 ppm. At the same time, this oil meets the PCA condition by the IP 346 method for the content of DMSO extract at max. 3 % wt. The solvent refining process also improves the oil viscosity index, colour and oxidation stability.

Parameter	MES 15	units
Density at 15 °C	922	kg/m ³
ISO colour	7,5	1
Refraction index at 20 °C	1,51	1
Flash point	232	°C
Pour point	-6	°C
Kinematic viscosity at 100 °C	15,4	mm ² /s
Kinematic viscosity at 40 °C	201,2	mm ² /s
Viscosity index	70,5	1
Aniline point	89,4	°C
Sulphur	1,78	% wt
Viscosity gravity constant	0,856	1
Refraction intercept	1,0505	1
PCA IP 346	2,2	% wt
Aromatic Carbon S non corr.	18	%

Parameter	MES 15	units
Naphthenic Carbon S non corr.	29	%
Paraffinic Carbon S non corr.	53	%
Aromatic Carbon S corr.	15,9	%
Naphthenic Carbon S corr.	22,8	%
Paraffinic Carbon S corr.	61,3	%
Distillation 5 % - 95 %	440-550	°C
Suma PAH 's	7,3	mg/kg
Benzo-a-pyrene	0,54	mg/kg
Clay gel analysis		
Saturates	41,7	%
Aromatics	48,1	%
Resins	10,2	%
Asphaltenes	0	%
Acid value/neutralization number	0,02	mg KOH/g

PRODUCTION OF PARAMO PROCESSING OILS

Process oils used as softeners for SBR rubbers and their mixtures used in the tyre manufacture are obtained by the solvent refining process (Fig.1). The refining process is based on extraction of polar substances into a suitable polar selective solvent. The solvent will then form a solution of more polar aromatic hydrocarbons and heterocyclic substances (extract).

Non-polar hydrocarbon types will not dissolve in this solvent and they create a raffinate. The non-polar part of the oil in the raffinate is less sensitive to the viscosity-temperature relationship (i.e. higher viscosity index) and low content of aromatically bound carbon, which is significant for lubricating oils. The polar part of the oil in the extract has a higher content of aromatically bound carbon (i.e. low viscosity index), which is suitable for process oils.

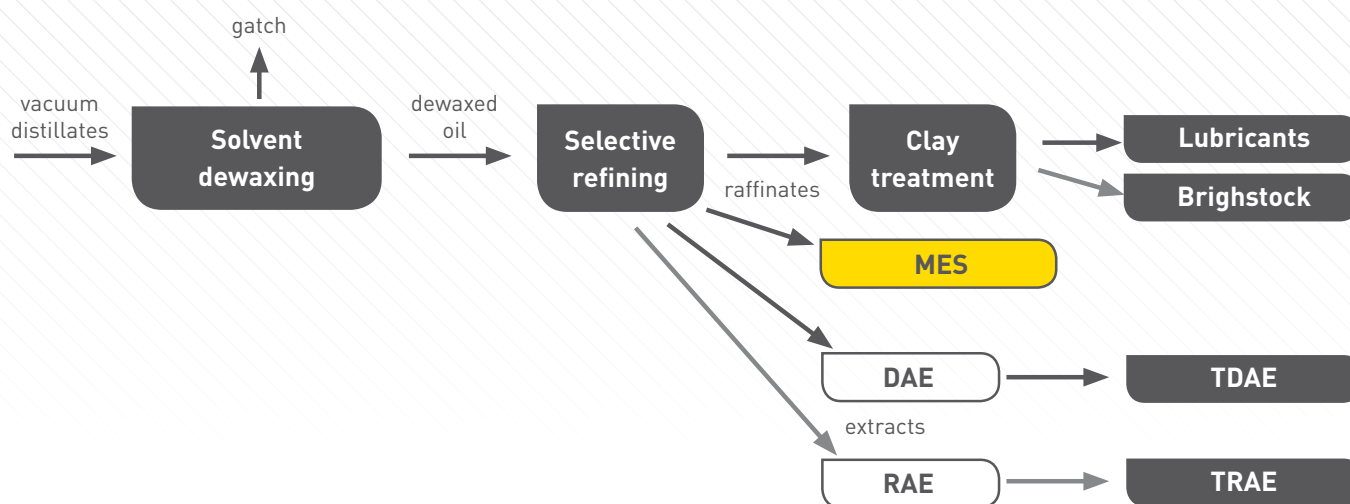


Fig. 1: Process flow diagram for the production of MES, DAE and RAE oils in PARAMO, a.s.
For technological reasons, the solvent dewaxing process is placed before the selective refining process.

