1.1.9. COERCIVITY METERING AS THE BASIC METHOD OF A NON-DESTRUCTIVE TESTING OF FATIGUE AND AS THE PRIORITY METHOD IN THE DIAGNOSTIC SET

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Here "*coercivity metering*" (c.m.) means a non-destructive testing of the mechanical properties, deflected mode and fatigue capacity based on measurements of the magnetic characteristic of metal – i.e. coercivity.

The objective assessment of the metal state should be formed of data on deflected mode (fatigue state) and presence of flaws in it. Modern diagnostic is mainly based on the flaw-detection data because in practice of the mass non-destructive testing there were no tools and methods of the metal fatigue assessment. Whereas fatigue flaws of metal are a result of progressing of its microdamages.

Today the coercivity metering allows revealing and making qualitative and quantitative assessment of any changes in a deflected mode and of fatigue state by the methodical, instrumental, fast, simple and low-cost way. It provides completeness of initial data for diagnostic. Measurements are performed without cleaning and contact liquid, directly through a protective coating up to 5–6 mm thick! Nothing else, except for fatigue changes in metal, will force a good coercimeter to show inadmissible values in the given zone of control. For constructional steel of wide application the coercivity increases by 100 – 400% (depending on a grade) while metal "lives" from a state of delivery to its destruction.

In stress concentration zones an accumulation of the fatigue microdamages occurs with advance. When achieving a specific damage degree (inherent to each grade of metal) it became reasonable to perform metal flaw detection as well. Till this moment the fatigue flaws in metal simply are not present. Such an aiming and selective approach reduces scope and cost of diagnostics, and improves their reliability.

The sizes of zones-concentrators essentially exceed those of fatigue flaws that inevitably arise in them; location of such zones is not casual, and it is predetermined by logic of design and distribution of the applied loads. Therefore fatigue zones, as being big and logically located, can be identified much easier, than the metal flaws being distributed in them in casual enough manner.

If measurements of the coercivity are performed first, as survey, we operatively obtain the general conception about a real current state of whole object. Here, at once, stress concentration zones and degree of metal degradation in them are well visible. It enables to make a well-grounded decision as regard to use or not to use other metal control method depending on real fatigue state, including also flaw detection in all its varieties, but already in precisely outlined locations and scopes.

The quantitative assessment of the metal fatigue state based on coercivity metering allows forming an integrated numerical characteristic of a state of whole object, as the weighed sum of the same c.m. numbers – indexes of fatigue of its assembly units or constructional elements. Here the comparative and absolute degrees of deterioration of the equipment, quality of its operation are well visible. On such a basis it is possible to make the well-grounded decisions on priority, expediency and scope of repairs, not blindly, but based on metal state, exactly within the limits of its inadmissible fatigue damage. The most effective operational strategy of the branch, enterprise, shop, facility, providing the maximal efficiency factor of the equipment is formed at the minimal expenses. Thus the correct introduction of additional method – coercivity metering – reduces scopes of diagnostics, decreases their cost and enhances certainty.