

eliminating image degradation from x-ray screen burn damage in high energy x-ray imaging

Advances in custom screen design & production offer significant advantages over conventional X-ray screens in eliminating X-ray burn damage in high energy X-ray imaging. Such improvements are to the maintenance of image quality in highly demanding applications

Background

High energy, high dose X-ray imaging is a key tool in quality analysis of steel, titanium, alloys and composites – essential in such markets as aerospace manufacturing. Similarly, the technique is relied upon across a wide range of machine vision applications involved in the manufacturing of pcbs, semi-conductors and structural components.

At high X-ray doses, organic compounds commonly discolour or “burn”. However, polymeric binders and adhesives are critical elements of conventional X-ray screens which are fundamental to the X-ray imaging process.

In the applications and markets highlighted (and many others) burn in the X-ray screen can cause imaging defects which could mask genuine structural flaws in the component being analysed.

It is therefore vitally important to ensure that such burn effects are minimised.

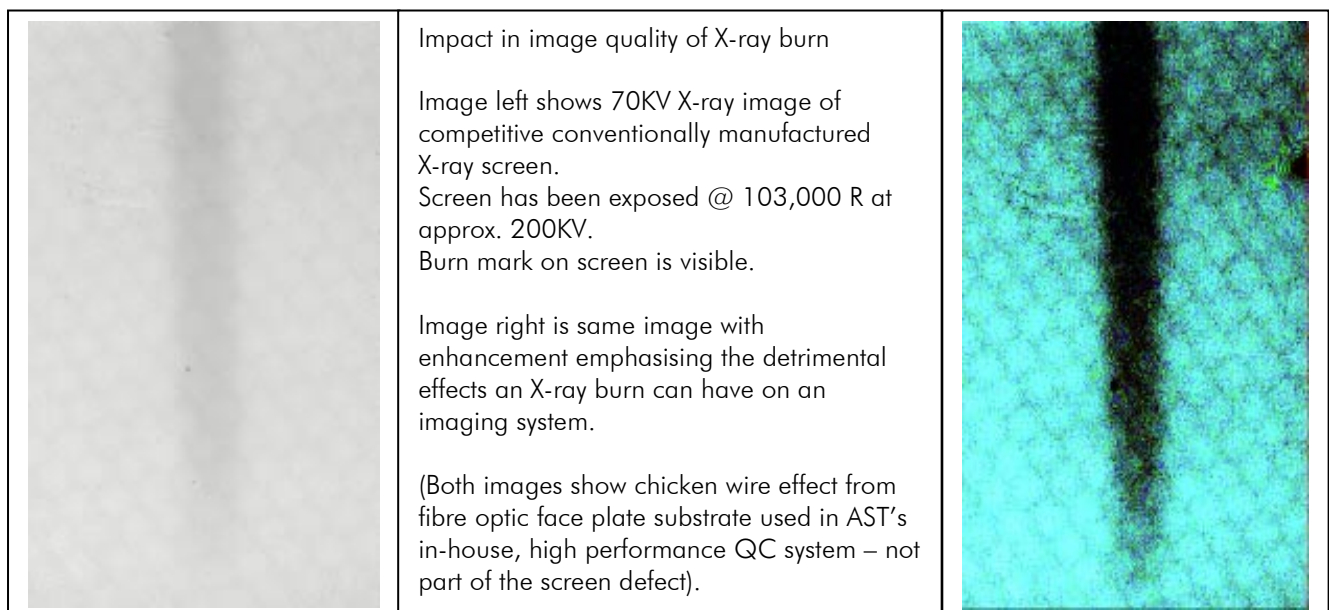
Applied Scintillation Technologies Assessment

Recognising demands of the market place, AST undertook an extensive evaluation programme of the source burn under high dose X-rays.

Evaluation of results from high flux synchrotron studies in collaboration with a number of UK based research institutions showed that the most commonly utilised phosphor – terbium doped gadolinium oxysulphide ($Gd_2O_2S:Tb$) – was not damaged and indeed showed indications of improvement through annealing processes under X-ray exposure.

This confirmed AST’s assessment of the material as being a generally robust phosphor scintillator. This led to the conclusion that the source of burn must be in the organic binders or reflectors utilised in screen construction.

