

Application of artificial intelligence in north-sea petroleum production enhancement and intervention

Lateef Akanji

University of Aberdeen, UK

Abstract:

In this work, an artificial intelligence technique for petroleum production enhancement and intervention in north-sea field operation is developed. It highlights the use of real time data generated from oilfields in delineating the performance of operational processes and proactive intervention. Applications in predictive operational practice particularly in offshore operations and management are also discussed. First, production data was numerically generated and matched against historical data from offshore fields. For each well, the subsurface production assembly was designed and modeled for two cases containing leaking and non-leaking production tubing systems. The matched data is then used in artificial intelligence platform to detect and predict the onset of a leak in subsurface production tubing. The artificial intelligence platform is a hybrid system consisting of fuzzy logic and artificial neural network superimposed on an enhanced algorithm for high precision and speed. The developed workflow provides opportunities for detection of leakage pathways in subsurface production tubing; provision of a proactive systems operation; reduction in prolonged equipment downtime in offshore operations; cost saving maintenance operation; accurate prediction of potential equipment failure; identification of well flow and reservoir pressure fluctuation; elimination of calendar-based reactive maintenance culture largely in practice; and screening reservoir candidates for enhanced oil recovery. Artificial Intelligence (AI) can be defined as the application of science and engineering with the intent of intelligent machine composition. It involves using tool based on intelligent behavior of humans in solving complex issues, designed in a way to make computers execute tasks that were earlier thought of human intelligence involvement. In comparison to other computational automations, AI

facilitates and enables time reduction based on personnel needs and most importantly, the operational expenses. Artificial Intelligence (AI) is an area of great interest and significance in petroleum exploration and production. Over the years, it has made an impact in the industry, and the application has continued to grow within the oil and gas industry. The application in E & P industry has more than 16 years of history with first application dated 1989, for well log interpretation; drill bit diagnosis using neural networks and intelligent reservoir simulator interface. It has been propounded in solving many problems in the oil and gas industry which includes, seismic pattern recognition, reservoir characterization, permeability and porosity prediction, prediction of PVT properties, drill bits diagnosis, estimating pressure drop in pipes and wells, optimization of well production, well performance, portfolio management and general decision making operations and many more. This paper reviews and analyzes the successful application of artificial intelligence techniques as related to one of the major aspects of the oil and gas industry, drilling capturing the level of application and trend in the industry. A summary of various papers and reports associated with artificial intelligence applications and its limitations will be highlighted. This analysis is expected to contribute to further development of this technique and also determine the neglected areas in the field. Plants contain different important phytochemicals that can be used as a potential treatment for various ailments including cancer. The green synthesis of silver nanoparticles from the extract of different plant parts has gained a wide range of engrossment among the researchers due to its unique optical and structural property.