Gauging

Gauges containing radioisotopes are widely used in industry to measure thickness, density, level, and other properties of a variety of materials. The importance of radioisotope gauges in industry is evident in the fact that approximately 20,000 of these devices are currently in use.

Basically, a radioisotope gauge consists of a radioisotope source and a radiation detector. The radioisotope is encapsulated into sealed sources emitting beta or gamma radiation, which interacts with the materials being gauged and is detected by the ionization chamber or other type of radiation detector. In most gauges the radioisotope sealed source is located on one side of the material being measured, and the detector is placed on the opposite side. (Figure 3.)

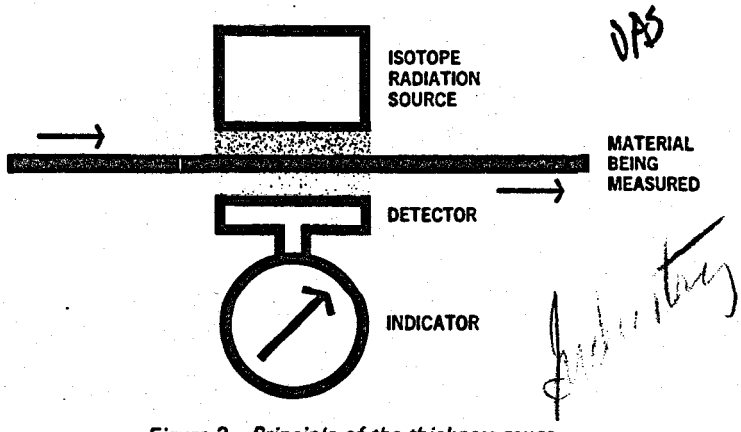

Figure 3. Principle of the thickness gauge.

The intensity of radiation penetrating a sheet of plastic, metal, paper, or rubber can be accurately correlated with the thickness or density of the sheet. Gauges of this transmission type are widely used by the industries producing such materials. The radiation source and detector traverse synchronously across the moving sheet on rigid parallel tracks to measure the variation of thickness across sheet material as it is continuously produced. The output of the radiation detector is amplified and used to drive a chart recorder, which produces a graph of the thickness profile. The signal can also signal automatic control mechanisms to keep the thickness as close as possible to specifications. Radioisotope thickness gauges of the transmission type usually employ a beta emitter as the radiation source; two of the most common isotopes used in this application are krypton-85 and strontium-90.