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The influence of rock conductivity on the of detached particles size distribution during filtration and cyclic loading

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The objective of this study was to analyze the impact of cyclic and static loads on permeability and the characteristics of carried-out particles during nitrogen filtration through sandstone samples. The experimental setup involved placing the samples in a test setup with filters positioned one by one under the end surface to capture exhausted particles. A different testing algorithm was implemented for each sample, considering variations in loads, number of cycles, and filtration. Four terrigenous core samples with varying permeabilities were used in the study. Analysis of the filter results provided graphs illustrating the normal distribution of the diameters of the carried-out particles. The findings indicated that, in most cases, an increase in the number of filtration cycles correlated with an increase in the standard deviation of the particle distribution. This observation suggests a higher degree of data dispersion or uneven particle sizes, as evidenced by the heavy tails in the distribution curve. Moreover, an increase in the number of filtration cycles resulted in the mathematical expectation or average diameter value increasing and a rightward shift of the distribution density curve. Interestingly, the distribution curves of highly permeable samples exhibited a flatter character and larger standard deviation compared to samples with lower permeability. This observation could potentially be attributed to the loose structure of the sample, in addition to the influence of filtration. As expected, rocks with lower permeability demonstrated smaller particle removal and exhibited minimal impact on permeability. These findings shed light on the relation between cyclic and static loads, particle characteristics, and permeability changes during filtration processes, thereby contributing to a better understanding of the behavior of sandstone samples under nitrogen filtration [1,2,3,4].

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