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PERFECTION OF AUXILIARY BLOWER CONTROL SYSTEM FOR MARINE LOW SPEED ENGINE

Abstract. *The particulars of automated electrically driven auxiliary blower functioning, repeated motor start-stop at diesel partial loads arising due to air receiver pressure fluctuation has been analyzed. The frequency convertor for electrical drive rigging is suggested for controllable air supply into diesel at partial loads. The basic operations of auxiliary blower electrical drive control algorithm and advantages of frequency control are considered.*

Keywords: *auxiliary blower, electrical drive, marine diesel, partial load, frequency convertor.*

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УСОВЕРШЕНСТВОВАНИЕ СИСТЕМЫ УПРАВЛЕНИЯ ЭЛЕКТРОПРИВОДНОЙ ВОЗДУХОДУВКИ ГЛАВНЫХ МАЛООБОРОТНЫХ ДВУХТАКТНЫХ СУДОВЫХ ДИЗЕЛЕЙ

Аннотация. *Проанализированы особенности работы автоматизированных электроприводных воздуходувок, возникновение старт-стопного режима при колебаниях давления в воздушном ресивере на частичных нагрузках дизеля. Предложено оснащение электропривода полупроводниковым преобразователем частоты, что обеспечит регулируемую подачу воздуха в дизель на частичных режимах. Рассмотрены основные операции алгоритма управления электроприводом воздуходувки и преимущества частотного управления.*

Ключевые слова: *воздуходувка, электропривод, судовой дизель, частичные режимы, преобразователь частоты*

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ВДОСКОНАЛЕННЯ СИСТЕМІ УПРАВЛІННЯ ЕЛЕКТРОПРИВОДНОЇ ПОВІТРОДУВКИ ГОЛОВНИХ МАЛООБЕРТОВИХ ДВОТАКТНИХ СУДНОВИХ ДИЗЕЛІВ

Анотація. *Проаналізовано особливості роботи автоматизованих електроприводних повітродувок, виникнення старт-стопного режиму при коливаннях тиску в повітряному ресивері при часткових навантаженнях дизеля. Запропоновано оснащення електропривода напівпровідниковим перетворювачем частоти, що забезпечить регульовану подачу повітря в дизель на часткових режимах. Розглянуті основні операції алгоритму управління електроприводом повітродувки і переваги при частотному регулюванні.*

Ключові слова: *повітродувка, електропривод, судновий дизель, часткові режими, перетворювач частоти*

Start up process and low load operation (up to 40 – 50 % of nominal) of marine low speed two strokes diesel engines with supercharging at constant pressure requires the electrically driven auxiliary blowers (EAB), which creates scavenging air pressure required for combustion process [1 – 4]. The cause of insufficient for normal diesel operation air delivery is in discrepancy between engine air consumption and turbocharger (TC) compressor feed owing to low exhaust gas amount for turbine.

Start and stop command for EAB are, accordingly, a lowering and rising of air pressure in the receiver with respect to the measuring unit settings. These settings' values has been established by engine maker, but can be corrected in dependence for vessel operation features.

Pressure value in the receiver is determined by the balance between TC compressor air feed and main engine air consumption, so it depends of the complex: vessel hull – steering system – propeller – the main engine – TC – speed governor work conditions. Therefore at low load operation (economic modes) it is "naturally" arising of scavenging receiver pressure slow fluctuations with period of about half of a minute to several minutes.

It leads to "start-stop" mode of EAB, which, according to recommendations [5 – 7], should be avoided by slightly changing the load of the engine or switching over EAB to manual mode. As substantiation of these recommendations authors indicate, in particular, the fact that the drive in question and its control system is not intend for prolonged "start-stop" mode. Among the negative factors such mentioned mode it should also been taken in consideration: the additional diesel-generator must work in parallel [5, 6], since the total electrical power consumption of EAB may be more than 1 % of the main engine nominal power, and the relatively large EAB motors frequent start-stopping influence on the electrical energy quality.

As a result of EAB control improvement peer review we suggest to replace commonly used relay-contactor control circuit on semiconductor frequency converter (FC). The purpose of the FC in this case is a smooth EAB motor speed change at start / stop on the definite scavenge air pressure settings and controllable optimal for the quality of the combustion process air supply. Taking in mind that in modern electronic control systems of main marine engines the scavenge air pressure signal is already presented and processed, the software upgrades, related to the producing of the reference signal for FC, will not meet

the difficulties. For this purpose can be used research results [3], which reflect the fact, that to ensure quality removal of the residual exhaust gas from engine cylinder it is necessary the definite scavenge air pressure excess over exhaust manifold pressure at specified engine load.

The FC control algorithm should include: commands for start up and lead out the motor on certain speed during the preparation of engine to work, adjusting the speed of EAB after successful engine start up and during transient acceleration and deceleration of the engine, turbocharger, and vessel.

It should be noted EAB advantage with FC is in possibility to increase scavenge air pressure owing to supply EAB motor with higher (then standard) current frequency for more reliable engine start up.

On TC acceleration and increasing due to this scavenge air pressure the EAB motor speed must decrease up to stop when pressure value will correspond to upper setting that eliminates motor switching off at load closing to nominal, and this increase reliability of the drive.

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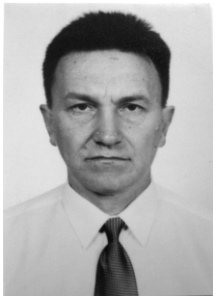

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