

PMI IN REVERSE ENGINEERING

By Mike Harry

PMI or Positive Material Identification when performed nondestructively is an engineering analysis tool used at ReGENco which uses X-ray fluorescence to determine chemistry of critical components used in the power generation and other related industries. These nondestructive chemical analysis tools use radioisotopes or miniature X-ray machines to provide the radiation necessary to get the results needed. In as little as 40 seconds, an analysis can be obtained. These chemical findings in conjunction with portable hardness testing (Equotip type) or standard laboratory hardness (Rockwell) testing, if parts are not too large, and conventional hardness testing is allowed, gives an experienced engineer much information needed for reverse engineering.

ReGENco has used PMI to check power plant steam valve bolts/nuts to verify that appropriate materials were used in these high temperature locations. Inappropriate materials were found in some valve locations and these were replaced with proper materials with recommended creep properties. This analysis tool is used often in the ReGENco plant and in the field to verify correct material usage, verification of material for proper choice of weld procedure, RCRR material when unknown, gas turbine materials of interest for replacement/repair issues, assisting in engineering analyses to get correct baseline properties, etc.

Due to worldwide sourcing of high alloy components, many customers, especially in the energy industries, are requiring 100% PMI testing of components and welds in fabrications. In addition, nonmagnetic stainless steel welds are required in some specifications to have their percent ferrite measured to verify it is within set ranges required per application. A small but defined range of ferrite (magnetic phase) is engineered into these weld grades to prevent hot cracking, but too much ferrite can cause weld corrosion problems in severe environments, thus the need for testing. ReGENco can verify the weld percent ferrite with a Severn Engineering Ferrite Indicator.