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METHODS OF REDUCING CORROSION PROCESSES OCCURRING AS A RESULT OF DUST AND MOISTURE INFLUENCE ON TRUCK CHASSIS

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Abstract. The topic of “Reducing corrosion processes occurring as a result of dust and moisture exposure on truck chassis” is very relevant in the automotive and transport sector. Since the stability, reliability and service life of the chassis largely depend on the degree of prevention of chassis corrosion.

The article considers the corrosion process in a broad perspective, presents the main factors, prevention methods and recommendations with technical tables.



Corrosion is the weakening of metallic materials through chemical or electrochemical processes. In this process, the metal gradually oxidizes, and the core of the structure begins to deteriorate. As for the chassis, road conditions, dust, humidity, salty soils, increased precipitation, and evaporation during trips turn the chassis into a “damaged environment”.

For example:

• The metal body is exposed to external influences.

• Moisture or sand can accumulate in confined spaces under bearings, joints, and applied coatings.

• Salt or potash solutions found on the road, sandblasting materials, accelerate corrosion.

Therefore, corrosion should be taken into account at all stages of the chassis design, from material selection to service methods. In this case, the damage caused by corrosion can be: reduced chassis strength, losses, increased repair costs, and even safety issues. Dust and moisture affect the chassis in the following ways:

• Dust, sand, and micro-fluids accumulate in the chassis's base structure, trapping moisture, which increases the moisture remaining in contact with the metal and accelerates the corrosion process.

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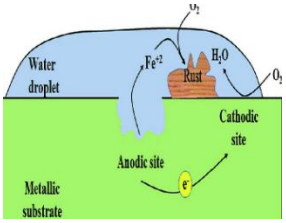
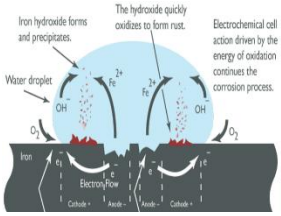
• Moisture (precipitation, evaporation, ingress of water) leads to oxidation of the metal, especially if the coating is damaged.

• Road salt or chemicals (for de-icing roads) act as an electrolyte when in contact with the metal and increase electrochemical corrosion.

• Joints (joints, gears, bolts), internal cavities of the chassis - these are places where moisture and dust can easily accumulate.

• Perhaps the chassis design allows for "reserve" areas, which accelerates corrosion.





The corrosion process usually proceeds as follows:

• Metal (for example, iron or non-ferrous metal in the chassis) oxidizes when it comes into contact with water or oxygen.

• If there are salt solutions on the road, they act as electrolytes, activating an electrochemical reaction.

• Galvanic corrosion (when two different metals are in contact with each other) can develop more quickly. For example, this occurs when bolts on the chassis are directly connected to unprotected metal.

• The result: melting of the metal layer, internal holes, the appearance of light-colored oxides (red), a decrease in the strength of the chassis.

• Certain factors and their degree of influence can be shown in the form of a table:

Factor	Impact Level	Comment
Salt solutions on the road	Up	If salt is used in road financing
Humidity/Evaporation	Medium–high	Monsoon rainfall, in interior spaces
Dust/sand	Medium	Sand fills the gaps that have not been cleared
Joints/bolts	Medium	Lack of protection in bolted joints
Improper attachments	Up	Corrosion is rapid if the coating is damaged

Monitoring charts are necessary to detect signs of corrosion in a timely manner.
For example:
Symptoms:

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• Reddish or old-colored oxidized metal spots
• Dense iron deposits or stains around bearings or bolts
• Moisture or sand accumulation in the internal cavities of the chassis
• Cracks or areas under the coating
• Significant decrease in metal strength, the appearance of holes in the metal

The choice of material is of great importance in corrosion protection.

For example:

• Galvanization is a method of coating iron with zinc, an effective method of combating corrosion.

• Coating (primer, epoxy, powder) - protects the dry part of the chassis.

• High-quality, high-strength, non-hammer-resistant sheet metals can also be used. The following should be taken into account when choosing:

• The strength of the metal and its microstructure - density, absence of cracks, seams
• The thickness of the material and the distribution of the coating
• Bolts, additional elements - they must also be made of materials in accordance with the policy (avoid dissimilar metal contacts)
• The possibility of inspection and recoating of coatings

The following points can be taken into account when designing the chassis, which will increase the possibility of reducing corrosion:

• The absence of gaps where water or dust can accumulate, or their provision for easy washing (for example, drainage holes).
• The absence of gaps in bolts, threads, joints (gaps) - this reduces the possibility of dust accumulation and water stagnation.
• Ensuring proper (eventually repairable) continuity in the coating and steel layers.
• The implementation of metal parts in isolation - insulation when joining dissimilar metals to protect against electrolytic corrosion.

Thus, the efficiency of production is greater if corrosion is taken into account from the design stage.

Conclusions and recommendations

As discussed in the article:

• Truck chassis require effective corrosion protection.
• Factors such as dust, humidity, salt and sand must be monitored.
• Approaches at all stages, from material selection to design, coating, washing and prevention, must be consistent.

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• It is necessary to implement in practice, supported by inspections, schedules, and control systems.

Recommendation: Continuous and systematic implementation of the indicated preventive measures by all means will significantly reduce the costs of corrosion in transport fleets.

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