from the local river supply, and the full quota was being withdrawn before the expansion of capacity. Consequently, the additional water had to be recovered from mill operations. Successful water conservation was based on the use of two gamma density gauges containing sealed sources of cesium-137. The measurement and control system based on these gamma gauges aided in the saving of the needed 3,000 gallons per minute.

Another illustration of the economic advantages of gamma density gauges is the case of a uranium-ore processing mill. This plant processes 1,000 tons per day of uranium ore containing about 2,500 parts per million of U_3O_8. The underflow from each of eight thickeners in the wash circuit is pumped to the succeeding stage at a rate that determines the ratio of solids to liquid. It is highly desirable to maintain an optimum wash ratio to minimize losses from the ore. Nine gamma density gauges, each containing 50 millicuries of cesium-137, were installed so that the output of each controlled the slurry pump at that stage or at the system input to maintain a constant wash ratio and a preset feed rate to the leaching circuit. Without automatic control by the gamma gauges, it is estimated that at least 50 pounds of uranium values would be lost in the tailings from the leach circuit each day; the prevention of this loss represented an annual savings of $90,000. Furthermore, the close automatic control of the liquid-phase flow rate allows an additional annual savings of about $12,000 in reduced flocculent use and $18,000 in decreased uranium in the waste tailings from the subsequent ion-exchange concentration step. This gives a total savings of about $120,000 per year.

Physical inventory of coal piles has become increasingly important as generating stations and annual coal consumption rates grow larger. Typical annual consumption at a large plant is in the neighborhood of four million tons; so a small percentage error in coal weighing can represent a large quantity of coal. The procedure for taking physical inventory involves measuring the total volume, density, and moisture content of a coal pile. Methods for determining total volume are quite accurate, but density and moisture measurements have been restricted to areas near the surface of the pile, which are not representative of conditions many feet below. One solution to this problem is a combination "density-moisture gauge" based on sealed isotope sources. Moisture content is derived from the total hydrogen concentration of the coal, which, in turn, is determined by the output of a slow-neutron detector in conjunction with an isotopic source of