Marica Briški, Marinko Oršić

ISSN 0350-350X
GOMABN 41, 3, 161-170
Stručni rad/Professional paper
UDK 621.892.1.001.53 : 621.899.001.53

ZNAČAJ ANALIZE MAZIVA

Sažetak

Poznavanje analitičkih podataka maziva je podloga na osnovi koje se donose odluke u razvoju, proizvodnji i primjeni maziva. Ispitivanja po kojima se određuju fizikalno-kemijska svojstva maziva, navedena su u specifikacijama, a provode se klasičnim metodama i raznim instrumentalnim tehnikama. Prednost instrumentalnih tehnika je u maloj količini uzorka, brzoj analizi, ali zahtijeva posebno educirano osoblje. Na temelju rezultata analize maziva iz eksploatacije može se utvrditi tzv. "trend analize", te na osnovi toga predložiti optimalan interval zamjene ulja i predvidjeti određene akcije u održavanju trošila.

UVOD

U laboratoriju se vrše ispitivanja prema planovima kvalitete proizvodnje, zahtjevima razvoja i postprodajnog servisa. U planovima i zahtjevima propisana su svojstva koja se trebaju ispitati i metode po kojima se vrše ispitivanja (1). U radu se koriste standardne metode izuzev nekoliko internih metoda za praćenje procesa.

Od tehnika prednost dajemo instrumentalnim pred klasičnim zbog poznatih prednosti: malo uzorka, kratko vrijeme izvođenja, ali ne zaboravljamo da točnost instrumentalne metode ovisi o točnosti koja se postiže klasičnom analizom (2). Usavršavanje klasične metode u isto vrijeme predstavlja usavršavanje točnosti metode. Vrše se analize: ulaznih komponenti, praćenja procesa, otpreme robe i ulja iz primjene.

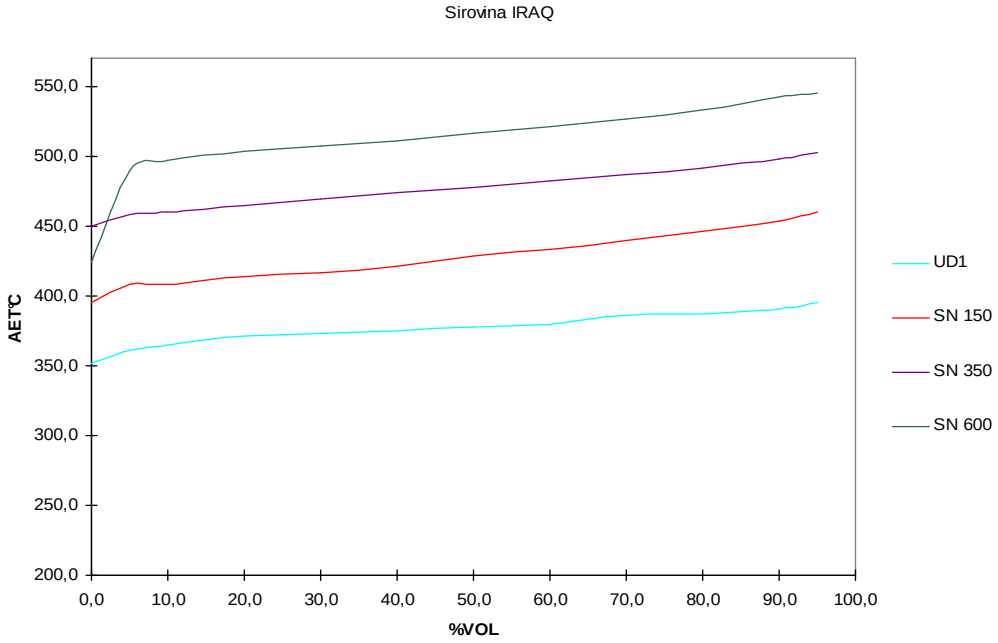
PROIZVODNJA

Bazna ulja osnova su proizvodnje a upotrebljavaju se za namješavanje mazivih ulja (3). Osnovni preduvjet za proizvodnju baznih ulja klasičnom tehnologijom je određeni tip nafte. Prethodne dvije godine prerađivali smo atmosferski ostatak od sirovine REB i Irak.

