The classical condition monitoring techniques for stationary conditions of machinery will be presented: i.e. the classical second order and higher order techniques. However, for some important practical applications it is necessary to perform diagnosis for transient conditions of machinery. The classical techniques are not suitable for those conditions. Novel condition monitoring techniques will be presented for transient conditions of machinery. Validation of these novel techniques by simulation and experiments in laboratory and field conditions will also be presented. It is shown that the proposed techniques offer an essential improvement (up to 70%-150%) in effectiveness of damage diagnosis in comparison to the traditional techniques.