ANALISIS ZONA PESISIR TERDAMPAK BERDASARKAN MODEL DISPERSI THERMAL DARI AIR BUANGAN SISTEM AIR PENDINGIN PT. BADAK NGL DI PERAIRAN BONTANG KALIMANTAN TIMUR

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ABSTRACT

Simulation of cooling-water discharges from PT. Badak NGL was conducted to predict the pattern of thermal dispersion by using hydrodynamic model and 3-D thermal transport by applying POM model (Princeton Ocean Model) (Mellor 2003). Driving forces used in this model were tides, flows of cooling water discharge and rivers discharge. Choice of time step (Δt)=0.5 second, with 118 grids (west-east) and 187 grids (north-south), grid size $\Delta x=\Delta y$=30 m. Initial value : $u=v=\zeta=0$, T_0=28 °C and S_0=32 ‰. Verification of elevation and temperature between results of models and direct measurement showed a good suitability with correlation value was 0.97 for elevation verification, correlation 0.90 and 0.87 for thermal verification during spring and neap tides, respectively. Results of simulation revealed the most extreme difference in pattern of surface thermal dispersion that found during spring tide for sampling condition of maximum tide and ebb. Distinct difference was especially found at station 8 (*mixing point*) i.e. 41 °C during maximum ebb and 35 °C during maximum high tide. Whereas, significantly high thermal difference between upper layer and bottom layer was found at station C i.e. around 2.54 °C for dry season scenario and 2.32 °C for wet season scenario. Effects of elevated water temperature from a thermal discharge on phytoplankton and coral reef was studied by using simulation results, where field observation for phytoplankton was adjusted with the time of output model. The results showed the negative correlation between temperature with abundance, the number of species and diversity index of phytoplankton. Impact of increase in temperature on the phytoplankton is mainly found in the waters with temperature > 37.91 °C, where at this temperature the number of species, abundance and diversity index of phytoplankton is very small compared with phytoplankton at natural temperature. As for coral reefs results simulation sampled at a location where the coral reefs found. The results showed that the increase of temperature up to 35.3 °C due discharge of cooling water caused the death of the coral reefs. While the temperature rise up to 33.3 °C in front of the Sieca Island cause damage to death of coral reefs.

Keywords : POM model, cooling-water and rivers discharges, thermal dispersion, phytoplankton, coral reef