VAKUUM DESTILACIJA

Postrojenje je osobito važno jer se na njemu postižu osnovna svojstva baznih ulja i to: viskoznost, boja i isparivost. Destilati moraju imati određenu viskoznost uz usku krivulju destilacije, bez preklopa sa susjednim frakcijama. Nije moguć popravak viskoznosti, boje i isparivosti na sekundarnim postrojenjima.

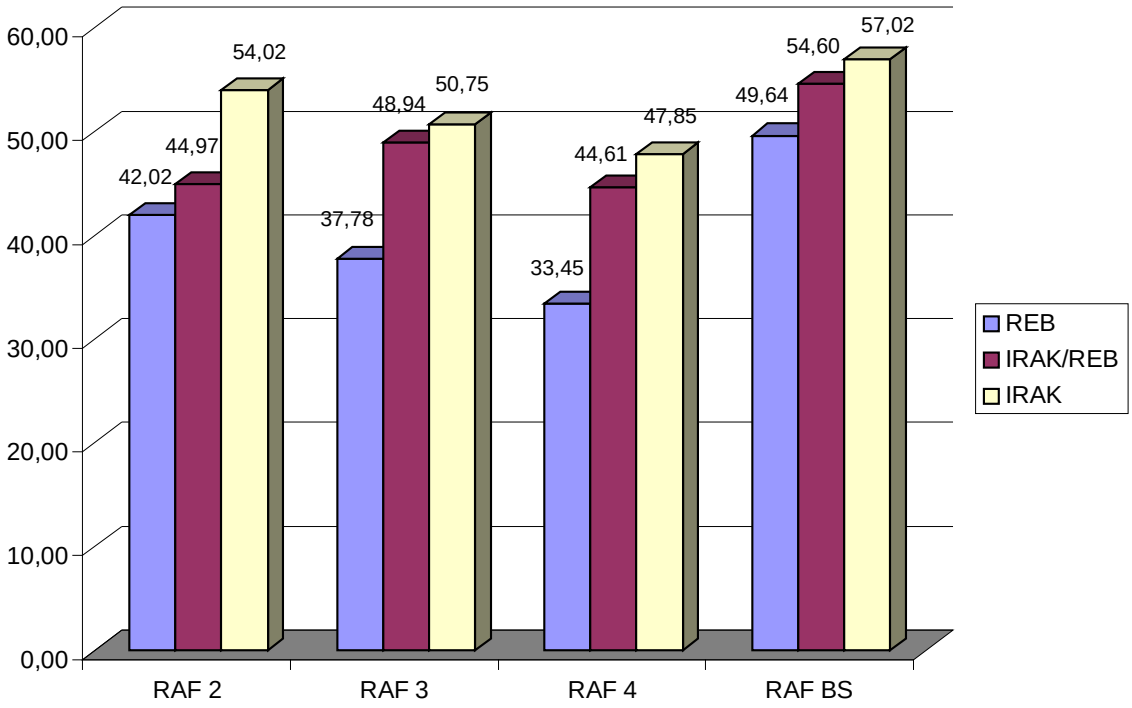
Slika 1: Krivulja destilacije baznih ulja, ASTM D 1160
Figure 1: Destillation of base oils, ASTM D 1160



EKSTRAKCIJA FURFURALOM

Na ovom se postrojenju iz destilata uklanjaju spojevi aromata koji negativno utječu na indeks viskoznosti, a sa spojevima kisika sumpora i dušika i na oksidacijsku stabilnost. Ovisno o sirovini koja se prerađuje, a da se zadovolje uvjeti norme za bazna ulja postižu se i različita iskorištenja.

