The manufacture of lead shielding subassemblies for use in CAT scan machines by Steve Madonna

Article published on May 9th 2012 | Business

CAT (computer axial tomography) scan machines are used primarily in the medical field to produce three dimensional images of the inside of an object â€“ typically part of the patientâ€™s body. The CAT scan device is basically a very sophisticated X-ray machine that uses a controlled beam of X-rays to distinguish various structures in the body via multiple exposures and computer software to integrate the data into 3 dimensional images of the structureâ€™s within the body.

In addition to the main use of medical testing CAT scans are also used in other fields such as non destructive material testing â€“ looking for hidden defects and so on â€“ and in archaeology for example to examine the inside of sarcophagi.

Among the many critical components of the CAT scan instrument is the lead shielding subassembly. This is a highly sophisticated machined component consisting of an aluminum housing assembled together with lead sheet and lead foil of varying thicknesses. The subassembly contains the X-ray generator, and provides protection to the X-ray technicians and the patients and also aids in the control on the X-ray beam that is critical to the correct functioning of the device.

This article describes the process steps at capabilities required to make this important subassembly. Nuclead is among the few companies in the USA that has in house the capabilities to perform all the steps required for this assembly.

Step 1 â€“ Spin Aluminum Housing

The first step is the manufacture of the housing for the radiation shielding assembly. The housing consists of several concentric cylinders and discs manufactured from Aluminum.

The various aluminum structures are manufactured from solid aluminum by a process known as metal spinning. This is a process typically performed on a CNC machine these days though it is possible to perform the process by hand using a regular lathe.

The process starts with a formed block that is in the shape of finished component, which is attached to the CNC machine rotating drive. A disk of the material to be formed is clamped against this and lathe brought up to rotation speed.

The work piece is then forced to flow over the formed block by the use of a spinning roller. The friction between the rotating roller and the workpiece provides the heat and force required to shape the metal into its final configuration.

The lead shielding sub assembly housing is a fairly complicated structure and is therefore manufactured is several pieces and assembly to make the final structure.

Step 2 â€“ Machine housing components and weld

The next step is to assemble the various components manufactured in step 1.

In order to get good seal the edges of the components, where they will be joined, will have machined into them male and female connecting edges into them. After this the various pieces are welded together to form the radiation housing for the CAT scan machine.

Care must be taken when welding aluminum. In particular the surfaces should be treated to remove aluminum oxide.

Step 3 â€“ Laminate with Lead Shielding

Next the housing must be lined with lead sheeting to provide the radiation protect for the technicians and patients and to help focus the X-ray beam.

The thickness of lead required is dependent on the peak voltages generated by the X-ray coil. For example X-rays generated with a peak voltage of 200kv requires a minimum thickness of 4 mm.

The lead sheet is cut to shape so that it is an exact match for the lead shielding subassembly housing. The lead sheet is then attached using pressure sensitive adhesives (PSA). PSAs require no solvent, water or heat in order make the bond. The lead sheet to aluminum bond is formed and the strength of the bond is determined by the pressure applied.

Step 4 â€“ Assemble completed components

After the lead laminate is applied any required final assembly is completed

Step 5 â€“ Finish subassembly

The final assembly can be finished either by powder, polishing or painting

Conclusion.

The x-ray tube housing subassembly is an important component in the construction of a CAT scan machine. The manufacture of the sub assembly itself includes several sophisticated process capabilities that the average machine shop would be unable to accomplish. These include lead shielding knowledge, lead lamination, CNC machining to tight tolerances using CAD drawings.

Article Source:
http://www.articleside.com/business-articles/the-manufacture-of-lead-shielding-subassemblies-for-use-in-cat-scan-machines.htm - Article Side

Steve Madonna - About Author:
Nuclead offers a lead shielding & lead flashing, lead bricks & sheets, lead based alloys, lead bar stock, lead bullets & extrusions, lead weights, ingots & other lead products.

Article Keywords:
lead shielding, lead bricks, lead sheets, lead flashing, lead weights and ingots, lead products

You can find more free articles on Article Side. Sign up today and share your knowledge to the community! It is completely FREE!