Preliminary Study for a Low Cost Gamma Tomography Tool for Corrosion Detection in Industry

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Abstract
Techniques for non destructive testing (NDT) are increasingly used to control industrial equipment in Morocco. These techniques can provide valuable information for determining the quality of equipment. Despite the effectiveness of these techniques, some devices require more advanced technology for their control. This is the case of internal corrosion, which is considered the main enemy of industrial equipment. For example, to control corrosion inside a pipe, radiography gives a simple form of projection of the item being inspected. In such a case the effective interpretation of results is often difficult.

The gamma transmission tomography technique represents an effective solution for the control of the internal corrosion and allows to obtain, after measure and appropriate treatment of the data, a mapping in section and even 3D imaging from the inside of the object.

The aim of the present work is to develop a portable Low Cost Gamma Tomography device adapted to the control of corrosion in industrial pipes, and in non-transportable objects. This control will certainly bring an invaluable complement to NDT techniques practiced in Morocco. To achieve the desired result we began by developing a prototype.

The developed prototype contains the following constituents: the radiation source (Co-60), the radiation detector (based on NaI scintillator), the collimator of the detector and another collimator of the radiation source (holes with 4mm) and the mechanical support of the object to be studied.

The movement of rotation is manually made by a support graduated in angles and the translatory movement is insured by a remote-controlled engine. The data acquisition is made thanks to a Ludlum module. The treatment of data is essentially made by Matlab. For image reconstruction we use the Matlab Images Toolbox functions. Matlab provides the Radon function and its inverse function as well as other functions related to the new generation of tomography. The Inverse Radon function, the main function to reconstruct the slice image of the scanned object, is based on the filtered back projection method. This function takes, as input parameter, a sinogram, a matrix or an image of the obtained measures. Preliminary tests conducted using a very rough version of the prototype allowed us to obtain reconstructed 2-D images of simple objects.

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