NONDESTRUCTIVE TESTING (NDT): THE SCIENCE, THE BUSINESS AND FUTURE FORECASTS

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ABSTRACT

The recent collapse of the I-35 Bridge in Minnesota, USA, brings infrastructure safety, integrity and performance to the "front page" of every news information channel around the globe. Local and federal governmental organizations increasingly focus on regulating maintenance and NDT inspection of industrial and public infrastructure (including bridges, refineries, nuclear and fossil fuel plants, pipelines, etc.). The continued utilization of the aging infrastructure and the increased focus of management for productivity and profitability has lead to "lean" construction and manufacturing, extension of useful life of assets and minimum downtime through Predictive Maintenance and NDT. In addition, the need for increasing governmental regulatory compliance and stringent environmental penalties has led to customer demands for advanced low cost automated digital NDT solutions that can guarantee overall Plan Asset Integrity Management. In the United States, most bridges are 30-35 years old. We had approximately 500 bridge failures in the last decade. Aging plant/manufacturing process industry facilities have resulted in over $50 billion spent in managing corrosion. Less than 5% increase in refinery capacity allowed environmentally in the last 25 years has led to consistent plants over-utilization. Over 60% of the U.S. pipelines are more than 45 years old, while most of the nuclear power plants are beyond their original designed life and now require constant monitoring of several critical components.

To address all of the above issues, we need a worldwide revival of NDT research! In the United States especially, such research in the past was heavily supported by military needs for quality and material safety. Now that such activities are not a top government priority industry must bear more of the research expense load. Organizations such as the Electric Power Research Institute (EPRI) financed by private U.S. power industry has lead joint research with several universities and companies like ours to develop UT Phased Array (PA) technology capable of replacing Radiography for thick wall boilers in both the fossil and nuclear power plants. Such projects result in excellent scientific achievements in 3D UT imaging and easy visualization of thick wall weld defects, while helping users increase their workers productivity at staged plant shutdowns by eliminating downtime due to the radiographic worker barriers restrictions. The most recent environmental accidents are driving hard the need for "more sophisticated" NDT inspections where visual must be replaced with such technologies as Infrared, Automated UT, AE, Ground Penetrating Radar and vibration. The author will address on-line remote monitoring and how is now coming to the front of NDT inspection arena. We will discuss advantages of such a new innovative technology while showing examples of pioneering installations/applications worldwide. The paper will present the case that while NDT Inspectors find a mechanical integrity flaw

indication and engineers perform a Fitness for Service (FFS) analysis that proves the existence and severity of a defect in the plant, operations personnel might not be able to do an instant shutdown for repairs or replacement of a plant component since it might be critical to the overall running of a plant. In that case, today's NDT technologies offer on-line, wireless remote monitoring using Acoustic Emission combined with other process parameters sensors (such detection methodology is based on "sensor fusion") for determining if the component conditions previously detected are worsening or what specific parameters are driving the existing defect to failure. Such blend of NDT technologies and process sensors will satisfy the need of API (American Petroleum Institute) for Enhanced Process Safety. Innovations in this area by researchers will be rewarded with ample PERF research contracts that are typically given to professors and scientists of various industrial NDT concerns by API. Over the past 20 years, our scientists have developed remote, on-line asset integrity monitoring strategies for comprehensive structural monitoring that combines local sensing and decision making capability with wireless remote coordinating systems that perform storage, display and analysis functions while providing alerts, performance assessments and recommended actions. In addition to the above the classical new materials NDT research will continue, but with emphasis on automated imaging technologies and rapid global defect identification. Research institutions with advances in MEMS technologies and low cost NDT permanent solutions will lead in the infrastructure applications.

The NDT business is rapidly transforming and is been incorporated within the more expansive term of Mechanical Integrity (MI). The user and owner of a plant within the MI umbrella is looking for comprehensive services that include engineering services, NDT inspection, NDT data archiving and management as well as overall plant integrity assessment and maintenance. The author will show examples of the new NDT needs for storing GBytes of files from Computer Radiography, automated UT, Phased Array, Guided UT waves etc. and all of that from a technicians day work. The use of wide use of "Plant Condition Management" and Risk Based Inspection (RBI) software will be discussed. Such information technologies are dominating today's MI business and will be the standards for helping industry prove environmental government compliance.

The author will end his talk by presenting the concerns of ICND members for today's wide shortage of NDT Certified professionals. Industry slides will be presented that show USA NDT personnel shortages of 5,000 by year 2010. Such numbers exclude the present USA nuclear industry that the EPRI/TVA report estimates >1,000 by year 2010. Considering the more than 40-nuclear plants constructed worldwide and with the start of the nuclear plants in USA by the end of 2008 industry expects the NDT personnel shortages to be in excess of 15-20,000 NDT certified technicians. The need for internet based NDT training is now a must and some suggestions will be made. The author will conclude with a summary of the state of the NDT industry as a profession as he sees it today.