In the extraction process, solvents such as phenol (cresol), furfural and, most recently, N-methylpyrrolidone, mutually differ in their respective selectivity, dissolve power, thermal stability, extraction temperature, toxicity, etc. The solvent refining process is extended with the process of solvent dewaxing, the importance of which consists in the lowering of pour point by removal of solid paraffinic hydrocarbons.

Until recently, specific requirements of the rubber and rubber mixture manufacturers for the quality and properties of process oils, namely the content of aromatically bound carbon (CA) according to the Kurtz method, viscosity, viscosity-density coefficient (VDC), were covered by a suitable combination of DAE obtained in refining of various vacuum fractions. There where RAE is used, the manufacturers also offer various options with modified physical properties, namely with reduced viscosity levels.

However, aromatic DAEs cannot be used for such modifications; instead of them oil fractions with certain aromatic properties that already passed through the refining process can be used (i.e. MES oil types). Such RAEs are marked by some manufacturers as modified (TRAЕ) or special (SRAE). A major attention of the process oil manufacturers is focused to the modification of harmful DAE oils. There are various methods and procedures of DAE modifications; however,



not all of them are efficient or technologically viable – hydrogenation, acid treatment, activated carbon or earth treatment, separation by distillation, changes of solvent refining conditions and second stage of solvent refining. During the development process in PARAMO, a. s., a major part of these processes was tested and it was confirmed that the second stage is the best viable in terms of technology. The second stage of refining can be considered both for the raffinate with the aim of obtaining in the second stage the extract from remaining aromates, but without PAHs removed in the first stage or for the extract with the aim of obtaining the second raffinate without paraffinic oils separated in the first stage. The second method is more common – it represents the DAE extract modification. However, this method requires setting of optimum conditions of the extraction selectivity, selection of suitable DAEs, selection of suitable selective solvents and method of separation of raffinate and extraction fractions. It has been shown that the DAE second extraction with cresol as a solvent and in a counter-current extraction column is not suitable for the TDAE production purposes. For these reasons, a new process of the DAE second stage refining was proposed; this process was verified in a laboratory on two models of extractors borrowed from specialised manufacturers. In these works, refining process conditions and the solvent selectivity by an addition of the so-called “counter-solvent” were gradually optimised so that DAE would separate clearly and in optimum quantities to the second raffinate in the TDAE quality and the second extract with a low utility value.

	TRIUMF (DAE)	TRIUMF RAE	TRIUMF TRAE	TRIUMF TDAE	PARAMO MES 15
Specific gravity at 15°C [g/cm ³]	960-990	960-1000	935-970	930-980	895-925
Sulphur content [wt. %]	<5	<4	<3	<3	<3
Kinematic visco at 40°C [mm ² /s]	260-580	~ 2800	500-700	180-400	150-230
Kinematic visco at 100°C [mm ² /s]	13-20	35-75	20-35	12-20	13-17
C(A) [%]	30-35	>25	18-23	20-25	11-17
PAH [mg/kg]	>10	<10	<10	<10	<10
IP 346 [hm. %]	>3	N/A	N/A	<3	<3

Table 1: Process oils of PARAMO, a. s.





WHY CHOOSE PROCESSING OILS FROM PARAMO?

we are here since 1889, our company has a very long tradition representing certainty in the world of oils

for several years we have cooperated with a world leading tyre manufacturer on the development of environment friendly rubber softeners. Only after series of long-term tyres testing and their approval, the product was added to the assortment of PARAMO

thanks to well timed introduction to the market we have become the main supplier of MES type oil in many European tyre and rubber products manufacturing companies, acquiring valuable references

for our customer we are able to prepare wide range of process oils modifications i.e. specific requirements for viscosity, carbon aromates content, colouring, we are able to load at desired temperature etc.

we are significantly modernizing the technology of selective refining and we switch to a modern type of dissolving agent

processing oils from PARAMO are time-proven and well known by world leading tyre manufacturers and other rubber products producers for more than 10 years

