Modelling of Jet-Type Surface Thermal Discharge at Urinj Site

M. Kuzmić, Lj. Jeftić and A.J. Policastro*

Center for Marine Research, "Rudjer Bošković" Institute, P.O. Box 1016, 41001 Zagreb, YUGOSLAVIA

*Division of Environmental Impact Studies, Argonne National Laboratory, Argonne, Illinois, U.S.A.

Rijeka I is a 800 MW_{th}/320 MW_e fossil-fueled power plant under construction at the seashore 9 km SE of the city of Rijeka. It employs a once-through cooling system. The intake is located about 68 m offshore and submerged 40 m below the sea surface. The design presently proposed calls for the condenser water to be discharged at the sea surface from a circular outlet of 2.5 m diameter.

Pre-operational measurements of temperature, salinity, ambient current and dissolved oxygen were made at the site to better estimate ambient conditions and their veriability. Vertical profiles of these variables were measured in the region of the discharge at selected periods of the year.

The most popular surface discharge models were then examined as to their potential for predicting the thermal plume from Rijeka I. Three models of integral development and two of phenomenological type were compared to experimental data, representing discharge and ambient conditions very similar to the Urinj case. It was found that the Shirazi-Davis integral model best represented that data.

The Shirazi-Davis model (1,2) was then applied to Rijeka I for typical cases for several months of the year. Predicted surface isotherms patterns are presented for the months in which the largest plumes are expected. Predictions revealed that the plume excess temperature became 20% of its

Rapp. Comm. int. Mer Médit., **24**, 3 (1977).

initial value within 45-65 m of the outlet. Surface areas of that 20% isotherm varied from 550 to 850 m^2. Plume depts were typically 6-10 m at these temperatures. It is apparent that only the nearest region of the discharge is being affected by the heated water. The high velocity of the discharge induces this rapid mixing.

Our calculations for Rijeka I will be validated with data taken at the site, once the plant is in operation.

Literatura:

1. M. Shirazi and Davis L., (1974), Workbook of Thermal Plume Prediction, Volume 2, Surface Discharge, Pacific Northwest Environmental Research Laboratory Report EPA-R2-72-005b, Corvallis, Ore. (May 1974).
2. W. Dunn, Policastro A., and Paddock R., (1975), Surface Thermal Plumes: Evaluation of Mathematical Models for the Near and Complete Field. Argonne National Laboratory, Argonne, Illinois, Report ANL/WR-75-3. Part One, May 1975 and Part Two, August 1975.

18. Kuzmić M., Jeftić Lj., Policastro A.J. - Modelling of Jet-Type surface thermal discharge at Urinj site.

Discussion

Dejak C. (Italy) : Have you used only plume-models? Do you think of using combined models (grid model type) for thermal and chemical pollution ?

Kuzmić M. : In this particular study we used integral models to predict spatial distribution of temperature only. Presently, we don't plan to use any combined model but we are thinking of making complex model for Adriatic Region that would include thermal and chemical pollution effects.