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UDC 658.5

DESIGN CONSIDERATIONS FOR THE ENGINE REPAIR SECTION OF A SERVICE FACILITY

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The engine-repair department is intended for:

· restoration of the engine's base components (cylinder blocks, crankshafts, and camshafts);

· assembly and testing of units (assembly of the crankshaft with the flywheel and clutch, and their balancing);

· general engine assembly;

· repair of auxiliary units (oil and water pumps, oil filters, etc.).

The engine-repair department includes the following sections: the fitting-and-machining section and the assembly section. The basis for designing the department's sections is the production program.

The diesel engine repair process includes disassembly and assembly operations; cleaning, washing, and restoration of parts; and painting operations. These tasks are performed by fitters. Base components arrive at the section after inspection and sorting. Some engine units arrive at the engine-repair department in an assembled state; their disassembly and repair are performed directly at the workstations. Such units include the cylinder head with valves, water pump, fan, oil pump, etc. [1].

Some parts are delivered to the workstation already restored and ready for assembly, while others undergo fitting and machining operations in the fitting-and-machining section, where the following operations are performed: cylinder or liner boring, boring of main bearings and camshaft bushings, grinding and polishing of crankshaft journals, valve grinding and lapping, and hydraulic testing of the cylinder block.

After restoration, base components are cleaned using washing units. Cleaned parts, free of dirt and abrasive residues, are sent to the engine unit assembly stations. Additional parts arrive from the kitting section. Auxiliary units arrive at the engine-repair section in an assembled state. They are repaired, tested, and then sent to the engine assembly stations.

Fully assembled engines are transported to the test station for break-in and testing. Repaired engines are painted, finally completed, and transported to the machine assembly line.

The annual labor intensity of the section is determined based on the time standards for disassembly-assembly and fitting-machining operations and the annual production program. The length of the engine assembly line is determined by the engine length and the spacing between engines on the line.

The number of stationary workstations for disassembling engine units into parts is determined by the annual labor intensity, the actual annual working time of a worker (fitter), and the work density.

To remove broken studs and bolts on the side and end surfaces of blocks, vertical drilling machines of type 2A135 with a maximum drilling diameter of up to 35 mm are used. Warped surfaces of the block and cylinder head are ground on surface-grinding or radial drilling machines. Boring of block saddles is performed using horizontal boring machines, while diamond boring machines are used for boring cylinder liners and liner seating surfaces. Universal hydraulic test stands are used for testing the water jacket of the block and cylinder head. For honing cylinder liners, vertical honing machines or drilling machines equipped with honing heads are used.

The number of metal-cutting machines S_M, pcs., is calculated using the formula [2].

$$S_M = \frac{T'_M \cdot N \cdot K_N}{F_{A.E.} \cdot \eta_O}, \qquad (1)$$

where T'_M - the annual labor intensity of machine-tool operations, man-hours;
K_N – the coefficient of non-uniformity of enterprise workload;
$F_{A.E}$ – the actual annual operating time of the equipment, hours;
η_O – the utilization factor of machine-tool equipment.

Other equipment and organizational fixtures are selected without calculation, according to the technological processes performed in the section, and an equipment specification is compiled. The number of production workers is determined based on the annual labor intensity of operations and the working-time fund of fitters. The area of the section is calculated based on the space occupied by the equipment, taking into account working zones and walkways.

Equipment layout should begin with the placement of machines at the cylinder-block restoration stations. The equipment is arranged in a line (integrated into the production flow) according to the technological process scheme, following the sequence of operations. In the cylinder-block restoration line, roller conveyors are used as transport devices; they are installed in sections between machines or alongside them, as well as monorails equipped with electric hoists or pneumatic lifters. The cylinder-block restoration line ends with a washing machine. Washed cylinder blocks are transferred by overhead crane to the assembly platform.

The continuation of the cylinder-block restoration line is the engine assembly line, where an overhead crane or a monorail with an electric hoist is used. Near the engine assembly line, it is recommended to place stations for unit assembly and auxiliary-unit repair.

References

1. Дашивець Г. І., Дідур В. А., Бондар А. М. Проєктування сервісних підприємств: посібник-практикум. Мелітополь: ТДАТУ, 2019. 144 с.

2. Дашивець Г.І., Бондар А. М., Паніна В. В. Проєктування сервісних підприємств: навчально-методичний посібник для самостійної роботи студентів. Мелітополь: ВПЦ «Люкс», 2019. 84 с.

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УДК 620.92:631.371

ТЕХНОЛОГІЧНА МОДЕРНІЗАЦІЯ БІОГАЗОВИХ КОМПЛЕКСІВ ЯК ЧИННИК ПІДВИЩЕННЯ ЇХ ЕКОНОМІЧНОЇ СТІЙКОСТІ

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Біогазові комплекси в Україні функціонують в умовах нестабільності енергетичного ринку, зміни тарифної політики, обмеженого доступу до інвестиційних ресурсів та підвищених вимог до екологічної безпеки виробництва. За таких умов ключовим завданням стає забезпечення економічної стійкості біогазових підприємств, яка визначається їх здатністю зберігати прибутковість та операційну стабільність при зміні зовнішніх факторів [1].

Практика експлуатації показує, що більшість біогазових комплексів, введених в експлуатацію 7–10 років тому, працюють на обладнанні з високою питомою енергоємністю, недостатнім рівнем автоматизації та обмеженим коефіцієнтом використання теплової енергії.