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ANALYSIS OF SURFACE WATER QUALITY IN KALINGARAYAN CANAL BY NUMERICAL MODELING USING COMPUTATIONAL FLUID DYNAMICS (CFD)

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Abstract

Kalingarayan canal is the oldest canal constructed in 1271 AD – 1283 AD located in Erode district and it is useful for irrigation purposes. This canal receives polluted water from various industries located nearby and also polluted by domestic activities and now is subjected especially to heavy metal pollution. This paper examines the pollutant status in the surface water of the Kalingarayan canal. The objective of the study is to find the dispersion of the pollutant concentrations, particularly heavy metals in surface water of canal. It is important to predict the environmental impact of new emissions in rivers, especially during periods of drought. Computational fluid dynamics (CFD) has proved to be an invaluable tool to develop models which identifies the dilution distance of pollutants along and across the Kalingarayan canal. The problem of heavy metal is addressed because water in the canal is polluted by anthropogenic activates, industrial and other uses. The study relies on experimental data gathered during monitoring campaigns conducted for a period of three years from 2014 to 2016. Every month surface water samples were collected from 8 stations along the canal. Heavy metal concentration was analyzed in the water samples for three seasons namely summer, pre-monsoon and post-monsoon periods. From CFD, it is observed that the distance at which the concentration of pollutant species becomes very much low and constant, reached i.e., across the canal is about 13 meters from the source point. The concentration of pollutant species along the canal is comparatively higher to that of the previous case (across the canal) till the distance of about 450 m. The results are agreeable with the experimental data obtained from the Kalingarayan canal. The geometrical model of the canal is developed in ANSYS - ICEM CFD. The domain is discretized using "MULTI BLOCKING TECHNIQUE" through which one can achieve a good quality structural mesh. It is highly recommended in computing for a better result.

Keywords: ANSYS, CFD, heavy metals, pollutant, surface water

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