Slika 2: Ovisnost iskorištenja o sirovini
Figure 2: Yield of different stocks



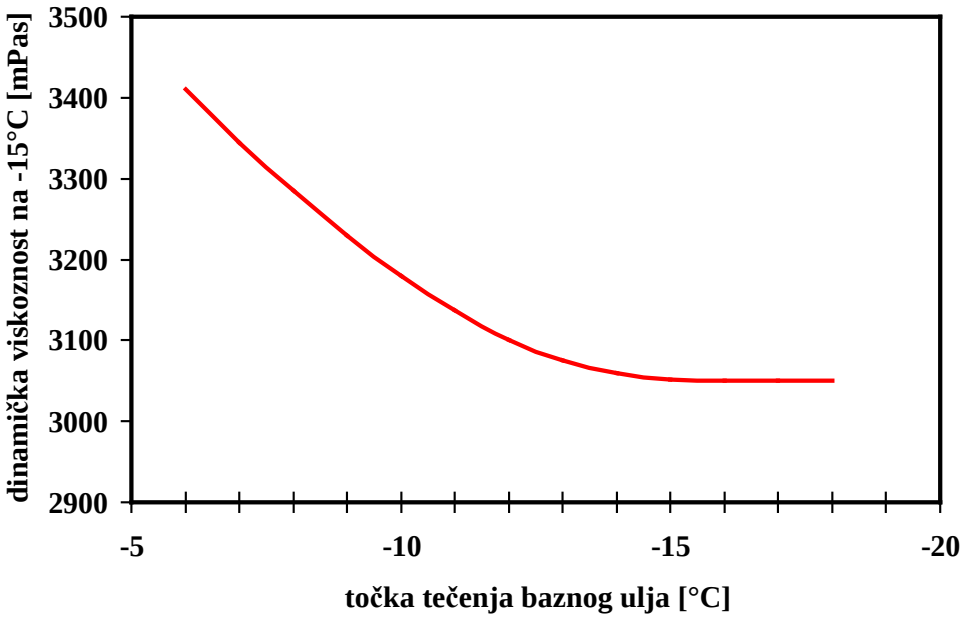
DEPARAFINACIJA

Da bi bazno ulje imalo tražena niskotemperaturna svojstva, trebaju se izdvojiti krute parafinske komponente. To se postiže solventom metil izobutil ketonom na niskim temperaturama. Bazno ulje ima tecište -9^0C do -12^0C.

DORADA VODIKOM

Provodi se radi ukljnjanja preostalih sumpornih, kisikovih i dušičnih spojeva, što dovodi do poboljšanja boje i stabilnosti baznih ulja.

Slika 3: Utjecaj tecišta na dinamičku viskoznost
Figure 3: Effect of base oil pour point on dynamic viscosity



MJEŠAONICA ULJA

U procesu poboljšanja svojstava baznog ulja s aditivima važno je znati da niti jedan aditiv bez obzira na tip i količinu ne može popraviti svojstva loše proizvedenog baznog ulja. U mješaonici ulja se prema određenim formulacijama namješavanjem baznih komponenata, DI paketa i impruvera viskoznosti dobivaju motorna ulja (4).

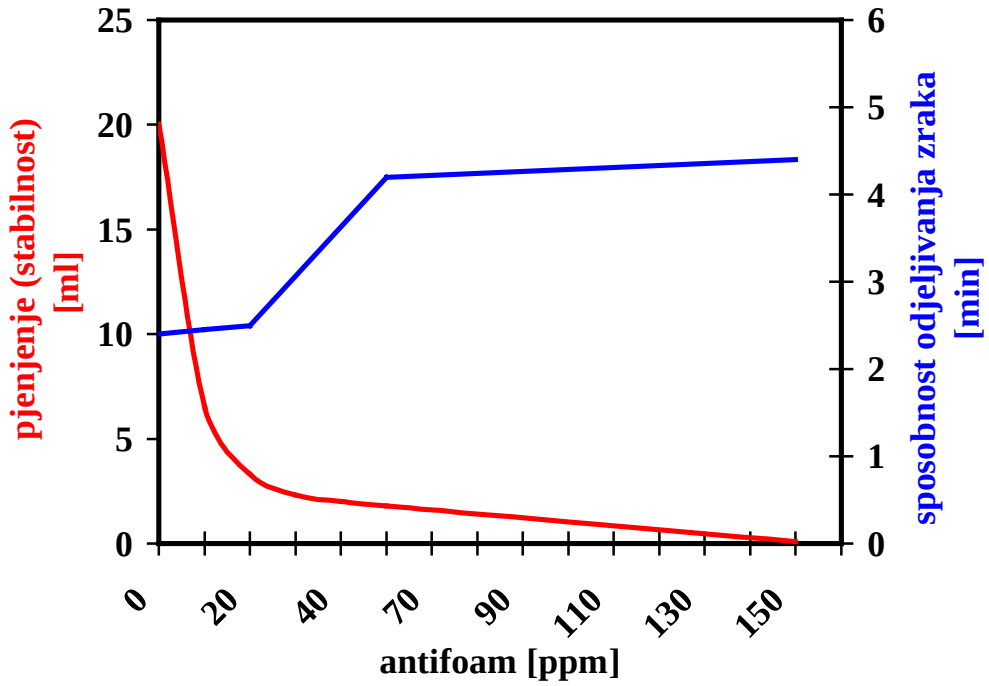
RAZVOJ

Služba u kojoj se provodi uvođenje novih ili poboljšanje i unapređenje postojećih proizvoda. Na slici je prikazan utjecaj antifoama na pjenjenje i odjeljivanje zraka.

