Oceanografia Química - Poluição

866 - ASSESSING WATER QUALITY CHANGES CAUSED BY DREDGING OPERATIONS IN SANTOS ESTUARY, SÃO PAULO, BRAZIL

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INTRODUÇÃO

Dredging activity may cause sediment resuspension, altering water quality regarding to dissolved oxygen, conductivity, turbidity, total suspended solids and nutrients (phosphorus and total organic carbon). In this work ten sampling campaigns were performed in four areas of Santos harbor's navigation channel, with different grain sizes, in order to monitor along one hour, the variation of these parameters in the sediment plume formed due to dredging activity. A previous campaign was carried out before dredging activities to be considered as "background". This study showed that despite of variations in the results of the investigated parameters, they are of small magnitude and of short duration.

METODOLOGIA

Santos harbor´s navigation channel is the object of study. It was divided in four areas, according to grain size (Area 1 contains the coarsest material and Area 4, the finest material). Water samples were taken by use of Van Dorn bottles, in compliance with ISO 5667-6. Dissolved oxygen concentration and conductivity were measured in the field. Collected water samples were transferred to appropriate flasks, preserved accordingly and analyzed for total suspended solids (TSS), turbidity, total organic carbon (TOC) and total phosphorus. Every analysis was performed by ABNT NBR ISO/ IEC 17025 accredited laboratory.

Water samplings were carried out with the watercraft in a fixed position, according to the direction of tidal current at approximately 500 m from the dredger. Water samples were taken at half depth of the sampling point from the beginning of the overflow (t = 0 min), and every 10 or 15 min until one hour was completed. Prior to dredging activity, two water samples were taken in each of the four studied areas, considering high and low tides, in spring tide. Additionally, water samples were collected during dredging activities, within the sediment plume resulting of dredger´s self-loading overflow. Eleven sampling campaigns were concluded: one previously to the beginning of dredging activities and ten during channel dredging, resulting in 88 water samples.

RESULTADOS E DISCUSSÃO

Evaluating obtained results in the samples collected before dredging activities, it was observed no significant variation between samples from high and low tides, except for total organic carbon, which values were lower for samples taken at high tide.

Results obtained in the samples collected after dredging activities showed:

•Field measurements (dissolved oxygen and conductivity): in Areas 1, 2 and 3, they presented no representative changes along sampling time; values were similar to those observed in first campaign, before dredging activities. Area-4 presented the most significant variations for these parameters; however, these variations were not expressive, being results close to those obtained in the first campaign and these variations were of temporary duration.

•Turbidity: it was observed changes due to dredging activity; however, when it was observed, it was of local effect and temporary action. For instance, in campaign 2 – Area-1, an increase in turbidity occurred after 30 minutes of overflow (123 NTU), decreasing gradually to values similar to those observed in the beginning of overflow (t= 0 min, 14.3 NTU) and in the first campaign (< 6 NTU). The highest values of turbidity were detected in the campaigns 9 and 10 in Area-4 (maximum of 265 NTU, after 60 minutes of overflow), during sampling in the innermost part of channel, where resuspension of sediments is caused by dragging of suction mouth in the bottom of the estuary and in the shallowest region of the navigation channel, with dominance of silt and clay fractions in sediment.

•Total suspended solids (TSS): it presented similar behavior to that observed with turbidity results - dredging affects TSS locally and temporarily - TSS returned to the values observed at instant zero (t = 0 min) and in the first campaign (before dredging). Samples were from 30 to 188 mg.L-1 in Area-1, from 30 to 387 mg.L-1 in Area-2 and from 30 to 264 mg.L-1 in Area-3. The main changes were observed in the Area-4 – campaign 10, with TSS values from 30 to 1270 mg.L-1, probably due to the sediment grain size (dominance of silt and clay).

•Total organic carbon (TOC) and total phosphorus: they presented small changes during all the

sampling campaigns. Samples from Area-1 presented TOC concentrations below quantitation limit (QL) and total phosphorus was measured in concentration above QL in just one sample. Samples from Area -2 and Area-3 presented variations similar to those observed before dredging activity. Samples from Area-4 were those with the largest oscillations, varying in the different instants samples after overflow and between the campaigns.

Similar pattern to this present work was described by Anchor Environmental CA, LP. (2003), i.e., most of the resuspended sediments tend to resettle within an hour after the stoppage of dredging activities. Santos et al. (2010), when assessed water quality along Gravataí river during dredging activities, concluded that dredging activities did not change water quality in the river section evaluated. The researchers observed changes in the monitored parameters mainly in total solids and Escherichia coli but both of these decreased after dredging.

CONCLUSÃO

The present study indicates that 30 minutes after ending of dredging activities, the monitored parameters (dissolved oxygen, conductivity, turbidity, TSS, TOC and total phosphorus) presented concentrations similar to those observed previously to the beginning of the dredging. Therefore, it can be concluded that the influence of Santos Harbor's channel dredging is local and temporary, with its effect finished after the end of the dredging.

However considering the high frequency of dredging activities and ships traffic through the channel, which also cause changes in the concentrations of suspended solids and turbidity in the water, as observed in the present study, it can be expected higher frequencies of temporary changes in quality water especially in relation to the parameters turbidity, total phosphorus and total suspended solids.

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