# EXPERIENCE WITH NAA AND RADIONUCLIDES IN AN INDUSTRIAL LABORATORY

**D.A.W. Bossus, R. van Sluijs**
*DSM Research*
*Radioisotope Applications & Support*
*P.O. Box 18*
*6160 MD GELEEN*
*The Netherlands*

Radioisotopes have been used in a wide variety of industrial applications since the early 1950s. At DSM, a Dutch chemicals and materials group, the first applications were introduced around 1955, when the company was still a coal mining enterprise. These applications, developed at DSM Research, mainly concerned on-line density measurements for process-control purposes. Process control is still the main field of application of radioisotopes in industry in general.

Over the past thirty years many other industrial applications of radioisotopes have been developed. This has also been the case at DSM, which may be considered representative of the chemical industry. These applications have become indispensable tools and are nowadays used on a routine basis. The reason for this success is that these applications can be performed on-line without any interference with the production process and under normal production conditions.

Besides process control, the following main applications of radioisotopes can be distinguished:

- column scanning: a technique using sealed $^{60}Co$, $^{137}Cs$ and $^{252}Cf$ sources for on-line troubleshooting in distillation columns and other process equipment; this technique allows investigations to be performed at very short notice, saving production time and therefore money.
- the radiotracer technique: used as a tool for troubleshooting, for flow measurements, for determining process parameters and for in-line corrosion studies. This technique is a very helpful tool for technicians and researchers aiming to study and improve chemical processes. Short-lived radionuclides typically used in this field are $^{56}Mn$, $^{24}Na$, $^{82}Br$, $^{113m}In$, $^{81m}Kr$ and $^{99m}Tc$. The first three are neutron activation products, the last three are isotope generator products as used for medical diagnostics.
- neutron activation analysis based on the $k_0$-standardization method. The NAA technique, which was originally introduced for trace element analysis in high-purity silica, has evolved into a key analytical technique at DSM Research besides ICP-MS, ICP-AES and other sophisticated in-house methods.