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ISA-RP105.00.01-2017

Management of a Calibration Program for Industrial Automation and Control Systems

Approved 24 May 2017

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Introduction

Purpose

The purpose of this recommended practice is to provide the basic framework for developing and maintaining a consistent calibration program for industrial automation and control systems (IACS), including instrumentation used in safety instrumented systems. This recommended practice provides guidance on methodologies for calibration of an IACS by considering the accuracy of each loop required by the process and, if necessary, adjusting a loop component(s) to achieve the desired loop or component accuracy.

Accurate, reliable, and repeatable operation of loops in an IACS is vital to maintaining the safety and reliability of a facility. Where repeatable measurements take place in the monitoring or control of a facility, the measuring instruments and test equipment must have repeatable outputs. A well-considered calibration program, correctly implemented and maintained, can directly contribute to the assurance of the desired operation of the IACS for the facility. A calibration program establishes periodic assessments of loop/component performance over time. Data acquired during these assessments not only aids in the establishment of future calibration intervals, but is also critical in the allocation of capital and operational resources. Clearly defined policy and procedures support the efforts of maintenance planners to schedule adequate labor and equipment for calibration both during and between facility outages. Following established calibration procedures and using correct equipment reduces the likelihood of human errors due to incorrect practices; avoids acting on incorrect information; ensures the desired results of the calibration efforts; and promotes the correct operation of an IACS.

In an IACS, more hardware faults occur in the measuring instrumentation, and control valve components than in the control components of the IACS. A calibration program can aid in early detection of these failures. Inadequate calibration and maintenance of an IACS may increase the likelihood of system problems, including:

- Inaccuracy of measurements and control;
- System not responding correctly or as desired;
- Reduced awareness of instrument performance and actual need for calibration and maintenance; and
- Potential for reporting of incorrect environmental or other data.

However, targeted reduction, or increase, in calibration activities based upon the assessment of data derived from an instrument asset management calibration program can both reduce maintenance costs and improve reliability and safety.

Various definitions of the term calibration can be found:

The formal definition of calibration by the [International Bureau of Weights and Measures](#) is: "Operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties (of the calibrated instrument or secondary standard) and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication." (from *International vocabulary of metrology - Basic and general concepts and associated terms* (VIM) (JCGM 200:2012, 3rd edition)).

A definition found in the NIST Handbook 150:2001 is: "1.5.8 Calibration: Set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards.