Wärtsilä 4-stroke
Technical Services

DS00/99/01
Issue 2, 31 October 2014

Lubricating oil requirements and treatment

Information to owners and operators of the following Wärtsilä - Deutz engines:

High speed:	Medium speed:
D234	**D628**
D604	**D640**
D604B	**D645**
D620	
D616	
D816	

For your information

Section
99 Service information

Introduction / Background
This bulletin holds the lubricating oil specifications and approval list for Wärtsilä - Deutz medium- and high speed engines.

Validity / Issue
Until further notice.

This issue supersedes issue 1 of this bulletin.

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Revision history

Issue 1: The first issue replaced technical bulletin TB00/99/2090 issue 03. The bulletin updates the list of applicable engines and list of approved lubricating oils.

Issue 2: Update of applicable engines and update of oils and tables.

Contents

1 General

In chapter 2 the system oil requirements and quality are mentioned for the high speed engines (D234, D604, 604B, D620, D616, D816)

In chapter 3 the system oil requirements and quality are mentioned for the medium speed engines (D628, D640, D645).

Lube oils not indicated but having the same capacity level as those mentioned in the enclosure can be used upon agreement with the oil producer and – compulsory during the warranty period – with the approval of Wärtsilä Netherlands B.V.

The indicated lube oil grades are minimum requirements. Higher quality levels can be used.

The manufacturer is responsible for supplying lube oils of constant quality and with those additives which were the basis for the release.

Upgrades and replacements of brands as mentioned in the enclosures are allowed to be used without contact with Wärtsilä.

Suppliers and brands not mentioned in the enclosures can be used, after field trial, upon agreement with oil producer and approval of Wärtsilä Netherlands B.V.

1.1 Test kit for lube oil & cooling water analysis

There is a Wärtsilä Deutz test kit available that allows quick determination of the lube oil grade. This quick test permits a trend definition of the lube oil variation. The test kit, with material number DZ12130382, is obtainable from the Wärtsilä Service Network. The test kit is also suitable for cooling water analysis.

2 High speed engines

2.1 Quality

For the engines of series D234, D616, D816, D604, D604B and D620, lube oils according to the existing specifications have been determined. In the enclosure, some reference oils are indicated, with which positive operating results have been achieved.

The lube oils must at least meet the following lube oil specifications:

Table 1

Engine(s)	Engine lube oil specifications * See NOTE 1	
	ACEA	API
D234 D816 D604/D604B	E2-96, E3-96 E4-99, E5-99	CF, CF-4 CG-4,CH-4

Table 2

Engine		
D616	Engine speed n > 2100/min	Lube oil quality grade **I**
	Engine speed n ≤ 2100/min	Lube oil quality grade **II**

Table 3

D620			
Power group	Power range	eff. average pressure P_{me}	Lube oil quality grade **I**
Genset engines in cont. operation > 4 000 op. h/year	50 Hz: > 100 kW/cyl. 60 Hz: > 120 kW/cyl.	> 18,0 bar > 18,0 bar	
Genset engines in peak load operation > 1 000 op. h/year.	50 Hz: > 110 kW/cyl. 60 Hz: > 126 kW/cyl.	> 19,8 bar > 19,0 bar	
Ship drive in rapid ferries and rapid commercial boats > 3 000 op. h/year	> 124 kW/cyl. n=1860/min > 120 kW/cyl. n=1800/min > 110 kW/cyl. n=1650/min	> 18,0 bar > 18,0 bar > 18,0 bar	
Ship drive for non-commercial ships (official ships, yachts) > 1 000 op. h/year	> 130 kW/cyl. n=1860/min > 127 kW/cyl. n=1800/min	> 19,0 bar > 19,0 bar	
All other engines	-	-	Lube oil quality grade **II**

Table 4

Lube oil quality grade	**Engine Lube oil specifications** * See NOTE 1
I	ACEA E4-99
II	ACEA E3-96, E5-02 API CF-4, CG-4, CH-4

NOTE 1:
It is sufficient, if one of the mentioned specifications is met.

Some reference lube oils of lube oil quality grades **I** and **II** can be taken from the enclosure.

NOTE 2:
In lube oil quality grade I, only fully or partly synthetic oils are permitted to be used.

