

PMI IN REVERSE ENGINEERING

By R. Scott Steube, Sr. Metallurgical Engineer – ASNT NDT Level III

PMI, or Positive Material Identification, is a nondestructive material analysis tool used at Toshiba's Milwaukee Service Center (MSC) that uses X-ray fluorescence to determine the chemistry of critical components used in power generation, energy and other related industries. These nondestructive chemical analysis tools use radioisotopes or miniature X-ray machines to provide the radiation necessary to perform this function. The MSC PMI unit does not have isotopes so there are no travel issues or other issues related to radioactive material in certain areas. In as little as several seconds an analysis may be obtained. These chemical findings coupled, with portable or conventional hardness testing of components, gives invaluable information to the experienced engineer for reverse engineering decisions.

MSC personnel have used PMI to check power plant steam valve bolts/nuts to verify that appropriate materials were used in these high temperature locations. In some cases, inappropriate materials were found in some valve locations and these were replaced with proper materials with appropriate creep properties. In another example, a mix of materials was resulting in the breakage of expensive cutting tools, required the separation of the foreign material from the proper alloy. Over 22,000 pieces were checked and about 800 were found to be foreign. Without a rapid analysis separation tool, all materials would have been scrapped, a situation the steel supplier could not tolerate.

This X-ray analysis tool is used often at the MSC for verification of incoming material, verification of material for the proper choice of weld procedures, to analyze the make-up of generator rotor coil retaining rings (RCRR) when unknown, as well as in the field to verify correct material usage or manufacture.

Due to worldwide sourcing of high alloy components, many customers, especially in the energy industries, are requiring 100 percent PMI testing of components and welds in fabrications.

