

Book Review

Non-Linear Wave Mechanics and Technologies

Book Authors: R. Ganiev, L. Ukrainsky

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The research book is devoted to systematic presentation of fundamentals of non-linear wave mechanics. This is a new field of mechanics and it serves as a basis for wave technologies, which find wide applications in engineering in recent years.

The authors have discovered new wave and oscillation phenomena, which are used as the basis for high performance wave technologies. Those technologies find application in a number of branches of industry such as production of gas and petroleum, recovery of oil and gas, production of energy, machine building industry, refining industry, petro-chemical industry, food industry, ecology and environmental engineering, technology of materials, production of nano-composites, construction materials industry, cosmetic industry, production of pharmaceuticals and drugs. A number of models and prototypes of machines and devices, the operation of which is based on the principles of wave technology developed by the authors, are described in the book.

Non-linear wave mechanics is a new field of mechanics and serves as a scientific basis for wave technologies. The authors in the process of development of this new field of non-linear wave mechanics discovered a number of new vibration and wave phenomena and effects. On their basis the authors proposed a number of new wave technologies that are widely applied in industry. This enables manufacturing of materials and products of much higher quality as well as to save energy used in the process of production. The authors developed a new direction in machine building, which is called wave machine building.

New mathematical models were developed by the authors in non-linear wave mechanics. They are based on numerical methods and analytical methods of non-linear mechanics (methods of small parameter, asymptotical methods, averaging methods, theory of stability of motion), which were modified for the case of non-linear resonances. Analytical methods of non-linear mechanics enabled to determine a number of new wave phenomena and effects. Of special importance are the investigations of non-linear vibrations of multi-phase systems and of discovered wave mechanisms of motions. Controlled motions of multi-phase systems are created by using wave and vibration processes. By active or passive control of small wave and vibration motions in the conditions of non-linear resonance interactions the dynamical characteristics of multi-phase systems are essentially changed. Vibrations generate not only vibration motions, but also various periodic and monotonous motions, stabilization of statuses of equilibrium and other resonance effects. In non-linear multi-phase systems a great number of resonances may take place and their regions of attraction are much wider if compared with conventional resonances.

R. Ganiev is an Academician of the Russian Academy of Sciences, Professor, Doctor of Technical Sciences, a world known specialist in mechanics and machine building, non-linear vibrations and wave processes, dynamics of machines and devices, and of wave technologies in various fields of engineering. L. Ukrainsky is Doctor of Technical Sciences and is a well known specialist in the field of theoretical and applied mechanics, theory of non-linear vibrations of multi-phase systems, and also of the dynamics of fluid and gas.

The book is recommended for scientists, researchers, engineers and representatives of industry in charge of innovative development.