

Study and Control of Scour below Pipelines under unidirectional flow

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Water and other fluids pipelines laid on sandy rivers and sea bed change flow pattern around pipelines. These changes increase the bed shear stress and the degree of confusion around the pipes and cause to create scour hole below the pipes. In this situation, the occurrence of scour below the pipelines may lead to instability, fracture and bending and even breakage where cause very severe economic and environmental harms eventually. In this research as well as studying of scour under the pipelines, the bed sill had been used as a new mechanism in order to reduce and control of scour. For this purpose, 3 pipes (smooth) with different diameters (D) were modelled in flow condition of

$U/U_c=0.8-0.9$ in the channel with 11m length, 25cm width and depth of 50 cm. Experiment has been performed in below 2 modes: 1) Scour below a smooth pipe without bed sill 2) Scour below a smooth pipe with bed sill. In the 2nd modes bed sill was located at 4 different distances ($L=0,D/4,D/2,D$) of downstream Of the pipe central axis. In the experiments bed sill was a barrier for spreading wake vortices and it controlled erosions of downstream. Results of this research indicated that whatever the distance of bed sill from central axis of pipe is less, there is the most influence in reducing the scour depth below pipe. In the case that bed sill had been located exactly under central axis of pipe, scour depth under pipe decreased about 100% Also in this situation with passing a long time from the beginning of examination, the pipe self-burial process occurred due to vortex creation in pipe downstream and relocation of particles toward pipe.