Tablica 1: Utvrđivanje potrebne količine poboljšivača indeksa viskoznosti
Table 1: Contribution VII to kinematic viskozity at 100^0C

GRADACIJA MOTORNOG ULJA	VII [% m/m]
SAE 10W-30	3,8 – 5,8
SAE 10W-40	7,9 – 9,9
SAE 15W-40	4,2 – 6,2
SAE 15W-50	6,9 – 8,9
SAE 20W-40	0,1 – 2,1
SAE 20W-50	3,1 – 5,1

Slika 4: Utjecaj antifoama na pjenjenje i odjeljivanje zraka
Figure 4: Effect of antifoam on foam stability and air release value



ANALIZA RABLJENIH ULJA

Izbor mazivog ulja vrši se prema preporučenim fizikalno-kemijskim svojstvima. U primjeni ulja mijenjaju svoja svojstva kroz(5):

- kontaminaciju produktima izgaranja i česticama trošenja metala,
- trošenje aditiva koje je kemijsko i ima utjecaj na važne funkcije ulja,
- oksidaciju baznog ulja.

Tablica 2: Analiza rabljenih ulja
Table 2: Analyse of used oil

	Motorno ulje iz benzinskog motora		Motorno ulje iz dizelovog motora		Traktorsko ulje	
	svježe	rabljeno	svježe	rabljeno	svježe	rabljeno
Kin. viskoznost kod 100^0C, mm^2/s	14,5	14,24	14,50	14,89	11,0	11,12
Plamište, ^{0}C	215	125	215	195	210	200
TBN, mg KOH/g	9,0	6,5	12,0	7,1	10,0	8,0
Netopljivo u n-pentanu, %m/m	0,00	2,13	0,00	1,75	0,00	0,80

Interpretacija analize rabljenih ulja je vrlo kompleksna jer su pojedinačne analize međuovisne. Zbog toga je potrebno poznavati kompletnu analizu ulja, a ne zaključivati na osnovi pojedinačnih rezultata analize. Isto tako je potrebno ustanoviti normalnu i kritičnu razinu kvalitete za specifična ulja u definiranom motoru i određenim uvjetima primjene.

ZAKLJUČAK

- Analize maziva neophodne su u procesu proizvodnje, razvoja i kod postprodajnog servisa.
- Analize maziva utječu na ekonomiku procesa proizvodnje.
- Poznavanjem trenda analize maziva moguće je postići uštedu u održavanju trošila.

IMPORTANCE OF LUBRICANT ANALYSES

Abstract

To know analitycal properties of lubricants is the base to make a decision in development, production and application of lubricants. The lubricant classifcations and approved system specify many performance charracteristisc and analytical tests. The analytical tests are classical and instrumental. Instrumental technic have the advantages in small quantity of the sample, rapid analyse, but their need specied operator. Analyses from used oil sample should always be compared with prrvious samples and final conclusions should be based on "trend analysis" and has two closely related objectives: to obtain information on the lubricant drain intervals and preventive maintenance of the machine.

INTRODUCTION

Laboratories perform tests with regard to production quality plans, development requirements, and post-sale servicing. Plans and requirements set the properties to be tested and the test methods to be used. (1). The paper uses standard methods, apart from several internal process monitoring methods.

When it comes to techniques, we give the advantage to those instrumental rather than those classic, because of the following well-known benefits: small sample quantities and short duration, without, however, forgetting that the accuracy of the instrumental method depends on the accuracy achieved by classical analysis (2). Perfectioning of the classical method at the same time assumes also the perfectioning of the method's accuracy. Analyses are made of the following: input components, process monitoring, shipment of goods and oil from application.