2.2 Viscosity

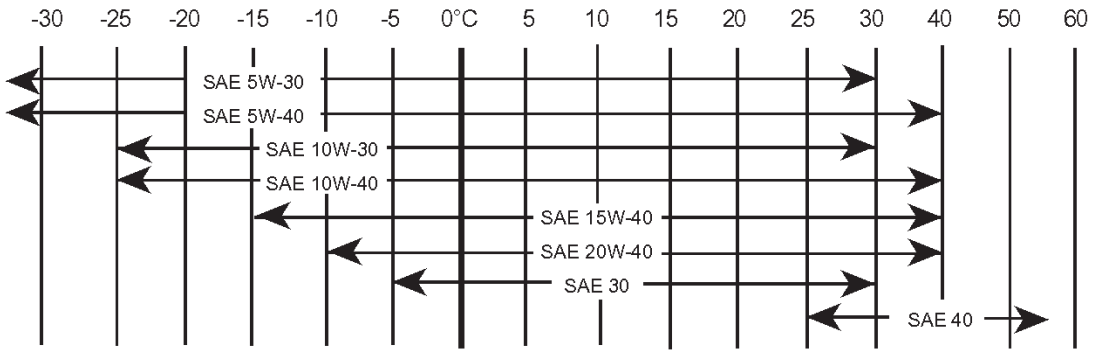

Figure 1, Viscosity specification

2.3 Lube oil change intervals

The oil should be changed only with the engine warmed up to service temperature; the oil is then highly fluid and drains off much better.

The first lube oil change after initial commissioning or re-commissioning following major repair work shall be effected after 50 running hours at the latest. Thereafter the following lube oil change intervals shall be adhered to:

Table 5

Engine	Mounted centrifugal lube oil filter			
	without		with	
	Type of fuel			
	Distillate fuel	MDF mixed oil ISO 8217 DMB	Distillate fuel	MDF mixed oil ISO 8217 DMB
D234	500 op. hrs.	250 op. hrs.		
TBD 234	250 op. hrs.	125 op. hrs.		
D616	250 op. hrs.	125 op. hrs.	500 op. hrs.	250 op. hrs.
D816	250 op. hrs.		500 op. hrs.	
D604/B	250 op. hrs.	125 op. hrs.	500 op. hrs.	250 op. hrs.
D620	250 op. hrs.	125 op. hrs.	500 op. hrs.	250 op. hrs.

Oil change once a year at a minimum.

The oil change interval may be extended depending on the engine operating mode and the lube oil grade.

2.3.1 Condemning limits for used lube oil

Table 6, Condemning limits for used lube oil

Kinematic viscosity at 100°C (DIN 51 562)	
Lube oil SAE 30, SAE .. W-30	min. 9,3 mm^2/s (cSt)
Lube oil SAE 40, SAE ... W-40	min. 12,5 mm^2/s (cSt)
Viscosity increase	max. 25% of value when new
Flash point (DIN EN 22719)	min. 180°C
Total contamination (DIN 51365 corr. to centrifuge)	max. 2.0% by mass
Water content (DIN 51777)	max. 0.2% by mass
Total base number (DIN ISO 3771)	min. 50% of value when new

2.3.2 Used-oil analysis

The oil sample shall be representative of the entire oil filling and shall be taken in good time before the oil change becomes due (see operation manual). It is best to start a series of analyses during or shortly after commissioning so as to define a possible variation of the lube oil depending on the duration of engine operation.

2.4 Servicing of the engine-mounted lube oil filters

Lube oil filter servicing is to be carried out as follows (see also relevant operation manual):

Table 7

D234	
Changing oil filter element	50 running hours after commissioning of new or overhauled engine, thereafter every 500 running hours, after 1 year at the latest

D616	
Changing oil filter element	50 running hours after commissioning of new or overhauled engine, thereafter every 500 running hours,
Cleaning centrifugal lube oil filter	50 running hours after commissioning of new or overhauled engine, thereafter every 250 running hours, at least after 1 year
D604, D604B, D620	
Cleaning strainer	50 running hours after commissioning of new or overhauled engine, thereafter every 500 running hours, at least after 1 year
Changing throw-away filter/element	
Cleaning centrifugal lube oil filter	50 running hours after commissioning of new or overhauled engine, thereafter every 250 running hours, at least after 1 year
D816	
Cleaning strainer	50 running hours after commissioning of new or overhauled engine, thereafter every 500 running hours
Changing throw-away filter/element	
Cleaning centrifugal lube oil filter	50 running hours after commissioning of new or overhauled engine, thereafter every 250 running hours

3 Medium speed engines

In case engine types are not listed in the various tables, please refer to:

Table 8, Engine type cross-reference list

Engine type	See engine type
510	645
528	628
540	640

3.1 Quality

For the use in engines of series D628, D640 and D645, the enclosure comprises reference lube oils. Here, the assignment depends on the fuel type of the engine.

For engines of series D628, we recommend the use of fuels with a sulphur content of less than 0.2 % by weight to avoid the formation of glazing in the cylinder liners, preferably the use of lube oils of quality class API CG-4 or API CH-4.

