The application of Sciensoria's eddy current instrument, Z-Scope (tm), in the nondestructive evaluation of thickness

1 INTRODUCTION

For Sciensoria, 2015 has been marked by the many applications we have developed in the field of thickness evaluation. Our Z-Scope system has proven its capability in many complex situations to determine metallic thicknesses nondestructively

The first application replied to a need from SALM, the owner of the famous kitchen brand "Cuisine Schmidt". SALM is based in Alsace, in Eastern France, and has many factories there. In some SALM factories, there are hundreds of meters of inverted U-shaped copper rails (see the picture below). The bottom of the U-shape is constantly rubbed by graphite electrodes and loses its matter over time. There is a narrow, of 4 mm-wide gap for accessing this part of the rail, and the thickness inspection must be done on the entire rail length, which represents hundreds of meters.

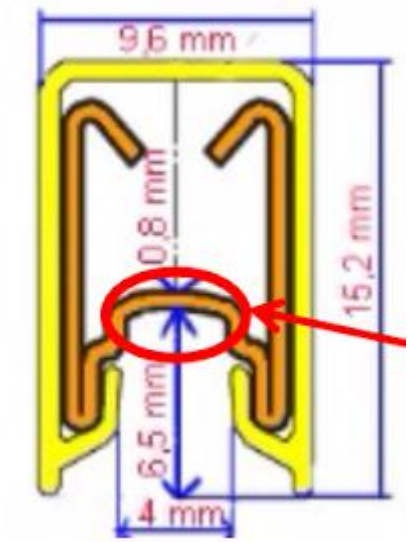

Figure 1. The profile of the inverted U-shape rail of SALM

Figure 2 – The Z-Scope eddy current instrument

The initial approach developed by SALM engineers was to measure the remaining thickness of the inverted U-shape bottom with an ultrasound thickness meter. However, the thickness to be measured is already very small, about 0.8 mm, and the acceptable remaining thickness is much smaller, about 0.3 mm. The ultrasonic instrument could not indicate a thickness smaller than 0.6 mm: it gives 0.6 mm for all inferior thicknesses. This was obviously unacceptable for SALM engineers.

In thickness measurement, people often think about "ultrasound" testing first, but there is a limit: the ultrasound method is good for high thickness only. For low thickness, under 1 mm, the precision is poor because the ultrasound echo comes back very fast and the electronic devices of the measuring instrument are not able to determine the time of fly precisely. In addition, using an ultrasound instrument requires liquid coupling; the operator has to apply a liquid to the working surface before measuring. This considerably slows down the inspection speed.

The eddy current equipment based on Sciensoria's Z-Scope model solves all these problems. Unlike the ultrasound technique, the eddy current method is sensitive to thin plates, so it is an ideal complementary method to the ultrasound technique. In addition, the eddy current technique does not require liquid coupling and tolerates much better tilt and liftoff. This means that the inspector can make his measurement much more quickly and solves his "hundreds of meters of rail" problem easily.

A special probe has been designed in order to enter the narrow gap of the inverted U-shape of SALM. It is built around a coils arrangement and encapsulated by high resistance epoxy resin. It has spent many months on SALM's hundreds of meters of rails and shown no weakness. A new industrial application was born.