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Automating sandstone acidizing using a rule-based system

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An expert system for automating sandstone acidizing has been developed in this study. The rule-based system is damage type specific, and includes guidelines that account for the mineralogical makeup of the rock as well as the acid-crude interaction. The guidelines, presented in a form of decision trees, include considerations for the presence of acid-sensitive minerals such as zeolites, chlorite, kaolinite, and feldspars, and their distribution in the rock matrix and in the pore space. In addition to the mud acids, and clay acids traditionally used for stimulating sandstones, the expert system recommendations are supported with novel phosphonic acids and acid-chelant blends that are tolerant to temperature, calcite and zeolite presence, presence of chlorite and feldspars. Two delivery methods are used for running the acidizing expert system. The first one is Java Applet Delivery for which a Java application is encapsulated in the HTML code. This method is appropriate for standalone applications. The second delivery method is through Servlet Runtime, which enables running the system as a web application, remotely accessed via the internet. The acidizing expert system has been validated against a large number of field cases spanning the Middle East, and the Niger Delta region in Africa. In each of these cases, the expert system yields an optimal acid job design, along with recommended acid volumes, pre- and post-flushes that are in perfect agreement with successful field results. This expert system will aid engineers avoid pitfalls of the perplexing sandstone acidizing.

Biography

Ali A Garrouch has completed his PhD and is the Chairman of Petroleum Engineering Department at Kuwait University.

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