
Smart Structures and NDE for Energy Systems and Industry 4.0

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Abstract Due:
22 August 2018

Author Notification:
29 October 2018

Manuscript Due Date:
6 February 2019

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Call for Papers

"The Internet of Things" and "Industry 4.0" are keywords indicating an industrial revolution that is unfolding at present. Industry 4.0 is a terminology preferred in Europe to characterize the integration of production and communication technologies to the so-called "smart factory". The process is characterized by customer-driven configuration and even design of products, cloud-based planning and management of production and logistics, and full-scale integrated monitoring of production processes. The component behavior can be continuously monitored to optimize maintenance and improve the design.

We are also seeing a paradigm shift from the production of large numbers of similar parts to small numbers of individual parts with properties tailored to a specific application. Additive manufacturing/3D printing opens the door to new applications of Smart Materials and Structures. Millions of micro sensors, actuators, and processors can be integrated in processes, materials, or components for permanent monitoring. Data can be collected and analyzed in real time by wireless technology through the Internet of Things. This leads to the next generation of Structural Health Monitoring, condition assessment, and proactive maintenance.

Significant attention is also paid to the nondestructive evaluation and structural health monitoring of these sometimes unique structures and components. NDE has to follow these trends, by not only adapting NDE techniques to the new technologies, but also introducing the capability of cyber systems into the inspection and maintenance processes. Crucial aspects of these new NDE trends are:

- 3D volume data creation by blending data from various sources
- management of large amounts of data volume/component live data files
- management and learning from big data
- real time monitoring of structural integrity
- reliable inspection of individual components
- NDE planning and interpretation based on modeling, pattern recognition and machine learning.

New handheld devices like data lenses, tablet computers, or cellphones can be efficiently used as user interfaces and make process monitoring and NDE available and affordable for everybody. Remote NDE will enable advanced competences not available on-site in an affordable way. This opens new business models and value streams for manufacturing companies as well as service providers. This might significantly increase the acceptance of NDE by solving new inspection problems for all day service. The term "NDE 4.0" is sometimes used to indicate this new quality of nondestructive inspections.

Major topics of interest are:

- industrial and commercial applications of smart structures and materials
- new applications for smart structures and materials for Industry 4.0 and Smart Factories
- the Internet of Things for monitoring components and smart structures
- structures with embedded micro- and nano-sensors, wireless communication, data collection, and analysis
- acquisition and analysis of large amounts of data (Big Data) for NDE and SHM
- 3D volume data creation and management of large live data files
- smart manufacturing, additive manufacturing, and 3D printing
- multifunctional materials for manufacturing
- real-time monitoring of factory systems
- reliable inspection of individual components and products
- NDE planning and interpretation based on modeling
- integration of CAD, structure modeling, and NDE
- remote engineering and remote NDE
- handheld devices as user interfaces for process monitoring and NDE
- cloud-based instrumentation for NDE
- industrial Internet of Things for SHM and NDE
- data alignment and integration for SHM and NDE
- data and information fusion in NDE and SHM
- VR and AR for NDE and SHM applications
- industrial and commercial applications to energy harvesting
- the concept of the digital twin.

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