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Design of a water-powered DTH hammer for deep drilling application[1] MIN JAE CHO, Korea Institute of Industrial Technology(KITECH)/Hanyang University, DONGUK KIM, Korea Institute of Industrial Technology(KITECH)/Korea Advanced Institute of Science and Technology(KAIST), JOO YOUNG OH, Korea Institute of Industrial Technology(KITECH), SE-JIN YOOK, Hanyang University, YOUNG WON KIM, Korea Institute of Industrial Technology(KITECH) — A DTH (Down-the-hole) hammer powered by highly pressurized fluid is a drilling tool using the motion of percussion of a drill bit. In retrospect, a DTH by using compressed air as a power source has been widely used in drilling industries such as applications of mining, geothermal etc. On the other hand, another type of a DTH that uses pressurized water, called a water hammer, has recently seen deep drilling applications, while it has been rarely investigated. In this study, we designed a water-powered DTH hammer which mainly consists of several components such as a piston, a poppet valve, a cap and a bit for deep drilling applications. We optimized the components of the hammer on the basis of the results of 1D analysis using commercial software of AMESIM. An experimental study has been also conducted to investigate a performance of the designed water hammer. We measured a pressure distribution inside the hammer system as a function of time, and it thus estimates a frequency of impaction of the bit, which has been also analyzed in frequency domain. In addition, some important parameters have been discussed in conjunction with a limitation of impaction frequency as input pressure. We believe that this study provides design rules of a water-based DTH for deep drilling applications.

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