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An innovative approach for modeling process systems at oilfields

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This paper proposes an innovative approach to develop models for addressing several challenges and opportunities at oilfields. In an E&P (Exploration & production) company, generally, state-of-the-art software packages are used to model any process system, utilizing built-in provisions for different process equipment. Nevertheless, such software packages do not adequately incorporate various aspects of emulsion that is a core issue at oilfields. For example, no direct provision is found for modeling dehydration and desalting process (DDP) employed at oilfield in reputed process simulation packages. Further, simulating any operating scenario, using traditional model, may involve performing complicated iterative calculations till convergence, every time any process variable assumes new value. Through this research paper, it is proposed to combine the advanced simulation ability of artificial neural network (ANN) (one of the popular artificial intelligence techniques) and versatility of spreadsheet software (that is widely used by operations/engineering staff) to avail variety of benefits. Such model has potential to handle complexity of emulsion. Also, such model can give faster solution (without needing to repeat iterative calculations every time any variable assumes new value, once convergence is achieved), which is a promising feature for RTO (real-time optimization) application. Some results of the efforts done towards implementing the proposed approach for a modeling problem pertaining to dehydration and desalting process is indicated. This paper highlights concepts that can aid several emerging solutions like digital oilfields, decision support systems, integrated asset models, real-time optimization (RTO), etc., which are being devised for attaining operational excellence at oilfields.

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A systematic method for regeneration of water and hydrogen networks

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Resource conservation role in process industry nowadays is due to market competitiveness and strict environmental regulations. Resource regeneration is one of strategies which can lead to resource conservation. In this work, the mass load cascade analysis (MLCA) for regeneration of water and hydrogen networks as an extension to the mass load analysis technique for reuse/recycle of water networks has been developed. The MLCA leads to the identification of minimum flow rate targets, pinch-point location and resource allocation targets for utility water and hydrogen regeneration systems. All these targets are determined ahead of detailed design of resource network. For hydrogen regeneration system, selection of hydrogen purification unit was systematically accessed via MLCA. Different case studies from literature for water and hydrogen networks are solved to illustrate the proposed approach.

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