

вихід біогазу на 6–8% без додаткових витрат сировини.

Кліматичні особливості України також зумовлюють необхідність регіональної адаптації рішень. У південних областях теплові втрати на 20–25% нижчі, що підвищує загальний коефіцієнт корисного використання енергії. Натомість у західних регіонах доцільним є застосування попереднього підігріву субстрату за рахунок рекуперації тепла дигестату, що дозволяє зменшити теплове навантаження на когенератор.

Економічне моделювання показує, що комплексна оптимізація енергетичного балансу (теплоізоляція, частотне регулювання, рекуперація, цифрове управління) потребує інвестицій у межах 8–15% від вартості комплексу [3]. Водночас скорочення власного енергоспоживання на 30–45% дозволяє збільшити чистий прибуток підприємства на 12–18% щорічно та скоротити строк окупності проєкту на 1,5–2 роки.

Таким чином, підвищення енергоефективності біогазових установок повинно базуватися на системному підході, що охоплює технічну модернізацію, оптимізацію режимів роботи, інтеграцію теплових споживачів та цифровий контроль параметрів процесу. В умовах трансформації енергетичного ринку саме енергетична збалансованість визначає конкурентоспроможність біогазових проєктів і їх здатність забезпечувати стабільну економічну віддачу в аграрному секторі України.

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SPECIFICS OF DESIGNING THE ELECTROPLATING AREA OF A SERVICE FACILITY

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The electroplating section is intended for restoring parts using electrolytic coatings, as well as for applying decorative and anticorrosive coatings. To increase the wear resistance of parts, chromium plating and iron plating are used; for anticorrosion protection – zinc plating; for protective and decorative finishing – chromium plating, nickel plating, and copper plating.

The basis for designing the section is the production program.

The technological process begins with parts requiring restoration of decorative and

anticorrosive coatings arriving at the electroplating section from the storage area for parts awaiting repair. Parts that require dimensional restoration are delivered to the electroplating section from the fitting and machining area, where they undergo grinding to remove wear marks and to obtain the correct geometric shape.

The electroplating section is intended to perform the following technological operations [1]:

- isolation of surfaces not subject to coating;
- mounting of parts on suspension fixtures;
- degreasing (chemical or electrochemical);
- rinsing of parts in hot and cold water;
- anodic etching of surfaces to be coated;
- electrodeposition of metal (chromium plating, iron plating);
- removal of parts from suspension fixtures;
- removal of masking materials.

During chromium plating, parts undergo rinsing in water (in an electrolyte-catching bath) and thermal treatment (heating in a drying cabinet); during iron plating, the process includes neutralization of electrolyte residues, water rinsing, and drying.

Before applying all types of coatings, as well as after applying decorative coatings, the parts are polished.

Parts whose working surfaces have been restored by applying a hard electroplated coating are transferred to the fitting and machining section for final processing.

The annual labor intensity of the section is determined by the total surface area of parts requiring buildup during the year, the duration of the coating process, and the surface area of parts per single bath load. The duration of the electroplating operation depends on the time required for electrolytic metal deposition in the bath and the time needed for loading and unloading the parts. The surface area of parts per bath load depends on the bath dimensions.

When designing the section, the required number of metal-plating baths, polishing machines, and low-voltage power units is calculated [2].

The number of baths is determined separately for each electroplating operation (chromium plating, iron plating, copper plating, etc.) based on the surface area of parts per bath load and the hourly productivity of the bath.

The number of polishing machines is calculated according to the total coating surface area and the hourly productivity of a polishing machine.

The rectifier for powering the baths is selected according to the required current output.

Other equipment and auxiliary fixtures are selected without calculation, according to the technological processes performed in the section.

The number of production workers depends on the annual labor intensity of electroplating operations and the actual annual working time of an electroplater.

The area of the section is calculated based on the footprint of the equipment, taking into account working zones and walkways. The overall dimensions of the section are determined considering the layout of the enterprise's production building.

Equipment in the electroplating section is installed in accordance with the adopted technological process and with the aim of minimizing unnecessary material flows. The main coating baths are placed along the walls, while auxiliary baths (for hot and cold water) are preferably located inside the room. In doing so, the required spacing standards between equipment and building elements must be observed

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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.