

Infrared inspection of carbone fire materials with induction heating

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Nowadays carbon fiber reinforced plastics (CFRP) become common construction materials and widely used in aerospace, naval and other sectors of industry. One of the most reliable method for CFRP inspection is infrared method (thermal testing). The usual heat sources for infrared inspection (Halogen lamps flashlights etc.) also the hairdryers and UT stimulation can be applied. All this heat souses have a lot of limitations: • interference of heat indications and overheated skin layer (one side inspection). • impossibility of cracks detection normal to heat input surface, •low maximal inspection thickness. •limited heat input (to avoid damage surface layers and coating). Induction heating can solve all this problem. The inductive heating of carbon fiber technology appears simultaneously in several technological centers. The phenomena of induction heating – that the low frequency (50 – 500 K HZ) Electromagnetic field induces the eddy current in carbon fibers. This partial conductivity of fibers is enough to create current circuit inside carbon fiber and produce heat. The damages in carbon fibers change the eddy currents circuits and change the thermal picture. • The inductive heat higher contrast (the change of fibers electric conductivity is many times more than change in heat conductivity) • Greater thickness of possible material thickness for inspection (the heat comes to surface from inside of material it reduces heat path twice). • On the surface thermal indication from imperfection are not interfering with overheated surface. Our company performs a lot of experiments with CFRP induction heating and in addition to very positive results of Induction heating application the next phenomena were founded. In case of two side inspection with low frequency field – opposite side of CFRP part will be heated proportionally to amount of field which pass through the thickness of material. The temperature on opposite side of CFRP plate depend on conductivity of layers “shielding” the surface layer from the induction source. As a result, we can see the imperfection immediately at the moment of field application, without any time delay for heat spreading process. This Phenomena can greatly increase the performance of infrared inspection in case of two side technic.