A CASE STUDY OF SEA CURRENT MEASUREMENT AND WASTEWATER DISCHARGE MONITORING

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This paper reports a study of the field measurements and monitoring of wastewater discharge in sea water at Bari East (Italy). A wastewater sea outfall system is an integral and fundamental part of each wastewater treatment with ultimate sink in the sea water (Wood et al, 1993). The design of a water treatment plant and wastewater outfall must take into account the use of the environmental water, the values of physicochemical parameters to be respected in order to safeguard the use itself and the quality of the environmental water where wastewater is issued. It is well known that outfall pipes are used to issue the depurated water of cities at a sufficiently long distance from the shoreline, in order to avoid the polluting action of the outfall, the sea currents and the natural processes of dilution and self-depuration which could cause damage to the coastal cities and shorelines which need to be preserved. Generally the polluting action of the wastewater is reduced by submitting it to suitable depurant treatments. Measurements of horizontal and vertical velocity components of the present study were carried out with a VM-ADP (Vessel Mounted Acoustic Doppler Profiler). Also salinity and wind direction and velocities were assessed with, for one survey, the total and faecal coliforms, BOD_5, dissolved oxygen and streptococchi. It was emphasized that the measurements necessary for monitoring cannot be concentrated only in the wastewater outfall pipe zone, but should be extended to a neighbouring area of the outfall pipe, with an extension depending on the wastewater discharge, the polluting charge and the magnitude of the sea currents and the winds typical of the interested zone. The analyses presented in this paper confirm that the sea zones close to the wastewater outfall pipe are particularly sensitive and vulnerable. Such results must be considered in the planning of a wastewater outfall pipe.

The Nortek VM-ADP, Vessel Mounted Acoustic Doppler Profiler, was used to measure sea currents. In order to provide the true ocean currents, all current vessel-mounted profilers must subtract the ship velocity from the measured data. The traditional method relies on "bottom track", a technique where the Doppler profiler measures the velocity of the sea bottom relative to the ship. The Nortek VM-Profiler primarily relies on connecting to the gyro and the DGPS to obtain the vessel velocity (Fig. 1). Advantages of this method are:

- the water depth is irrelevant and the system works equally well in shallow and deep water (bottom track does not work if the bottom is deeper than the maximum acoustic range);
- the quality of the bottom acoustic conditions is irrelevant (bottom track fails when the bottom is acoustically indistinct);

- high resolution data close to the surface can be collected in deep water (bottom track requires the use of low frequency acoustics because the pulse must always reach the sea bottom).

Figs 2 and 3 show an example of sea current measurement.

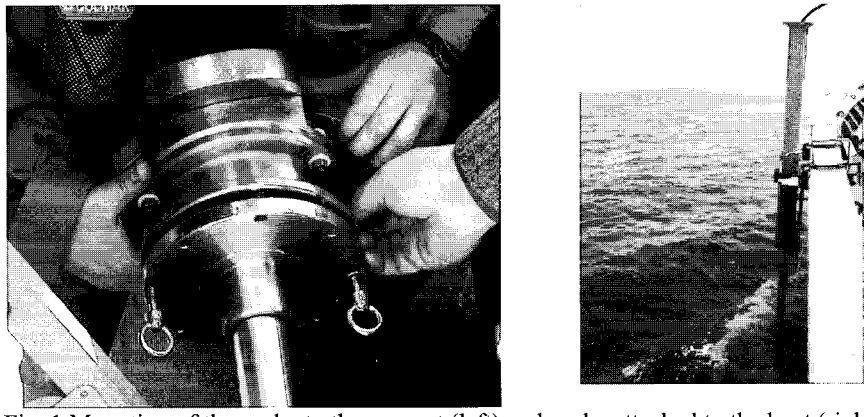

Fig. 1 Mounting of the probe to the support (left) and probe attached to the boat (right)

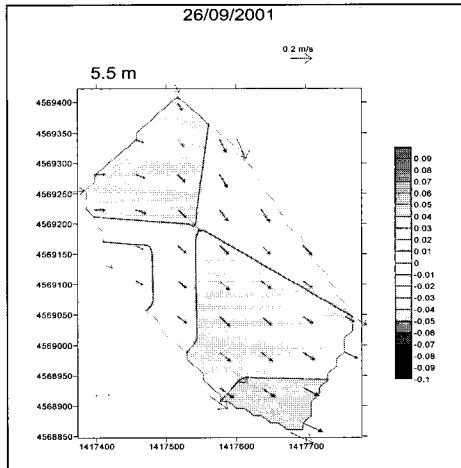

Fig. 2 Horizontal and vertical velocity components of 26 September 2001 at a depth of 5.5 meters

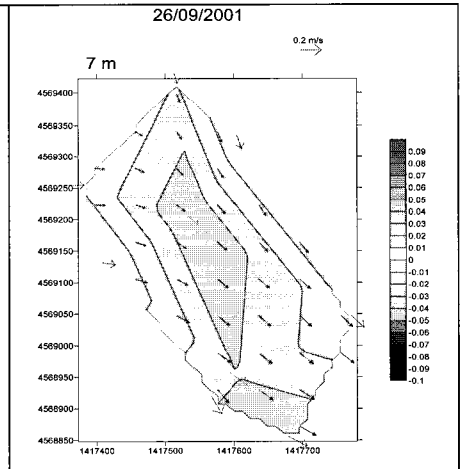

Fig. 3 Horizontal and vertical velocity components of 26 September 2001 at a depth of 7 meters

REFERENCES

Wood, I.R., Bell, R.G., and Wilkinson, D.L. (1993). *Ocean disposal of wastewater*, World Scientific, Advanced Series on Ocean Engineering, Vol. 8.