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Research Article

TECHNOLOGY OF REPAIR OF PRESS MOLDS FOR PRODUCTION OF MACHINE PARTS FROM STEEL COILS, ALUMINUM ALLOYS

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ABSTRACT

The article provides knowledge and skills on the rational use of equipment of machine tools, a single system of pre-scheduled repairs to extend the service life of metal cutting machines, an inspection of machines, wear of parts and components and modern methods of their restoration, the formation of appropriate knowledge, skills and competencies. In particular, at present, the enterprises producing parts for the local automotive industry, operating in the regions of the Republic, produce products on large press tandem lines and small press machines. Thousands of expensive press moulds are imported from the world's largest machine-building companies, and their maintenance and repair processes are very expensive for localized companies. If there are small defects, problems or repairs in the parts of the press moulds, it is necessary to carry out urgent repair of the mould with the participation of the enterprise and the main manufacturer. There is a solution to the problem of forming the current and capital repairs of small and large press-moulding equipment, the restoration and production of parts and other elements.

KEYWORDS

Press moulds, mould emergency repair, unified system of scheduled repairs, local automotive, maintenance and repair.

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INTRODUCTION

Maintenance and repair of parts and components are carried out in specially equipped mobile or stationary workshops. These workshops will be equipped with the necessary equipment and spare parts, and all the conditions for the work of workers (heating and cooling systems of the building and the mobile workshop, washing and dining rooms) will be created [1-4]. The workshop has special buildings for maintenance and repair work. Indoor washing; division into parts and components (including those that are suitable or unsuitable for restoration); mechanical (this shop is mainly equipped with various machines for cutting, sawing, drilling, tooth extraction, grinding, grinding and other metalworking); metal smelting and heat treatment; welding; diagnostics; collect hardening; There will be painting shops. Organizations with a fleet of construction and reclamation machines will have a base with their own machine maintenance and repair shop [5-11]. The base area is surrounded by a wall, including a residential and administrative building, a workshop, a warehouse of petroleum products built in compliance with fire safety and their storage containers, a device consisting of fire-fighting materials and containers, and fuel. - Lubricant pouring station, car storage room and areas, parking area for repaired cars, storage area for raw materials, external control and washing areas of the machine [12-19]. The base will also have equipment with special prefabricated measuring instruments for maintenance and repair of field machines, various equipment, and portable technical equipment equipped with a set of keys of different sizes.

MATERIALS AND METHODS

The purpose of the work is to improve the basic types of automatic lines, robotic manipulators, conveyors and unique equipment, their components, parts repair technology, post-repair assembly technology, equipment improvement, installation, inspection and maintenance, increase training. Theoretical knowledge of basic devices, important parts, control of automatic equipment, including: digital software and microprocessor control systems, the use of industrial robots and pre-training on how to increase their accuracy and productivity [20-27]. The subject "Repair and maintenance of technological equipment" for students to know and use by professors and teachers in scientific work in the framework of the tasks performed in the process of manufacturing enterprises operating in the region:

- know the development trends, types, structure, principles of operation, basic structures, essential parts, use of technological equipment and methods of maintenance and repair for their rational use, rational use of technological equipment used in machine-building enterprises;
- Professors and students of engineering and technology to ensure their optimal technical and economic performance in the use of technological equipment, the calculation of their service life between repairs, the types of repairs, and the optimal conditions under certain production conditions. Ability to correctly determine the geometric proportions of the design parameters of process equipment and industrial robots to ensure the performance and operating modes;
- Technical and economic and constructive analysis of technological equipment and industrial robots produced and used by the student, determination of optimal indicators and operating modes for their accurate and efficient use, calculation and design of workflows on technological equipment, knowledge of

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automated technological equipment must be qualified to perform the work.

Modern machine building is characterized by the complexity of product design and the rapidly changing range of products, as well as the short duration of production. Under such conditions, it is necessary to accelerate production and increase its efficiency, as well as ensure the competitiveness of the product [28-32]. Therefore, the organization and conduct of maintenance and repair work on a scientific basis for the efficient use of high-performance and high-precision technological equipment is one of the most pressing issues in the effective use of expensive technological equipment.