For mixed fuels with sulphur contents > 1.0%, we recommend for the first filling to use an oil with a TBN of 40 mg/KOH/g, for sulphur contents ≤ 1.0%, a TBN of 30 mg/KOH/g.

To achieve the maximum possible economic operation, for refilling, an oil with lower or higher TBN is permitted to be used. The lubricating oil supplier of mineral oil must be involved in this measure, to give their recommendations on the basis of regular analyses of the used oils. Moreover, the according limit values must be observed (see Ch. 3.3.1).

According to our experience, when being refilled, the engine D645 rather needs an oil with a TBN of 40 mg/KOH/g, the engines D628 and D645, however, rather an oil with a TBN of 30 mg/KOH/g. See also Ch. 4

When using anti-corrosive oil (emergency genset), contact Wärtsilä Netherlands B.V., engine services.

3.2 Lube oil viscosity

Generally for these engines viscosity class SAE 40 is specified. All-temperature oils SAE 10W-40 or 15W-40 can also be used, provided these oils are indicated in the list of lube oils or are equivalent.

The D628 engines in operation, which were previously operated with a lube oil viscosity of SAE 30 (previous version: oil cooler upstream of charge air cooler), may be operated with SAE 40 or SAE 10W-40 or SAE 15W-40 as from now on.

Selection of the lube oil viscosity shall be based on SAE-classification J 300 9/87 (Society of Automotive Engineers). Selection of the SAE-class does not give any indication of the oil grade.

In view of particular requirements of D628 engines operating in the fishing industry inland navigation and in excavator operation, and running on distillate fuels, the lube oils mentioned in enclosure 3 are released for these applications.

3.3 Lube oil change intervals

The oil should be changed only with the engine on operating temperature; the oil is then highly fluid and drains off much better.

In the case of these engines, a lube oil change always takes place after a previous used oil analysis. Upon agreement with the mineral oil producer, the lube oil must be partly replaced or exchanged, if one of the limit values is exceeded or fallen below. For engines D628 operated with distillate fuel (entire oil volume in the oil pan), we generally recommend a lube oil change after 5,000 running hours, irrespective of the result of the used oil analysis.

If, upon operation with mixed fuel, the TBN-value should fall below the indicated minimum value, refilling is possible with lube oil having a TBN-value of 40 mgKOH/g or 50 mgKOH/g (freshening up), see Ch.4.

3.3.1 Condemning limits for used lube oil

Table 9, Condemning limits for used lube oil

Kinematic viscosity at 100°C (DIN 51 562)	
Lube oil SAE 40	min. 12,5 mm^2/s (cSt)
Viscosity increase	max. 25% of value when new
Flash point (DIN EN 22719)	min. 180°C
Total contamination (DIN 51365 corr. to centrifuge)	max. 1.5% by mass
Water content (DIN 51777)	max. 0.2% by mass
Total base number (DIN ISO 3771)	
with distillate fuel	min. 6 mgKOH/g
with mixed fuel with a sulphur content S ≤ 1% by wt.	min. 12 mgKOH/g
with mixed fuel with a sulphur content S > 1% by wt.	min. 18 mgKOH/g

3.3.2 Used lube oil analysis

The oil sample shall be representative of the entire oil filling and shall be taken in good time before the oil change becomes due (see operation manual). It is best to start a series of analyses during or shortly after commissioning so as to define a possible variation of the lube oil depending on the duration of engine operation.

The oil analysis must be made for engines D628 and D640 at least every 500 operating hours, for engines D645 at least every 1000 operating hours.

3.4 Servicing of the engine-mounted lube oil filters

Lube oil filter servicing is to be carried out as follows (see also relevant operation manual):

Table 10

D628	
Lube oil filter combination: • Operating edge-type filter	daily
• Cleaning filter chamber	every 1,500 running hours
• Paper filter: Changing paper element	50 running hours after commissioning of new or overhauled engine, thereafter when the permissible differential pressure is exceeded, at the latest after every: 3,000 running hours with distillate fuel operation 1,500 running hours with intermediate fuel operation
Cleaning centrifugal lube oil filter	50 running hours after commissioning of new or overhauled engine, thereafter every 250 running hours
D640, D645	
Cleaning strainer candles	500 running hours after commissioning of new or overhauled engine, thereafter every 6000 running hours For engine D640 in standby < 300 op. hs./year after all 150 op. hs. at the latest 0.5 years.

4 Change of lubricating oil brand

Top-up with another lubricating oil brand than being filled to the system is not allowed, except if the both two lubricating oils originate from the same manufacturer. E.g. if Company A's BN 40 oil is filled into the oil system and top-up with same Company A's BN 50 oil is desired, that can be done provided that both products are based on same base oils and additive technology. Otherwise the lubricating oil system has to be drained and then filled with another brand by following the procedure described here below.

