IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Smart Materials and Adaptive Structures (9)

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SMART MANUFACTURING IN THE FRAMEWORK OF SPACE INDUSTRY. AN INDUSTRY 4.0 APPROACH TO LARGE SCALE PRODUCTION OF SATELLITE CONSTELLATIONS

Abstract

In recent years the so-called New Space Economy or Space 4.0 paradigm has seen a number of new commercial players entering the satellite industry and creating completely new business models, most of which based on very large constellations consisting of several hundreds or even thousands of satellites. The production of the high number of satellites involved in the modern mega-constellations is bringing in the Space Industry the necessity of improved and optimized manufacturing approaches suitable for serial production (standard environment/high number of platforms). For this reason, the adoption of new models in the organization of the production activities is not only desirable in the present Space Industry scenario, but it is also essential for gaining efficiency and competitiveness. In this framework, the adoption

of Industry 4.0 methodologies into space industry will lead to a significant improvement and optimization of the whole Manufacturing Assembly Integration and Testing (MAIT) cycle. The main aim of Industry 4.0 is the creation of intelligent factories where manufacturing technologies are upgraded and transformed by Cyber-Physical Systems (CPSs) the Internet of Things (IoT), cloud computing and big data analytics with predictive monitoring features such as the ones that characterize Smart Structures [1]. One main element of the Industry 4.0 approach is the synergic use of embedded production technologies with intelligent production processes with positive and important modifications of the industrial values chains, production value chains, and business models. In the present work, developed in the frame of project of European Space Agency, possible scenarios of applications of the Industry 4.0 concepts are presented and discussed in terms of applicability and advantages for Satellite Manufacturing [2,3]. Particular focus will be given to development of a CPS, by establishing a control network of sensors (e.g. temperature, location, load) over a target MAIT process. Performance monitoring, control, scheduling functions, based on connected systems, Machine Learning and Artificial Intelligence are envisioned, combining the innovative methodologies of in-line, in-situ process monitoring and embedded sensors for Advanced Manufacturing Processes, with cyber-systems that record and analyze data obtained from sensing networks.

References:

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