

Applications of Ultrasonics

The field of the applications of ultrasonics is extremely wide. Some of important are the following:

(i) Depth of Sounding:- Ultrasonic waves are used for signalling for finding the depth of sea and to detect the positions of submerged rocks, submarines and ice bergs.

(ii) velocity of sound in liquids:- Ultrasonics have been used to find the velocity of sound in liquid available in small quantities. This determination reveals many physical and chemical properties of the substances.

(iii) Thermal effects:- A fluid subjected to ultrasonics shows a slightly higher temperature than that of its surroundings due to absorption of waves.

(iv) Elastic Symmetries of Crystals:- When ultrasonic waves are passed through a solid or liquid and a beam of light is made to travel in a direction at right angles, the ultrasonic wave system acts like a grating. The compressions act as lines of greater density or opacities and rarefactions like lines of lesser density or transparencies.

If ultrasonic waves are applied to an isotropic crystal they give rise to interference fringes from which the elastic symmetry of the crystal can be determined.

(V) Chemical effect! - Ultrasonic waves have been used to form stable emulsions of immiscible liquid like water and oil, to liquify gels like aluminium hydroxide in the same manner as they are liquified by shaking to coagulate a colloidal system of colloidal particles dispersed in a gas, smoke or fog to accelerate crystallisation and to produce oxidation.

(vi) Biological effects: - Small animals like frog, fish, etc are maimed or killed when exposed to these waves. Micro-organisms like bacteria are torn to pieces or burnt or otherwise destroyed and yeast loses its power to reproduce.

(vii) Industrial uses! - Ultrasonic waves have been employed for cleaning clothes and objects like parts watches etc. Ultrasonic beam shakes the dirt out of the cloth in water. In textile industry it is used to improve the dyeing properties of dye suspensions.

(viii) Medical uses! - Ultrasonic vibrations have been found to produce soothing massage action on affected joints. Doctors have actually used them to cure neuralgic and rheumatic pains. They have also been used to localise tumours in the brain.

(ix) Detection of flaws in metals! - The fine internal cracks and flaws in metals act as good sound reflectors of ~~an~~ ultrasonic wave whose wavelength is small compared with the size of the cracks or flaws. Hence they can be detected and located by echo-sound techniques.