

capacitance level gauges. It was decided to automate the process with 10 isotope level gauges, which were installed at a total cost of \$40,000, including \$15,000 for the hardware. The new equipment virtually eliminated downtime and increased the chemical yield from the process, saving an estimated \$80,000 annually.

Another widespread use of isotope gauging equipment is in the automatic control of extruders for plastic film manufacture. The larger companies producing film for both consumer and industrial packaging use have completely automated their operations with the use of scanning beta thickness gauges. The close control achieved by these gauges results in a more uniform product and in lower consumption of polymer than without the instrumentation. According to one of the largest producers of food-wrapping film, the greatest saving is associated with reduced labor requirements. At one plant operated by this company the reduction in manpower following the installation of the gauges resulted in a saving in labor costs of about \$160,000 annually.

Beta gauges, usually containing sealed sources of krypton-85 or strontium-90, are used extensively to measure thickness or "basis weight" of paper, usually expressed in pounds per 500-sheet ream. The economic advantages of using beta gauges in paper production can be illustrated by the example of a Midwestern company producing fine writing and printing papers. Examination of the records for two years of operation with the beta gauges compared with experience before their installation showed a saving in scrap material of 40 tons annually per machine, or 200 tons per year for the entire operation. Additional benefits were realized through a decrease in the time required for weight changes. This wasted time was reduced from 240 to 90 hours per year per machine by the use of the beta-gauge system. The increased productivity is equivalent to 1100 tons of paper per year for the whole mill.

Finally, deviations from uniformity, as measured by the sum of the variances above and below nominal basis weight, declined from 1.405 to 1.052%.

Radioisotope gauging is also of major importance to the rubber industry. Very precise quality control is essential in the manufacturing process to achieve the close tolerances required in the fabrication of tires capable of long service under high-speed driving conditions. A most important step is the regulation of the thickness of the rubber