In recent years, due to the economical and environmental benefits, biofiltration has been chosen by industries as the preferred technology for volatile organic compound (VOC) removal even in regions such as the Middle East where a warmer climate prevails throughout the year. In this work, a theoretical non-isothermal steady-state model is developed and the model has been used to evaluate temperature effects of biofilter performance. The model predicts that toluene removal increases as the inlet and surrounding air temperatures increase. A 5 °C increase in the inlet air temperature results in a 20% increase in the percent removal of toluene. A complete sensitivity analysis of the model is carried out. Heat of biological reaction (- ? H_R) has only a negligible effect on biofilter performance for the range of values (10–100 kJ/g) considered and overall heat transfer coefficient (U_{ov}), for values <25 J s^{-1} m^{-2} K^{-1}, have shown a profound effect on toluene removal. Although the results of this study are based on the assumption of complete saturation of incoming air, and negligible moisture loss from the media, the results and this non-isothermal model will be useful in estimating key design parameters for full scale systems.