High frequency eddy-current testing for the inspection of chromium coated fuel rods

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The Fukushima nuclear disaster has prompted several investigations into the cause of the accident and led to an increase in the number of safety measures in nuclear power plants. One measure that is expected to increase safety is the application of a chromium protection layer on the zirconium cladding tubes that contain the nuclear fuel. The coating increases the corrosion resistance and reduces the mass increase of the cladding tubes under temperature supply. To ensure a uniform chromium layer of optimal thickness, this must be monitored during production at speeds of 0.2 m/s. A 100 percent surface inspection is vital for the fuel rods. For this purpose, a high frequency automated eddy-current testing system is being developed, which will record the thickness of the layer as well as detect cracks in it. The sensor system is controlled by eddy current electronics developed at Fraunhofer Institute for Ceramic Technologies und Systems IKTS. To provide a noncontact thickness measurement of the 0.005 to 0.018 mm thick chromium layer a new eddy-current probe has been designed. A lift-off independent thickness signal is important for noncontact inline inspection. Therefore, lift-off compensation methods needed to be investigated. The experimental results of those investigations and the application of new signal-processing techniques will be presented in this contribution.