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Analysis of Performance Criteria of Boosted Diesel Engine Slide Bearings

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Abstract

The paper deals with the design of the bearing assembly slide bearing crank pin of the crankshaft of boosted diesel engines. Selecting bearing diametrical clearance is an important matter in the design of the bearing assemblies. Then the assigned values clearances are checked with the help of the bearing and oil consumption hydrodynamic parameters of calculations. The magnitude of the clearance is one of the main indices. The final selection of clearance magnitude is carried out after the experimental operation or special experimental studies in case the latter is done.

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Keywords: boosted diesel engine; boundary friction; anti-friction materials;

1. Introduction

The main element of the boosted diesel engine slide bearing is a-shell with thin layers of anti-friction material and the run-in coating. (Fig.1). Casting bronze, anti-friction cast iron, babbitt metal based on tin and lead up to 110°C, plastic with water lubrication are used as anti-friction materials [1, 2]. Porous cermet shells of iron-based powder or bronze with additives of copper, graphite, tin or lead are also used. The liquid lubricant, in the pores is squeezed during overload, providing satisfactory operating conditions for the bearing [3]. To reduce the consumption of expensive materials bimetallic shells which are a steel tape coated with a thin sliding layer it babbitt, lead bronze, silver, an alloy of aluminum containing inclusions of tin and 30% and others are used.

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2. Analysis

The design of the bearing assembly In this context, we can consider the main design features and the relationships of some plain bearings of domestic and foreign forced diesel engines. Design relationships are given in the table, whereas N is cylinder capacity; D - the diameter of the engine cylinder; S is - stroke; n is the engine speed; l is length of the bearing; d is-bearing diameter; r - index indicating on the radical neck of a crankshaft; c – the similar index of the crankshaft crank pin.

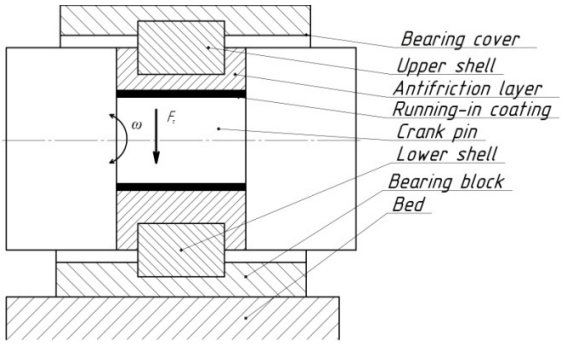

Fig. 1. Scheme of the shaft bearing in the liquid friction exert crucial influence to its performance

From the data given in the Table 1 it is clear that the diameter of the crank pin 6CHN21/21engine in comparison with the cylinder diameter is 0.64, and for the main bearing the ratio is 0.71. These figures show that the shaft journal diameters are on the border of the lower limit regarding other engines. It should be noted that the relatively small bearing diameter has advantages in metal capacity and friction losses, but in terms of the outside they are in more severe conditions.

Table 1. Basic design bearings relationships of domestic and foreign forced diesel engines.

Engine model	N hp	D mm	S mm	n rp/m	bearings						d_r/D	d_c/D
					the radical neck			the crank pin				
					l_r	d_r	l_r/d_r	l_c	d_c	l_c/d_c		
16CHN26/26	200	260	260	1000	88	220	0,40	120	200	0,60	0,85	0,77
6CHN 21/21	125	210	210	1500	58	150	0,40	94	135	0,69	0,71	0,64
6CH23/30	75	230	300	1000	80	160	0,50	85	155	0,55	0,69	0,67
12CHN18/20	100	180	200	1850	56	105	0,53	70	95	0,70	0,58	0,53
RA6-280	400	280	290	1050	115	231	0,50	80	208	0,40	0,82	0,74
RA4-200	175	200	210	1500	65	160	0,40	52	145	0,45	0,80	0,72
RA4-185	150	185	210	1500	60	160	0,37	59	129	0,45	0,86	0,70
12CH331TC-12 (12CHN16, 5/15,5)	119	165	155	2200	50	140	0,34	45	105	0,43	0,85	0,64
TD120A	55	130	150	2200	38	108	0,35	40	92	0,43	0,83	0,71
10CHN12/12,5	31	120	125	2650	32	90	0,36	30	75	0,40	0,75	0,62
6CHN12,5/15,5	47	125	155	2200	40	96	0,42	35	83	0,42	0,77	0,65
12CHN21/21	125	210	210	1500	80	150	0,40	54	135	0,40	0,71	0,64