X-Ray Technology Myth – Explained

Within the world of x-ray inspection, there has recently been a great deal of hype about a supposed 'great new technology' which monitors and controls the stability of output of an x-ray tube to ensure consistency of image quality for the Operator when running automated inspection programs repeatedly over a period of months. This 'new technology' goes by several different names such as 'flux calibration', 'tube stability feedback', X-ray Intensity Control', etc. It has even been said that certain Salesmen are telling potential customers that without their 'patented gizmo', the machine may be dangerous to operate. This is wrong. Any possible tube instability cannot, of itself, lead to an escape of radiation. The only way that there could be a possible radiation leak would be if there was serious and substantial damage to the radiation shielding of the system.

Should the design and manufacture of a particular x-ray tube mean that it is more likely to be unstable then the more important this type of 'stability control' becomes. So there is a view that tube stability assistance is a big deal for some companies perhaps because until they had discovered this 'great new thing' they had problems with their machines? This could be why it is suddenly hitting the headlines and being promoted by several companies as something which they have and the competitors do not.

In reality, this technology of 'flux calibration' is nothing new and has been around, in some way, shape or form, as long as 'open' style x-ray tubes have been produced. There are different solutions to providing the same aim and some better than others. Dage, for example, has a system called 'TCC', which has been fitted to every x-ray tube it has ever supplied over the last 7 years. TCC works by maintaining a constant number of electrons (the target current) striking the x-ray target for the output required and this is directly related to the x-ray intensity. This is achieved through a high-precision screened amplifier circuit which is connected to the transmission target. This circuit monitors the number of electrons hitting the target by measuring the current flow with an accuracy of better than 100 nano-amps. Advanced software then reads the amplifier circuit 50 times a second and monitors for any change in the value. If a change is spotted, then the cathode emission current is automatically raised, or lowered, to correct for any drift. This software control loop has to be carefully weighted as a second order system so that the speed of response to any change keeps the target current within precise limits. Dage's TCC approach enables its x-ray tube output to be stable to within 0.5% over a continuous running period of over 20 hours and gives excellent repeatability over time.

What may not be immediately obvious when 'flux calibration' is raised as 'an issue' is that there is a second factor that can affect x-ray output. This is the wear of the x-ray transmission target itself. Speed of target wear is dictated by the target current used and the quality of vacuum within the tube. While Dage's open x-ray tubes have a simple indexing system allowing target rotation to give a fresh target area for the electrons to hit, they have also developed something even better. In the Dage NT tube, a 'sealed transmissive' tube, the typical vacuum level is 5000 times better than in any open tube. As such, the wear rate of the target in this tube is phenomenally low. However, to ensure the wear on the target never affects image quality and resolution, the patented NT tube

automatically rotates the target to a new spot every 250 hours of x-ray use. This is one of the many advanced features of Dage's technology, which also includes automated calibration, optimization and maintenance routines.

So is 'flux calibration' new? Does one company have something unique? No. Myth Busted!