Repair and maintenance of metal cutting machines. Press moulds are complex high-tech equipment of injection moulding technology. Timely diagnosis and maintenance of moulds are the keys to the successful operation of the enterprise. Repair of press moulds, repair of moulds for making parts from aluminium alloy. If there are small defects in the press-mould parts, we must carry out an emergency repair of the mould in the presence of the customer. Forming and restoring press moulds for moulding and other equipment elements in the production of parts. Using MikroSpot technology, the metal coating (welding with TIG gas-shielded filler wire) allows for practically correcting all defects in the press-mould parts that occur during the operation of the equipment. When repairing a mould with a surface, we select the fillings that match the metal brand and allow its hardness to be maintained. The advantage of welding with a non-consumable TIG electrode is the very high quality of the weld, the absence of slag, and the practical absence of slag. This method of welding and surface coating is universal, allowing it to work with a variety of materials and many types of metal compounds (Figure 1-8).

Figure 1. Coating, expansion of the monolithic sector.

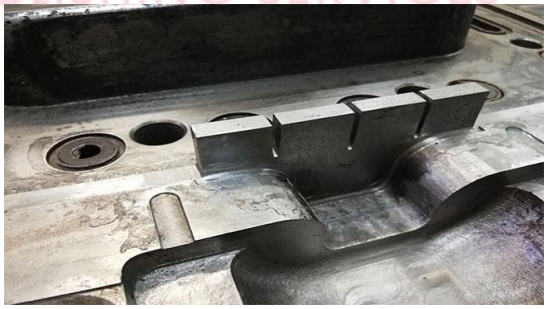

Figure 2. Restored view of the sector.

The hard-coated sector is machined on a DPS machine. View of the post-restoration barrier sector.

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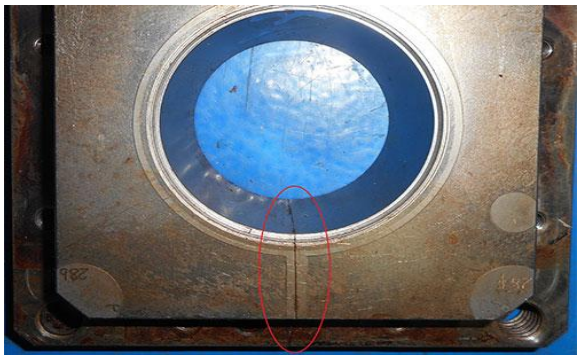

Figure 3. Cracks in matrices.

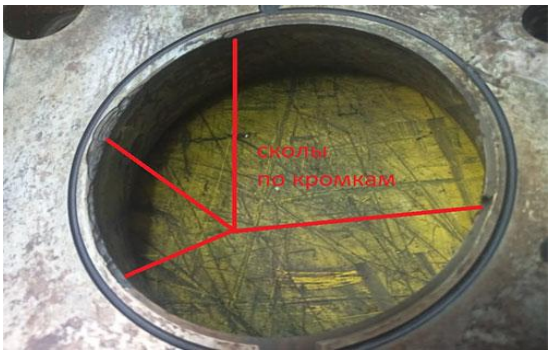

Figure 4. This matrix is a view of the worn edges of the punched plates of the Puanson press mould.