In order to minimize the risk of lubricating oil foaming, deposit formation, blocking of lubricating oil filters, damage of engine components, etc., the following procedure should be followed when lubricating oil brand is changed from one to another:

- If possible, change the lubricating oil brand in connection with an engine (piston) overhaul
- Drain old lubricating oil from the lubricating oil system
- Clean the lubricating oil system in case of an excessive amount of deposits on the surfaces of engine components, like crankcase, camshaft compartment, etc.
- Fill the lubricating oil system with fresh lubricating oil.

If the procedure described above is not followed, responsibility of possible damage and malfunctions caused by lubricating oil change should always be agreed between the Oil Company and customer.

5 How to contact Wärtsilä

For questions about the content of this bulletin, or if you need Wärtsilä assistance, services, spare parts and/or tools, please contact your nearest Wärtsilä representative. If you don't have the contact details at hand, please follow the link "Contact us" – "24h Services" on the Wärtsilä webpage: www.wartsila.com

6 Enclosures

Lube oil tables for high speed engines, medium speed engines, and an engine application related table.

Engine lube oil D616, D620		
Lube oil quality grade	**Lube oil specifications** It is sufficient, if one of the indicated specifications is met.	**Supplier / Brand name**
I	ACEA E4-99	Shell Rimula Ultra 5
		Mobil Mobilgard 1 SHC 5
		Mobil Delvac 1 SHC
II	ACEA E3-96, E5-02 API CF-4, CG-4, CH-4	Shell Rimula Super
		Shell Sirius X
		BP Energol HPDX
		Mobil Delvac HP
		ChevronTexaco Ursa SuperTD

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Supplier	Engine lube oil D628, D640, D645			
	Fuel type Classification of the fuels as per TB00/99/2089			
	EN590 and DM(ISO8217)**		**RM** (ISO8217)**	
	Brand name	**TBN**	**Brand name**	**TBN**
Agip	Agip CLADIUM 120	12	Agip CLADIUM 300	30
	-		Agip CLADIUM 400	40
BP	BP Energol HPDX 40	12	BP Energol IC-HFX304	30
	BP Vanellus C3	10.5	BP Energol IC-HFX404	40
	-		BP Energol IC-HFX504	50
Castrol	Castrol MHP 154	15	Castrol TLX 304	30
	Castrol CRD-DB 40	10.6	Castrol TLX 404	40
	Castrol Seamax Extra 40	12	Castrol TLX 504	50
	-		Castrol TLX 554	55
CEPSA	-		CEPSA Troncoil3040 plus	30
	-		CEPSA Troncoil4040 plus	40
	-		CEPSA Troncoil5040 plus	50
Chevron	Delo 1000 MARINE 40	12	Delo 3000 MARINE 40	30
	Taro 16 XD 40	16	Delo 3400 MARINE 40	40
	Taro 16 XD 15W-40	16	Taro 30 DP 40	30
	-		Taro 40 XL 40	40
			Taro 50 XL 40	50
Exxon Mobil	ESSOLUBEXT 401 (SAE15W-40)	13.3	EXXMAR30TP 40	30
	EXXMAR CM Super 40	15	EXXMAR40TP 40	40
	Mobilgard ADL	12		
	Mobilgard HSD	10.5	Mobilgard M 430	30
	-		Mobilgard M 440	40
	-		Mobilgard 50 M	50
	-		Mobilgard M 50	50
	-		Mobilgard SP 55	55
	-		-	
Fuchs Europe	Titan SDX	11	-	
	Titan HD Superior	11	-	
Lukoil	Navigo TPEO 40 Ultra	10	-	
Total	Antar Milantar MT	11	Total Aurelia 4030	30
	Total Rubia TIR 4000	11	Total Aurelia 4040	40
	Total Neptuna	11	Total Aurelia 4050	50
	Total Caprano TD	11	-	
	Total Disola M 4015	14	-	

Supplier	Engine lube oil D628, D640, D645			
	Fuel type Classification of the fuels as per TB00/99/2089			
	EN590 and DM(ISO8217)**		**RM** (ISO8217)**	
	Brand name	**TBN**	**Brand name**	**TBN**
Repsol YPF	-		Repsol YPF Neptuno NT 3000	30
	-		Repsol YPF Neptuno NT 4000	40
Shell	Shell Sirius FB 40	13	Shell Argina T 40	30
	Shell Gadinia AL 40	15	Shell Argina X 40	40

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Application	Lube oil type	
	Fuel type EN590 and DM** (ISO8217)	
	Brand name	TBN
Fishing industry Inland navigation Excavator	Shell Gadina AL40	-
	Mobilgard ADL40	-
	Chrevon Delo SHP40	-
	Gulf Gulfmar AL415	-