We investigate whether successful leptogenesis driven by heavy right-handed neutrino decays can be compatible with flavour fits within the minimal and potentially realistic non-supersymmetric SO(10)-based model with Yukawa sector composed of $\mathbf{10}_H$ and $\overline{\mathbf{126}}_H$, and with additionally imposed Peccei-Quinn symmetry. To this end, we solve density matrix equations and renormalization group equations for effectively direct symmetry breaking of SO(10) down to the Standard Model. We scan over the parameter space and generate a number of configurations compatible with flavour fits. One of the most striking results of this analysis is that we obtain configurations that give the value of the baryon asymmetry of the Universe within an order of magnitude of the measured value, despite the fitting procedure independent of the leptogenesis yield. Moreover, leptogenesis in this region of parameter space is predominantly driven by decays of the second lightest right-handed neutrino. Furthermore, the analysis shows that the fitted $B - L$ breaking scale is consistent with previous studies, despite not explicitly incorporating gauge coupling unification and full renormalization group equations with $B - L$ breaking. We also provide the best flavour fit for the model without additionally imposed Peccei-Quinn symmetry that shows preserving of characteristics and some predictions of the first model.