Figure 5. Repair of press-mould dies by filling and welding

Figure 6. Detection of cracks in the corners of the press-mould matrix

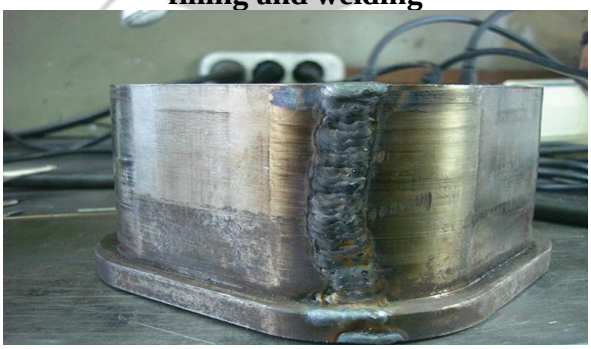

Figure 7. Welding on the outside of the press mould

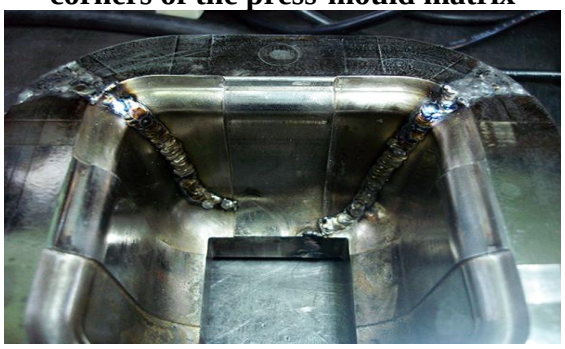

Figure 8. The technology of filling of forming surfaces by filling methods

If the repair of Press-molds is carried out in accordance with the requirements of 10-point series repair, the most complex mould repair will be carried out with high quality. For complete diagnostics or information on the repair of moulds (and other technical equipment):

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1). Press-mold testing is carried out on special TITA test equipment. This allows the detection and formation of casting defects and mould performance defects. Based on these indicators, plan the necessary repairs, indicating the cost and timing of repairs on the initial list of defects.

2). Disassembly (disassembly) and diagnostics of elements, parts, and plates of the press mould, which is planned to be repaired. Approval of the repair list indicates the price and duration.

3). Agree on the types of methods of repair of the press mould, current and capital repairs, agree on the possible results of the work, in particular:

- Operation and maintenance of the mould;
- Injection quality.

4). Carry out a visual inspection of all elements, parts, and plates of the mould, if possible and, if necessary, measure the parts and elements of the mould block. If necessary, agree in advance on a list of additional repairs, indicating the price and duration.

5). Carrying out repair work, agreeing on the current or overhaul options of the mould, agreeing on the possible results of this work, in particular: the performance of the mould, the quality of the casting.

6). Carrying out repair work, and assembling the mould.

7). Coordinate and remedy deficiencies if defects are identified during the block assembly process.

8). Press-mold testing in TITA laboratory device.

9). Processing of press mould and casting defects identified during mould testing.

10). After the repair of the press-mould defect, the mould is re-tested on the TITA device and the results are diagnosed.

Accurate execution of press moulds in the sequence of diagnostics and repair of the mould, detection and elimination of defects in all elements, parts, and plates of the moulds, the most positive results can be achieved in high-quality and efficient repair work.

Prophylactic maintenance of press moulds of structural complexity. The moulds must undergo maintenance and scheduled warning repairs. The service life of moulds depends in many respects on the current service and qualifications of the operator, timely lubrication, elimination of minor defects, timely grinding of scratches, preventive inspections and periodic repairs [33-36].

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Figure 9. External inspection of forming joints and press-mold parts

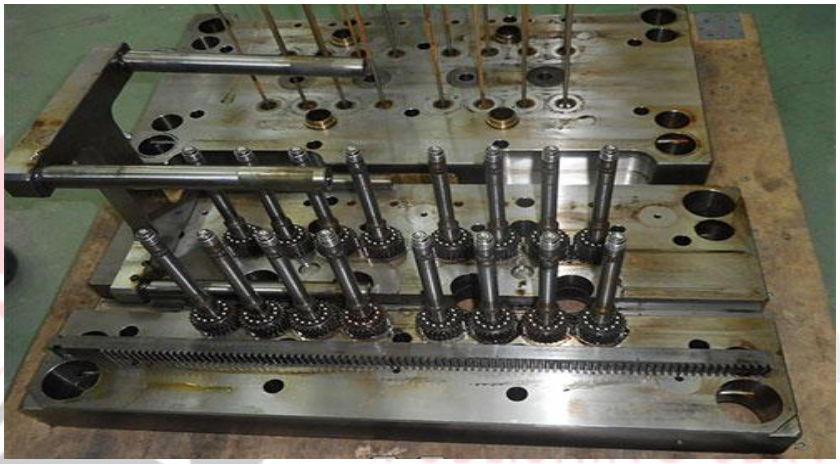

Figure 10. Complete disassembly, inspection, and inspection of all assembled parts

Press mould maintenance and repair list. During operation, the press moulds must undergo periodic maintenance and scheduled notification repairs (DNR). The DNR system for presses and castings for the production of plastic and steel sheet products is subject to organizational and technical measures for the control, maintenance and all kinds of repairs of moulds. The DNR system includes the following basic types of mould maintenance:

- preventive inspection and maintenance of press moulds;
- current repairs;
- medium and capital repairs.