TECHNICAL SUPPORT

Protocols of testing mandatory characteristics in independent laboratories

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES



Environmental Division - Europe

Protokol o zkoušce

Zakázka	: PR1105091	Datum vystavení	: 16.2.2011
Zákazník	: PARAMO, a.s.	Laboratoř	: ALS Czech Republic, s.r.o.
Kontakt	: Mílos Medved	Kontakt	: Zákaznický servis
Adresa	: Přerovská cp.560 530 06 Pardubice	Adresa	: Na Hartě 336/9, Praha 9 - Vysočany, 190 00, Česká republika
E-mail	: medved@paramo.cz	E-mail	: customer.support@alsglobal.com
Telefon	: ----	Telefon	: +420 226 226 228
Fax	: ----	Fax	: +420 284 081 635
Projekt	: Analýza PAU v procesním oleji PARAMO MES 15	Stránka	: 1 z 2
Číslo objednávky	: 450088405	Datum přijetí vzorků	: 14.2.2011
Číslo předávacího protokolu	: ----	Číslo nabídky	: PR2010PARAM-CZ0002 (CZ-123-10-0161)
Místo odběru	: ----	Datum zkoušky	: 14.2.2011 - 16.2.2011
Vzorkoval	: zákazník	Úroveň řízení kvality	: Standardní QC dle ALS ČR interních postupů

Poznámky

Bez písemného souhlasu laboratoře se nesmí protokol reprodukovat (jinak, než celý).
Laboratoř prohlašuje, že výsledky zkoušek se týkají pouze vzorků, které jsou uvedeny na tomto protokolu.

Jméno oprávněné osoby

Tento dokument je elektronicky podepsán oprávněnými osobami uvedenými v příloze osvědčení o akreditaci č. 521/2008. Osvědčení o akreditaci pro zkušební laboratoř č. 1163 vydal Český institut pro akreditaci.
Jméno oprávněné osoby: Zdeněk Jiráček
Pozice: Organic Department Manager



Zkušební laboratoř
akreditovaná ČIA




ALS Czech Republic, s.r.o.
Part of the **ALS Laboratory Group**
Na Hartě 336/9, Praha 9 - Vysočany, 190 00, Česká republika
Tel. +420 226 226 228 Fax. +420 284 081 635 www.alsenviro.com
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1. The sum of eight PAH values (polyaromatic hydrocarbons) max. 10 mg/kg.

Vzorek:	Procesní olej PARAMO		
Navážka[g]:	MES 15	Finální objem extraktu [μl]:	2000
Sušina[%]:	0.1549	Nastříkovaný objem [μl]:	4
	-	Datum nástřiku [d.m.r]:	13.04.12
PAH	Obsah	Mez detekce	Mez stanovitelnosti
	[mg/kg]	[mg/kg]	[mg/kg]
Benzo(a)anthracene	0.19	0.021	0.11
Chrysene	0.75	0.023	0.11
Benzo(b)fluoranthene	0.44	0.035	0.18
Benzo(k)fluoranthene	n.d.	0.042	0.21
Benzo(j)fluoranthene	n.d.	0.053	0.26
Benzo(e)pyrene	0.68	0.079	0.40
Benzo(a)pyrene	0.34	0.042	0.21
Dibenzo(a,h)anthracene	0.24	0.031	0.15
Σ PAU (č.1907/2006) -"Lowerbound"	2.7	-	-
Σ PAU (č.1907/2006) -"Upperbound"	2.8	-	-

2. Benzo(a)pyrene content max 1 mg/kg.

This parameter was implemented into technical norm in 2006 and is guaranteed by the producer.

		Odbor vývoje a kontroly jakosti PARAMO, a.s. Přerovská 560, 530 06 Pardubice, tel: 466 810 378	
PROTOKOL O ZKOUŠCE č. 28/05/12			
<i>Označení vzorku:</i>	PARAMO MES 15		
<i>Datum dodání vzorku:</i>	5.8.2013		
<i>Datum analýzy:</i>	6.8.2013		
<i>Popis problému, požadavek na rozbor:</i>	Stanovení DMSO extraktu		
Jakostní parametry	Metoda	Rozměr	Výsledek
DMSO extrakt	IP 346	% hmotnostní	2,1

3. Protocol of PCA values determined using IP 346 DMSO extract method, max allowed value 3 %

PARAMO
a.s.
PARDUBICE
OKJ



Dne: 7.8.2013

Vypracoval: Ing. Jan Pavlík, DiS.
Vedoucí odboru vývoje a kontroly jakosti



CONTACTS

PARAMO, a.s.
Přerovská 560
530 06 Pardubice
Czech Republic

www.paramo.cz
paramo@paramo.cz
Tel.: +420 466 810 111

Contact person:

Ing. Jan Křivský
jan.krivsky@paramo.cz
Tel.: +420 466 810 188
Fax.: +420 466 810 510