The biomass-derived char (biochar) produced in the gasifier as a residue, is a potential solution for removing tars from producer gas. This work investigates the interaction between tar compounds and biochar. Residual biochar from a TwoStage gasifier was tested as bed material in a laboratory setup. Phenol and naphthalene were chosen as model tars, and entrained in a nitrogen flow. The gaseous stream was sampled before and after the biochar bed to evaluate the extent of conversion. The biochar bed (30g) was tested at 250°C, 500°C and 600°C, with for 3 consecutive hours. The compounds concentration in the gas phase was quantified by stable isotope dilution analysis, using Gas Chromatography-Mass Spectrometry (GC-MS). Results showed a significant effect of biochar on the removal of phenol, at all temperatures. Naphthalene was removed less efficiently at higher temperature, and this trend was even more visible with a smaller char bed (17g). The characterization of the residual biochar from the TwoStage gasifier showed high carbon content and a specific surface area comparable with active carbon. Scanning Electron Microscopy revealed that the wood structure is largely maintained in the biochar particles, and the main inorganic components are calcium, potassium and silicon in form of oxides.