Preventive inspection and preventive maintenance. Depending on the scope of work, the scope of work and the implementation of the work, preventive work is divided into the following types:

- Inter-shift maintenance, depending on the operation of the press moulds performed during the entire shift;
- maintenance after removal of the mould from the equipment, before sending it to the warehouse;
- Maintenance of each shift without removing the moulds from the equipment includes:
- check the fastening and centring of the press mould on the equipment, tighten the bolts if necessary;

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- checking the mould, adjusting and lubricating the guide elements;
- cleaning holes from waste;
- inspection of plates (pushers, rods);
- check the heating plates, replace if necessary or fasten the terminal block of the terminal, replace the heaters;
- check the surface of the parts of the press-mould layer;
- check the smooth movement of the moving parts of the mould, lubricate the moving parts;
- ensure the normal operation of other parts of the press mould and components.

After removing the mould from the equipment before sending it to the spare warehouse, its maintenance includes:

- external inspection of the form, detection, cleaning, lubrication of defects during operation;
- elimination of small defects, fastening, adjustment of individual parts and devices;
- replacement of easily replaceable disassembled and fastened elements;
- quality assessment of moulded products.

Current repairs. Maintenance is a type of light repair in which the replacement of worn parts and the restoration of the required surface coatings of surface elements, as well as the cleaning and casting system ensure the normal operation of the press mould until the next scheduled repair. The current repair of the mould includes:

- partial disassembly and assembly of the press mould by washing and cleaning individual parts;
- replacement of pushers (their installation);
- replacement of forming additives;
- replacement of fastening bolts, checking of threaded holes with holes (driving);
- replacement of fastening screws and rods, pushers, mechanisms of lateral movement signs;
- elimination of rotating cones, precise adjustment of drawing dimensions of individual inserts, die elements and punches with a punch;
- replacement of guideposts and bushings;
- replacement of gear bushings for handles;
- replacement of replacement signs;
- replacement of rods, loading chambers;
- Improving the injection system;
- replacement of side handles, wedges, columns;
- repair or replacement of mould heating system;
- replacement of small sections;
- replacement of fastening pins;
- replacement of individual non-forming parts and assemblies not listed above;
- elimination of bumps, pits, creases in the waste formations;
- Installation and removal of the press mould on the device.

If one or more of the listed works have been completed and the total labour intensity of the repairs does not exceed 20 standard hours, the current repair is considered to have taken place.

Medium and capital repairs. Medium repair - a type of planned repair in which partial dismantling of the mould, overhaul of individual parts, replacement and restoration of the main obsolete parts, restoration of the coating and repair of the forming parts of the moulds, their casting (presses) will be improved in accordance with the requirements of the drawing. An overhaul is a set of works, which includes the complete dismantling of the mould, the replacement of all worn parts with the restoration of all its performance, provided by the technical conditions and drawings. Medium or overhaul of press moulds includes:

- complete or partial restoration of the coating of press-mould parts;

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- preparation and installation of moulding parts;
- production of new punches and matrices;
- Production of new clips and punch holders;
- production of new plates and gaskets;
- production of new slab stocks, slab pushers, other parts of moving sleepers;
- re-grinding of plates and proper adjustment of pushers marks;
- production of new additions;
- Production of new clinics and side mechanisms;
- restoration and installation of worn parts;
- installation and adjustment of new restrictive mechanisms;
- return of works included in the current repair;
- replacement of electric motors, reducers, bearings and gears, hydraulic cylinders, etc.

Due to the complexity of the production of a new press-mould, the labour productivity of the restoration repair:

- 20-30% - for average repairs;
- 40-60% - is allocated for capital repairs.

Parts and equipment plates are made by milling the surface of the surfaces. DPC milling equipment for metalworking can be used to process parts of complex configurations and plates of moulds, mould fillers, calibrators, punches, and plates of other technological tools and equipment. Drilling and planning operations can be performed on these machines thanks to a special tool mounted on the appropriate working heads. Digital control of the equipment increases the productivity of the machine several times, increases the accuracy of processing, as well as precise placement of cutters and other cutting tools. The use of hard-melting tools (cutters, cutters) allows working on surfaces with a hardness of up to 55 HRC.

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