

Low Process Productivity Caused by Widely Used Vacuum Gauges

by

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ABSTRACT

Significant productivity loss can occur when a vacuum coating process employs a vacuum gauge whose calibration changes with time of use. Our long term tests of widely used hot and cold cathode ionization gauges under realistic operating conditions showed changes in calibrations ranging from -60 to 60% or more relative to their initial calibration. These deviations are far greater than what is tolerated for other process parameters such as temperature, current gas flow, material evaporation rate, etc. When a gauge used for process control shifts calibration with use, the next step in the process will not be initiated at the pressure, and thus gas density, chosen during process characterization and accepted for production. Also, the time at which the next step is initiated will change from its initial value. Thus nonstable gauges can cause significant process time delays and also increase the probability of producing defective products. Such delays are economically equivalent to process downtime caused by equipment malfunction or maintenance. However, unlike such downtime, these delays are invisible to the user. Equivalent process downtime and the possibility of defective products can be minimized by replacing older technology ionization gauges with a new, stable, reproducible gauge, thus achieving higher productivity.