Energy Concept of Technical Equipment's Stressed-Strain State Control

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The problem of mechanical stress control in operated structures in order to assess their condition is currently being addressed by all the leading diagnostic centers throughout the world. However, most methods of stress control, well studied and mastered in laboratory conditions on specimens, are ineffective when applied in practice. It is known that the main sources of equipment damages are stress concentration zones (SCZs), in which metal corrosion, fatigue and creep processes develop most intensively. SCZs are not only the areas known ahead, where the structure features create various conditions for distribution of stresses due to external work load, but these are randomly located areas where large strains occurred due to initial inhomogeneity of the metal structure combined with off-design additional work loads. Structural and mechanical properties of the metal need to be primarily studied exactly in SCZs. Existing conventional methods of non-destructive stress control (X-ray, ultrasonic testing (UT), Barkhausen noise, etc.) do not allow to solve this difficult task – detection of SCZs due to workloads on the equipment. In addition, conventional methods and means of non-destructive stress control, which are based on active interaction of the instrument signal with the structure metal, obtain indirect information about the inspected object's stress state, i.e. have insufficient information content of the physical fields used in the control. The paper discusses the problems of technical equipment's stress-strain state (SSS) control and their solution based on the energy ratio between the magnetic and mechanical parameters used in the metal magnetic memory method. Examples are given from the practice of the MMM method application during SSS control of individual equipment parts and components.