Positive Material Identification of Critical Fasteners

John Morgan, Dave Mercuro and David Del Rio, Thermo Fisher Scientific, Tewksbury, MA

## Introduction

Fasteners are such a ubiquitous component of so many machines and assemblies used on a daily basis that we tend to take them for granted, until something goes wrong. Fasteners, particularly those used in mission-critical situations, must be designed, fabricated, inspected, and installed properly or lives can be put at risk. For this reason, it is imperative to ensure that fasteners used in critical applications are made from the precise metal alloy called for in the design specifications. This verification can be accomplished quickly, easily, and accurately using a hand-held x-ray fluorescence (XRF) analyzer.

Despite the complex physics involved, the basic premise behind XRF technology is really quite simple. When exposed to external x-rays of a sufficient energy, each of the individual elements present in a sample will produce a unique set of characteristic fluorescent x-rays that are essentially a “fingerprint” for that specific element. An XRF analyzer collects and analyzes those characteristic x-rays to determine the elemental composition of the material being inspected.

Handheld XRF analyzers are used in a wide variety of applications from lead paint inspection to mining exploration to Positive Material Identification (PMI). Examples of PMI applications include identifying the exact alloy grades used in piping, valves, and flanges that transport hazardous chemicals in refineries or chemical plants. Another growing application is in the precious metals market, where XRF can determine the precise karat weight of gold coins and jewelry. In the fasteners market, XRF is used for inspection of incoming raw material to ensure it matches the alloy grade and composition documented on the material test report (MTR). It is also used for final quality inspection before finished parts are sent to the customer. This “double-check” process ensures that the incoming raw materials and the outgoing finished parts meet the expected engineering requirements.