New developments in thermal stress analysis by infrared thermography.

Pierre Bremond
Cedip Infrared Systems
pierre.bremond@cedip-infrared.com
Pierre Brémond
Export sales manager Industrial application and thermography
pierre.bremond@cedip-infrared.com
19, boulevard Georges Bidault
77183 CROISSY BEAUBOURG - France
Tel.: +33 1 60 37 55 01

Abstract:

It is well know that Infrared Thermography is a powerful full field non contact technique to measure temperature. Its field of applications covers all industries from chemistry to agriculture without forgetting medicine. Most of applications deal with high temperature measurements and measurements on moving, very small or inaccessible objects. It is less known that infrared thermography can be used to measurement minute changes of temperature and its associated origin.

Thermo elastic effect is known since the middle of the 19th century as the conversion between the mechanical forms of energy and heat. It occurs when changes of stresses within a material element alter its volume. Density of energy created in material element is transformed into local change of temperature. As specific heat of metal is high this phenomena is very small in terms of temperature change. Roughly 1MPa stress produces a temperature change of 1mK in steel. Moreover conversion takes place only during dynamic test. So it is not surprising that this technique started to be used with the first non contact temperature measurement technique in the late 60's.

Nowadays FPA detector technology and Lockin processing technique allow measuring stresses thanks to that effect without any problem. Thermo elastic stress analyser is on of the most powerful tool for mechanical engineering.

This article will introduce some of the application of thermal stress analysers and new developments.

Key words: mechanical energy, stress, fatigue, infrared thermography,