PRODUCTION

Base oils are the basis of production, used for lubricant oil blending (3). The basic precondition for producing base oils using classical technology is a given type of stock. During the past two years, we have been processing the atmospheric residue of the REB and Irak stocks.

VACUUM DISTILLATION

The plant is of special significance, because it provides the essential properties of the base oils, as follows: viscosity, colour and volatility. Distillates must have certain viscosity with a narrow distillation curve, not overlapping with the neighbouring fractions. It is not possible to improve viscosity, colour and volatility on secondary plants.

EXTRACTION USING FURFUROL

This plant is used to remove aromatic compounds from distillates, because they bear a negative impact on viscosity index, and, with oxygen, sulphur and nitrogen compounds, also on oxidation stability. Depending on the crude being processed, in order to meet the standards for base oils, various yields are obtained.

DEPARAFFINATION

In order for the base oil to obtain required low-temperature properties, solid paraffinic components need to be isolated. This is obtained using the solvent methyl isobutyl ketone at low temperatures. Base oil has the pour point ranging from -9^0C to -12^0C.

ADDITIONAL PROCESSING USING HYDROGEN

It is done in order to remove the remaining sulphur, oxygen and nitrogen compounds, leading to improved colour and stability of base oils.

OIL BLENDING PLANT

In the process of improving base oil properties using additives, it is important to know that not a single additive, regardless of its type and quality, can improve properties of a poorely produced base oil. In the oil blending plant, motor oils are obtained according to certain formulations, through the blending of base components, DI packages, and viscosity improvers (4).

DEVELOPMENT

The department in which the introduction of new or the improvement and advancement of the existing products takes place. The Figure shows the influence of antifoaming agents on foaming and air release.

Table 1: Contribution VII to kinematic viscosity at 100^0C

MOTOR OIL GRADE	VII [% m/m]
SAE 10W-30	3.8 – 5.8
SAE 10W-40	7.9 – 9.9
SAE 15W-40	4.2 – 6.2
SAE 15W-50	6.9 – 8.9
SAE 20W-40	0.1 – 2.1
SAE 20W-50	3.1 – 5.1

USED OILS ANALYSIS

The choice of lubricant oil is made according to recommended physico-chemical properties. In application, oils change their properties through (5):

- contamination by combustion products and metal wear particles,
- consumption of additives which is chemical and bears impact on important oil functions,
- base oil oxidation.

Table 2: Analysis of used oils

	Motor oil from gasoline engine		Motor oil from diesel engine		Tractor oil	
	fresh	used	fresh	used	fresh	used
Kin. viscosity at 100^0C, mm^2/s	14,5	14,24	14,50	14,89	11,0	11,12
Flash point, ^{0}C	215	125	215	195	210	200
TBN, mg KOH/g	9,0	6,5	12,0	7,1	10,0	8,0
n-pentane insoluble, %m/m	0,00	2,13	0,00	1,75	0,00	0,80

The interpretation of used oils analysis is very complex, because the individual analyses are interdependent. That is the reason why it is necessary to know the entire oil analysis, and not bring conclusions based on individual analysis

results. It is also necessary to establish both normal and critical quality levels for specific oils in given engines and under specific application conditions.

CONCLUSION

- Lubricant analyses are necessary in production process, development, and post-sale servicing.
- Lubricant analyses bear impact on the production process economics.
- If we know the lubricant analysis trend, we may achieve maintenance savings.

Literatura / References:

1. QA dokumentacija Maziva Rijeka, QPL –ovi Proizvodnje
2. M. Feldin, The role of reference materials and interlaboratory comparisions SLOTRIB 1996, str. 115.
3. M. Oršić, The effect of base oil on the engine oil performance, SLOTRIB 1998, str. 233.
4. Formulacija maziva, Tehnička dokumentacija Maziva Rijeka
5. J. Denis, Lubricant properties analyses and testing, 1997, Editions Tehniq, Paris

ključne riječi:
621.892.1 Maziva po postupku proizvodnje
621.899 Maziva u uporabi i u regeneraciji
.001.53 Gledište fizičkog i fizičko-kemijskog ispitivanja produkata

key words:
Lubricants according to process of manufacture
Lubricants in use and recovery
Viewpoint of physical and physical-chemical examination

Autori/Authors:

Marica Briški, Marinko Oršić
INA Maziva Rijeka

Primljeno/Received:

09.4.2002.