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PROPERTIES OF BIODEGRADABLE LUBRICANTS USED IN AGRICULTURAL ENGINEERING

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(procedures, methods and their application)

Title: PROPERTIES OF BIODEGRADABLE LUBRICANTS USED IN AGRICULTURAL ENGINEERING

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EM		electric motor
F		filter
F_N	N	normal force
g	$m.s^{-2}$	gravitational acceleration
HEES		synthetic ester
HETG		rape-based liquids
HEPG		polyglycol
HEPR		polyalphaolefin
HG		hydraulic pump
HM		hydraulic motor
hz	m	tooth height
ICP		inductively coupled plasma
Mk	Nm	torque
n	s^{-1}	speed
N		tank
P	W	pump power input
p		pressure sensor
PAO		polyalphaolefins
PAG		polyalkylene glycols
P_G	W	pump output power
POE		polyolesters
P_V	W	cooling capacity
P_T	W	theoretical pump output power
PŠV		proportional throttle valve
P_{01}	$W.°C^{-1}$	specific cooling capacity
p_v	MPa	pump outlet pressure
p_{max}	MPa	maximum pipeline pressure
q		flow rate sensor
q_p	$m^3.s^{-1}$	fluid flow rate per revolution of the pump
Q	$m^3.s^{-1}$	fluid flow rate
Q_{max}	$m^3.s^{-1}$	maximum fluid flow rate
Q_{min}	$m^3.s^{-1}$	minimum fluid flow rate

Q_T	$m^3.s^{-1}$	theoretical flow rate
R	m	piston distribution radius
RS		quick connector
RV		distributor
r_{a1}, r_{a2}	m	radii of gears
$r_{p1,}$ r_{p2}	m	radii of contacting gears
SP		clutch
S_{kp}	m^2	piston surface
ŠV		throttle valve
T_1		maximum temperature
T_2		minimum temperature
t		temperature sensor
TAN		total acid number
TcV		three-way valve
TV		pressure valve
V_G	m^3	geometric volume of the pump
V_{pc}	m^3	instantaneous volume in the piston chamber
V_{HG}	m^3	volume of the pump
V_{HM}	m^3	hydraulic motor volume
VH	m^3	volume of hydraulic components
$V_{20\%}$	m^3	resizing
$V_{nádrž}$	m^3	tank volume
V_{str}	m^3	loss volume
V_p	m^3	pipe volume
Vk		coefficient of variation
V_0	m^3	initial volume of the piston chamber volume
w		energy
x_i		value of $x_i - th$ variable
		arithmetic mean of the statistical population
Z		normal distribution
z		number of teeth
z_m		number of tooth gaps

z_v		number of cylinders
Δp	MPa	pressure drop in the pump
ΔT	°C	temperature difference
α_s	°	angle of plate inclination
γ	Pa^{-1}	fluid volume compressibility
η_c	%	total efficiency
η_m	%	mechanical efficiency
η_{hm}	%	hydraulic-mechanical efficiency
η_p	%	flow rate efficiency
μ	Pa.s	dynamic viscosity
ρ_{01}	$kg.m^3$	fluid density
σ		standard deviation
σ_2		variance
σ_{dov}	MPa	permissible tensile stress
φ	°	piston position angle
ω	$rad.s^{-1}$	angular velocity

Introduction

Greening and eco-friendly activities within the agricultural primary production are currently playing an important role not only in the Slovak Republic. Within these activities and considering the environmental impact of agricultural technology, there is a possibility of applying ecological lubricants in transmission-hydraulic systems. Our scientific monograph presents the results of long-term service life tests of selected ecological lubricants. Before applying ecological lubricants in working machines, these lubricants have to be subjected to laboratory tests since the manufacturers of agricultural technology only minimally recommend the application or use of these lubricants. In case of application of plant-based ecological lubricants, it is necessary to monitor their effect on operating parameters of transmission-hydraulic systems, their degradation process in laboratory or in-service tests and the way of their contamination by external or internal (abrasion) adulterants and by chemical elements. It is also necessary to monitor their effect on the most important machine components.

Determination of possibilities to apply plant-based ecological lubricants enables to determine their technical worthiness for use. The use of these lubricants is necessary in ecologically sensitive areas (drinking water sources, protected areas) or in organic farming on agricultural lands. The above mentioned prerequisites can be fulfilled by legislative intervention of the government (European Union), or by tax/subsidy measures.