AST, utilising its extensive in-house analytical facilities, located the vulnerable chemical component and developed an optimised solution to address the problem.

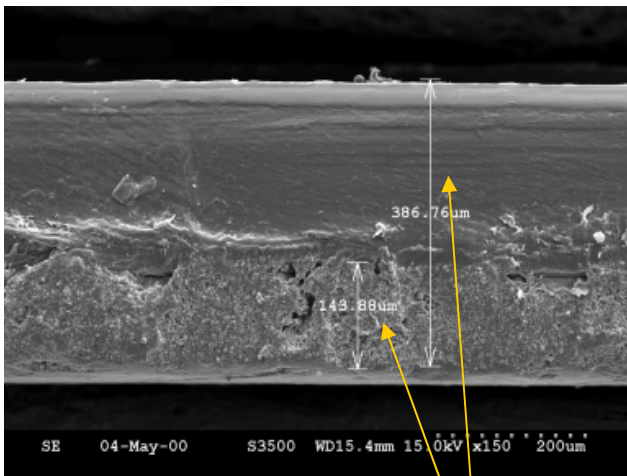


The Applied Scintillation Technologies Solution

Conventional screening technologies rely on a wet web process – the phosphor and reflector both being carried in a polymeric matrix which closely bond to create an essentially plastic screen. This construction is the source of the burn problems shown.

To address this, AST developed a screen construction which eliminates the polymers in the binder and minimises the organic binder content of the phosphor layer. Further an additional wipeable layer is provided for added protection.

This construction in which the layers are distinct and in which the polymer content is much reduced has been proven by our customers to be a significant advance in X-ray screen lifetime in high flux applications



SEM image of competitive X-ray screen showing integration of TiO₂ loaded polymer reflector and high polymer content binder in phosphor layer

screen approx 38mg/cm², 4µm particles

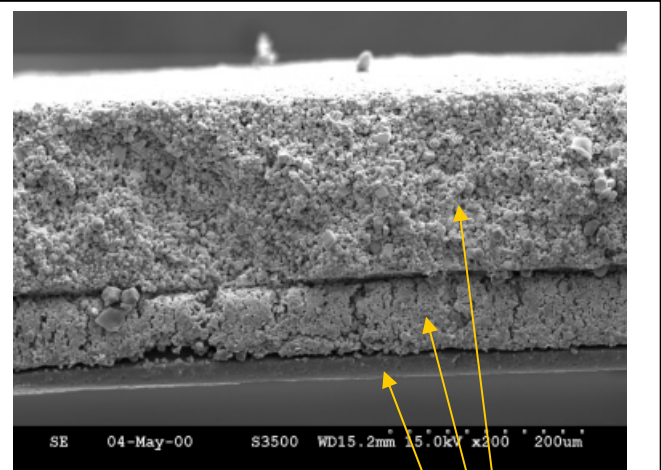
- ❖ reflector layer
- ❖ phosphor layer
- ❖ no protective layer

AST Products

AST supplies custom X-ray screens for a wide range of markets.

These screens are optimised to give maximum system performance for each application with phosphor type, coating weight, screen construction and other variables carefully selected to give required performance.

Screens are available in sizes up to 1.5 x 1.0m and up to 400mg/cm² – the largest and most highly absorbing commercially available X-ray screens



SEM image of AST screen showing distinct 3 layer construction with burn free reflector and protective overcoat

screen 94mg/cm², 10µm particles

- ❖ reflective card
- ❖ phosphor layer
- ❖ protective overcoat

Summary

AST's X-ray screens offer optimised performance and demonstrate superior life-time characteristics to competitive products with X-ray burn under high flux being eliminated.

Applied Scintillation Technologies has the knowledge and expertise based on years of experience to partner you in the development of custom products for high quality, extended lifetime X-ray imaging. Resolution, sensitivity, speed & colour of response are a few of the parameters that can be influenced in the production of a customised product that more closely relates to your customer need.

- ◆ A customised product is often a more cost effective solution
- ◆ Formulations can be developed to meet your specific requirements
- ◆ Exceed your initial expectations through partnership development
- ◆ An ISO9002 company – quality assurance is guaranteed through every delivery
- ◆ Product differentiation can provide unique product positioning versus competitors
- ◆ Enjoy continued product development and technical support through partnership

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