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Quantification of Defects in Radiography for Space Applications

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Abstract

Radiographic Testing is used extensively for qualification of solid and liquid propellant stages of all launch vehicles. High energy radiography is the principal NDT method for the inspection of large size solid boosters used in PSLV/GSLV programme. Generally in the conventional film radiography only two dimensions of the defect are obtainable. Many a time, in order to carry out detailed structural and ballistic analysis of flight motors, it is required to characterise the flaw completely including its spatial location and the hidden third dimension. While the location can be obtained by triangulation exposures, the third dimension has to be estimated based on optical density values of the image. If the defect is in the form of a cluster in large objects as that of solid motors, the above method gets complicated warranting the use of microdensitometer and multi-angular exposure for characterisation of the defect-cluster. A rigorous approach based on contrast sensitivity formula needs experimental estimation of build-up factors and film gradient values. This approach is used to estimate the effective depth of void-cluster and is presented in this paper. Linear response characteristic of X-ray film is used for estimation of inclusion thickness. This approach has been used in carrying out NDE of the cryogenic upper stage (CUS) engine thrust chamber. Details are presented in this paper.