Automated X-Ray Quality Control of Catalytic Converters

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Catalytic converters are devices attached to the exhaust system of automobile or other engines to eliminate or substantially reduce polluting emissions. They consist of coated substrates enclosed in a stainless steel housing. The substrate is typically made of ceramic honeycombs; however stainless steel foil honeycombs are also used. The coating is usually a slurry of alumina, silica, rare earth oxides and platinum group metals. The slurry also known as the wash coat is applied to the substrate in two doses, one on each end of the substrate; in some cases multiple layers of coating are applied. X-ray imaging is used to inspect the applied coating depth on a substrate to confirm compliance with quality requirements. Automated image analysis techniques are employed to measure the coating depth from the X-ray image. Coating depth is assessed by analysis of attenuation line profiles in the image. Edge detection algorithms with noise reduction and outlier rejection are used to calculate the coating depth at a specified point along an attenuation line profile. Quality control of the product is accomplished using several attenuation line profile regions for coating depth measurements, with individual pass or fail criteria specified for each region.