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ANALYSIS OF METHODS FOR ASSESSING THE QUALITY OF CLEANING REPAIR OBJECTS

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Problem statement. During machine repair, cleaning restored objects of operational and technological contaminants is crucial. Surface cleaning involves the removal of liquid and solid contaminants to a specific cleanliness level. Based on the physical and mechanical properties of machine contaminants and their components, contaminants can be conventionally divided into three groups by the complexity of their removal [1]:

I – road-soilcontaminants, fuel-lubricant residues, metal shavings, abrasives, etc;

II – aged grease, oils, residues of cleaning agents, pastes, and mastics;

III – asphalt-tar deposits, carbon deposits, scale, corrosion products, and old paint coatings.

Specific technologies are developed to remove each group of contaminants. Cleaning operations result in achieving a certain surface cleanliness level, making research into effective methods for objectively evaluating cleaning quality relevant [2].

Main research materials. A clean surface is defined as a condition where only an acceptable amount of contamination remains for a given production or process. In repair production, three cleaning levels are distinguished: macro-cleaning, micro-cleaning and activation cleaning.

Macro-cleaning – removesthe largest contaminants that hinder disassembly, defect analysis, and mechanical processing. Contaminant residues should not exceed 0,25–1,25 mg/cm².

During *micro-cleaning*, traces of contaminants remaining after macro-cleaning and light production-origin contaminants (dust, emulsion residues, etc.) are removed. Achieving the level of micro-cleaning is crucial when preparing surfaces for applying paint and varnish coatings and during final assembly operations of units and components, as the cleanliness of surfaces in these cases directly affects the reliability and lifespan of the products. To ensure normal adhesion of paint and varnish coatings, partial contamination with lubricants of no more than 0,005 mg/cm² is permissible.

For assembly operations, the amount of oil contamination on the surface should generally not exceed 0,1–0,15 mg/cm², as higher oil contamination significantly increases the accumulation of dust particles from production areas.

Even after thorough micro-cleaning, the surface remains contaminated with residues of surface-active substances, protective films, and inclusions of foreign substances. Cleaning the surface from such contaminants to prepare it for the application of electrolytic coatings should be classified as *activation cleaning*. For electrolytic coatings, this type of cleaning is an intermediate operation involving the etching of a metal layer 2–15 μm thick. The remaining contaminants on the surface after cleaning are evaluated using various methods: weight, visual, and luminescent.

Weight method – contaminationresidues are determined by weighing the object before and after cleaning.

Visual method – surfacecontamination is compared with a reference scale. A ten-point scale correlates with specific contamination levels:

1 – practicallyno cleaning (residual contamination $C \geq 5{,}0$ mg/cm²).

2 – slightsmear of contamination, most of group I contaminants are removed ($C = 1{,}6$ mg/cm²).

3 – breaks in contamination continuity,group I and most of group II contaminants are removed ($C = 1{,}25$ mg/cm²).

4 – group II and some group III contaminants are removed ($C = 1{,}0$ mg/cm²).

5 – isolated clusters of asphalt-tar contamination and loosened carbon deposits remain ($C = 0{,}75$ mg/cm²).

6 – thin asphalt-tar film residues in some spots; most carbon deposits and corrosion are removed ($C = 0{,}55$ mg/cm²).

7 – isolated carbon deposits, scale, corrosion, and old paint residues remain ($C = 0{,}5$ mg/cm²).

8 – almost complete cleaning. Minor scale and soot residues remain, not exceeding 0,25 mg/cm².

9 – complete cleaning. Possible residual thin oil films detectable by luminescent methods ($C = 0{,}1$ mg/cm²).

10 – complete cleaning. Total residual contamination does not exceed 0.01 mg/cm².

Luminescent method – used to control residual contamination from petroleum products. It is based on the fluorescence properties of certain substances (oils, greases) under ultraviolet light.

Conclusions. Given that the primary cleaning goal is contamination removal, the quality of cleaning serves as the optimization criterion. An analysis of effective methods for evaluating the cleaning quality of repair object surfaces has been performed.

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WORKING CONDITIONS AND PERFORMANCE INDICATORS OF HYDRAULIC SYSTEM ELEMENTS OF MOBILE MACHINERY

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Construction and road machinery includes motor graders, bulldozers, excavators, scrapers, specialized vehicles, agricultural machinery includes forage harvesters and grain harvesters, etc. In these machines, due to its advantages, hydraulic drive has found wide application. More than 90% of single-bucket excavators produced in the country have a hydraulic drive. The share of construction mechanization equipment with a hydraulic drive exceeds 50%. In mobile agricultural machinery, a hydraulic drive for controlling working equipment has found 100% application, and hydraulic transmission is used in almost all combines of both domestic and foreign production.This is confirmed by the analysis of literary sources [1], which showed that modern combine harvesters DON-1500/1500B/1500M/2600/091, Yenisei-1200/950/960/9, forage harvesters KSK-100, DON-750/680/680M, Polissya-250, mower-conditioners DON-800, KPS-5G, root and shoot harvesters RKM-4, RKM-6, KS-6B, concrete mixer trucks SB-92V/159B/172-1/237, SMB-060, as well as foreign equipment from corporations "John Deere", "Claas", "Case", "Massey Ferguson" and others, are equipped with various hydraulic systems that include a volumetric hydrostatic drive of the transmission (ГСТ).

The developer of the volume hydraulic drive (ГСТ) is the Sauer company, which was founded in 1946 in Germany. Over the years, the company has developed and produced axial piston pumps and hydraulic motors of the 15, 20, 40, 42, 51, 70, 90 series.

ГСТ-90 is an analogue of the 20th series of axial piston pumps and hydraulic motors and is most popular in our country and neighboring countries.

The general view of the hydraulic drive of the ГСТ-90 transmission is shown in Fig. 1.

Volumetric hydraulic drive ГСТ-90 (Fig. 1) includes an axial-plunger pump 3 with an adjustable working volume, a non-adjustable axial-plunger